



Regional Plan for the Lake Tahoe Basin
2001 Threshold Evaluation Draft



July 2002

REGIONAL PLAN FOR THE LAKE TAHOE BASIN



2001 THRESHOLD EVALUATION *DRAFT*

“ and at last the lake burst upon us--a noble sheet of blue water lifted six thousand three hundred feet above the level of the sea, and walled in by a rim of snow-clad mountain peaks that towered aloft full three thousand feet higher still! It was a vast oval, and one would have to use up eighty or a hundred good miles in traveling around it. As it lay there with the shadows of the mountains brilliantly photographed upon its still surface I thought it must surely be the fairest picture the whole earth affords.

The forest about us was dense and cool, the sky above us was cloudless and brilliant with sunshine, the broad lake before us was glassy and clear, or rippled and breezy, or black and storm-tossed, according to Nature's mood; and its circling border of mountain domes, clothed with forests, scarred with landslides, cloven by canyons and valleys, and helmeted with glittering snow, fitly framed and finished the noble picture. The view was always fascinating, bewitching, entrancing. The eye was never tired of gazing, night or day, in calm or storm; it suffered but one grief, and that was that it could not look always, but must close sometimes in sleep.

So singularly clear was the water, that where it was only twenty or thirty feet deep the bottom was so perfectly distinct that the boat seeming floating in the air! Yes, where it was even eighty feet deep. Every little pebble was distinct, every speckled trout, every hand's-breadth of sand...The water was not merely transparent, but dazzlingly, brilliantly so.

**--excerpts from
Roughing It, by
Mark Twain (1871)**

The rate of decline in winter average Secchi depth (Lake clarity loss) appears to have slowed since 1988. While both the winter and annual average Secchi depths continue to decline, the slowing in the rate of decline for the winter average may indicate that degradation to lake clarity is leveling off and, possibly, clarity is improving in the long run.

**--excerpt from
TRPA 2001 Threshold Evaluation.**

Table of Contents

ACKNOWLEDGEMENTS xiii

EXECUTIVE SUMMARY xvii

Chapter One: INTRODUCTION

BACKGROUND 1-1
THE LAKE TAHOE REGION 1-4
SUMMARY OF THE 2001 EVALUATION 1-9
RECOMMENDATIONS 1-13

Chapter Two: AIR QUALITY

I. INTRODUCTION 2-1
II. THRESHOLD SUMMARY 2-7
 Threshold Matrix 2-9
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES 2-17
 AQ-1 Compliance Form 2-19
 AQ-2 Compliance Form 2-23
 AQ-3 Compliance Form 2-27
 AQ-4 Compliance Form 2-33
 AQ-5 Compliance Form 2-39
 AQ-6 Compliance Form 2-43
 AQ-7 Compliance Form 2-49
 AQ-8 Compliance Form 2-55
IV. STATUS OF 1996 RECOMMENDATIONS 2-65
V. 2001 RECOMMENDATIONS 2-69
VI. EIP INTEGRATION 2-74
VII. SUPPLEMENTAL INFORMATION 2-78
 TABLE 2-3. Carbon Monoxide (1 Hour)
 TABLE 2-4. Carbon Monoxide (8 Hours)
 TABLE 2-5. Ozone (Hourly)
 TABLE 2-6. Ozone (8 Hours)
 TABLE 2-7. Particulate Matter, 10 Microns Or Less (Pm10)
 TABLE 2-8. TRPA Regional Visibility Standard Analysis, Bliss State Park
 TABLE 2-9. TRPA Regional Visibility Standard Analysis, South Lake Tahoe
 TABLE 2-10. Nitrate (Annual Mean)
 TABLE 2-11. Nitrogen Dioxide (Hourly)
 FIGURE 2-1 – Tahoe Region VMT Forecast Lines by Established Base Year

Chapter Three: WATER QUALITY

I. INTRODUCTION 3-1
II. THRESHOLD SUMMARY 3-7
 Threshold Matrix 3-9
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES 3-19
 WQ-1 Compliance Form 3-29
 WQ-2 Compliance Form 3-37
 WQ-2A Compliance Form 3-45
 WQ-2B Compliance Form 3-51
 WQ-3 Compliance Form 3-55
 WQ-4 Compliance Form 3-63
 WQ-5 Compliance Form 3-69
 WQ-6 Compliance Form 3-77
 WQ-7 Compliance Form 3-83

Chapter Three: WATER QUALITY (continued)

IV. STATUS OF 1996 RECOMMENDATIONS	3-97
V. 2001 RECOMMENDATIONS	3-98
VI. EIP INTEGRATION	3-108
VII. SUPPLEMENTAL INFORMATION	3-111
APPENDIX 1. Littoral Turbidity Monitoring Results	
APPENDIX 2. Annual Average Secchi Depth/Winter (Dec-Mar) Secchi Depth.	
APPENDIX 3. Winter (Dec-Mar) Secchi Depth 1968 –1987: Summary Statistics	
APPENDIX 4. Winter (Dec-Mar) Secchi Depth 1988 – 2000: Summary Statistics	
APPENDIX 5. Erosion & Runoff Control Projects Constructed Since 1988	
APPENDIX 6. Completed EIP Projects As Of Fall 2000	
APPENDIX 7. Hydrologic Features Map	
APPENDIX 8. Tributary Annual Average Concentrations	
APPENDIX 9. N Tributary Graphs	
APPENDIX 10. P Tributary Graphs	
APPENDIX 11. Fe Tributary Graphs	
APPENDIX 12. TSS Tributary Graphs	
APPENDIX 13. Surface Runoff At Point Of Discharge	
APPENDIX 14. LTIMP Monitoring Programs Paper	
APPENDIX 15. USGS MTBE Paper	

Chapter Four: SOIL CONSERVATION

I. INTRODUCTION	4-1
II. THRESHOLD SUMMARY	4-5
Threshold Matrix	4-7
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES	4-9
SC-1 Compliance Form	4-13
SC-2 Compliance Form	4-19
IV. STATUS OF 1996 RECOMMENDATIONS	4-21
V. 2001 RECOMMENDATIONS	4-24
VI. EIP INTEGRATION	4-29

Chapter Five: VEGETATION

I. INTRODUCTION	5-1
II. THRESHOLD SUMMARY	5-4
Threshold Matrix	5-5
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES	5-9
V-1 Compliance Form	5-13
V-2 Compliance Form	5-19
V-3 Compliance Form	5-25
V-4 Compliance Form	5-29
IV. STATUS OF 1996 RECOMMENDATIONS	5-37
V. 2001 RECOMMENDATIONS	5-39
VI. EIP INTEGRATION	5-44

Chapter Six: FISHERIES

I. INTRODUCTION	6-1
II. THRESHOLD SUMMARY	6-4
Threshold Matrix	6-7
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES	6-11
F-1 Compliance Form	6-17
F-2 Compliance Form	6-23
F-3 Compliance Form	6-27
F-4 Compliance Form	6-31
IV. STATUS OF 1996 RECOMMENDATIONS	6-35

Chapter Six: FISHERIES (continued)

V. 2001 RECOMMENDATIONS	6-36
VI. EIP INTEGRATION	6-39
VII. SUPPLEMENTAL INFORMATION	6-40
APPENDIX 1. Status of Fish Species That Have Been Recorded in the Lake Tahoe Basin.	
APPENDIX 2. Stream Ratings Reported in the 1996 Threshold Evaluation (TRPA 1996).	

Chapter Seven: WILDLIFE

I. INTRODUCTION	7-1
II. THRESHOLD SUMMARY	7-4
Threshold Matrix	7-7
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES	7-9
W-1 Compliance Form	7-43
W-2 Compliance Form	7-47
IV. STATUS OF 1996 RECOMMENDATIONS	7-51
V. 2001 RECOMMENDATIONS	7-54
VI. EIP INTEGRATION	7-57
VII. SUPPLEMENTAL INFORMATION	7-60
APPENDIX 1. Wildlife Species of the Lake Tahoe Basin.	
APPENDIX 2. Species By Habitat Association Recorded at Different Wetland Locations in the Lake Tahoe Basin, June Through November 1999.	
APPENDIX 3. Species By Habitat Association Recorded at Different Wetland Locations in the Lake Tahoe Basin, June-November 2000.	
APPENDIX 4. Wetland Site Descriptions, Human Disturbance Rating (Refer To Table 1), Type of Wetland, Distinguishing Characteristics, and Human Influences, June- August 1999 and 2000 in the Lake Tahoe Basin.	

Chapter Eight: SCENIC RESOURCES

I. INTRODUCTION	8-1
II. THRESHOLD SUMMARY	8-2
Threshold Matrix	8-5
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES	8-9
SR-1 Compliance Form	8-23
SR-2 Compliance Form	8-33
SR-3 Compliance Form	8-43
SR-4 Compliance Form	8-53
IV. STATUS OF 1996 RECOMMENDATIONS	8-59
V. 2001 RECOMMENDATIONS	8-61
VI. EIP INTEGRATION	8-75
VII. SUPPLEMENTAL INFORMATION	8-78
APPENDIX 1. Travel Route Ratings	
APPENDIX 2. Scenic Quality Rating Changes (including new scenic quality resources)	
APPENDIX 3. Recreation Area and Bike Trail Ratings Changes	
APPENDIX 4. New Roadway Units	
APPENDIX 5. Scenic Shoreline Units and Scenic Roadway Units Maps	

Chapter Nine: NOISE

1. INTRODUCTION	9-1
II. THRESHOLD SUMMARY	9-4
Threshold Matrix	9-5
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES	9-9
N-1 Compliance Form	9-13
N-2 Compliance Form	9-21
N-3 Compliance Form	9-29
IV. STATUS OF 1996 RECOMMENDATIONS	9-35

Chapter Nine: NOISE (continued)

V. 2001 RECOMMENDATIONS 9-37
VI. EIP INTEGRATION 9-41
VII. SUPPLEMENTAL INFORMATION 9-42
 TABLE 9-7. Comparison of Measured Noise Levels to Plan Area Statement Criteria
 TABLE 9-108. Predicted Traffic Noise Levels

Chapter Ten: RECREATION

I. INTRODUCTION 10-1
II. THRESHOLD SUMMARY 10-6
 Threshold Matrix 10-7
III. THRESHOLD STATUS AND EFFECTIVENESS OF COMPLIANCE MEASURES 10-11
 R-1 Compliance Form 10-23
 R-2 Compliance Form 10-29
IV. STATUS OF 1996 RECOMMENDATIONS 10-39
V. 2001 RECOMMENDATIONS 10-42
VI. EIP INTEGRATION 10-46
VII. SUPPLEMENTAL INFORMATION 10-48

Chapter Eleven: ECONOMICS

I. INTRODUCTION 11-1
II. SOCIO-ECONOMIC PROFILE OF LAKE TAHOE REGION 11-4
III. ECONOMIC IMPACTS GENERATED BY TRAVEL SPENDING IN THE LAKE TAHOE REGION 11-22
IV. EXTERNAL AREAS AFFECTING THE LAKE TAHOE REGION 11-32
V. VISITOR VOLUME FOR LAKE TAHOE REGION 11-39
VI. TRPA INFLUENCE ON LAKE TAHOE REGION ECONOMY 11-40
VII. ECONOMIC CRITERIA FOR EVALUATION OF CAPITAL EXPENDITURE PROJECTS 11-50
VIII. POLICY IMPLICATIONS AND RECOMMENDATIONS 11-52
 1996 Recommendations And Progress-To-Date 11-54
 Recommendations For 2001 11-55
IX. SUPPLEMENTAL INFORMATION 11-58
 APPENDIX 1. Lake Tahoe Region Zip Codes
 APPENDIX 2. Average Daily Traffic
 APPENDIX 3. Regional Travel Impact Model
 APPENDIX 4. IMPLAN Modeling System
 APPENDIX 5. Discussion Guide for TRPA Assessment Section

APPENDICES

A. MASTER LIST OF COMPLIANCE MEASURES
B. 2001 THRESHOLD EVALUATION RECOMMENDATION IMPLEMENTATION SCHEDULE
C. CUMULATIVE ACCOUNTING
D. [CUMULATIVE EFFECTS](#)

List of Tables

EXECUTIVE SUMMARY

1	Summary of 2001 Evaluation.....	xxiii
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Chapter Two: AIR QUALITY

2-1.	US 50 Traffic Volumes, Saturday of President's Day Weekend.....	2-36
2-2	Effectiveness of Measures in Place for the Air Quality Threshold.....	2-57

Chapter Three: WATER QUALITY

3-1	Estimated Nutrient Budget (Loading As Metric Tonnes)	3-19
3-2	Shallow Lake Tahoe Turbidity Sites	3-23
3-3	Summary for Annual Cycles in Turbidity Measurements at 8 Locations in Lake Tahoe ..	3-26
3-4	Summary of Water Quality Capital Project Expenditures Since 1996 Threshold Evaluation	3-40
3-5	Water Quality Thresholds CIP Mitigation Measures and Proposed Project Units of Benefit.....	3-41
3.6	Effectiveness of Measures in Place for the Water Quality Threshold	3-85
3-7	Lake Tahoe Water Quality Data, 1995 Through 1999.....	3-115

Chapter Four: SOIL CONSERVATION

4-1	Approved New Coverage.....	4-10
4-2	Completed Land Coverage Reduction Projects (1996-2000).....	4-10
4-3	EMCF Disbursement (1996 – 2000)	4-11
4-4	Excess Coverage Mitigation with a Fee.....	4-11
4-5	Completed SEZ Restoration Projects 1996 – 2000	4-15

Chapter Five: VEGETATION

5-1	Relative Vegetation.....	5-11
5-2	Status of Uncommon Plant Communities	5-16
5-3	Survey Results for Tahoe Yellow Cress	5-22
5-4	Status of Sensitive Plants	5-22
5-5	Effectiveness of Measures in Place for the Vegetation Threshold	5-31

Chapter Six: FISHERIES

6-1	An Estimate of Substrate Acreage by Habitat Type and 'Disturbance' in Lake Tahoe's Shorezone	6-13
6-2	Status of Lake Habitat Threshold Standard.....	6-14
6-3	Original Stream Ranking Criteria Used to Rate the Condition of Threshold Streams ..	6-19
6-4	Stream Score Classes Used in 1982 and 1996.....	6-20
6-5	Miles of Stream by Different Ratings for 1982 and 1996 Compared to Threshold Standard.....	6-21
6-6	Status of Stream Habitat Threshold Standard	6-22
6-7	Number of Lahontan Cutthroat Trout Stocked by Lake in the Upper Truckee Watershed, Lake Tahoe, CA. 1996 – 2001	6-29
6-8	Effectiveness of Measures in Place for the Fisheries Threshold.....	6-33

Chapter Seven: WILDLIFE

7-1	TRPA's Wildlife Threshold Standards and Indicators.....	7-3
7-2	Human Activity Rating System for Surveyed Wetlands in the Lake Tahoe Basin.....	7-15
7-3	Golden Eagle and Peregrine Falcon Survey Effort and Site Summary7-23 in the Lake Tahoe Basin, Summer 1999.	7-23
7-4	Golden Eagle and Peregrine Falcon Survey Effort and Site Summary in the Lake Tahoe Basin, Summer 2000.	7-25

Chapter Seven: WILDLIFE (continued)

7-5	Special Interest Species Threshold Attainment Status as Reported for 1982,1991,1996,2001	7-42
7-6	Effectiveness of Measures in Place for the Wildlife Threshold	7-49

Chapter Eight: SCENIC RESOURCES

8-1	Interim Targets	8-10
8-2	Travel Route Rating Score Changes 2001	8-11
8-3	Roadway Travel Routes: 2001 Non-Attainment Units	8-17
8-4	Roadway Travel Routes At Risk	8-19
8-5	Shoreline Travel Routes: 2001 Non-Attainment Units	8-19
8-6	Shoreline Travel Routes At Risk	8-20
8-7	Scenic Quality Rating Score Changes 2001	8-28
8-8	Scenic Quality Ratings: 2001 Non-Attainment Resources	8-30
8-9	Scenic Resources At Risk	8-31
8-10	Recreation Area and Bike Trail Scenic Quality Changes	8-38
8-11	Community Design Evaluation	8-47
8-12	Effectiveness of Measures in Place for the Scenic Resources Threshold	8-55

Chapter Nine: NOISE

9-1	Typical A-Weighted Maximum Sound Levels of Common Noise Sources	9-1
9-2	TRPA Threshold: Single-Event Noise	9-9
9-3	TRPA Threshold: Single-Event Noise	9-15
9-4	Measured Single Event Snowmobile Passby Noise Levels	9-17
9-5	Watercraft Setbacks Required to Achieve PSIL Criteria	9-18
9-6	Results of Noise Measurements on Common Watercraft	9-19
9-9	Effectiveness of Measures in Place for the Noise Threshold	9-31

Chapter Ten: RECREATION

10-1	Recreation Visitation at Lake Tahoe	10-17
10-2	Lake Tahoe Region Bicycle Trails	10-20
10-3	PAOT Status	10-26
10-4	Effectiveness of Measures in Place for the Recreation Threshold	10-31
10-5	Lake Tahoe Recreation Demographics	10-50

Chapter Eleven: ECONOMICS

11-1	Population by County, Lake Tahoe Region, 1990-2010	11-4
11-2	Lake Tahoe Region Room Tax Receipts and Rates by Jurisdiction, 1999	11-9
11-3	Sale Price of Homes in Lake Tahoe Region, 2000	11-13
11-4	Annual Average Daily Traffic, 1999	11-17
11-5	Percent Change in Seasonal ADT from Annual Average 1999	11-19
11-6	Lake Tahoe Region Travel Impact Summary	11-24
11-7	Lake Tahoe Region Travel Impacts, 1996-2000p	11-24
11-8	Sierra-Nevada Travel Impacts, 1999 *	11-27
11-9	Employment and Earnings Generated by Tahoe Region Travel Expenditures, 2000.	11-29
11-10	Total Employment Generated by Lake Tahoe Region Visitor Expenditures, 2000	11-30
11-11	Total Earnings Generated by Lake Tahoe Region Visitor Expenditures, 2000	11-30
11-12	Population of Visitor Region and Driving Time to Lake Tahoe	11-33
11-13	Lake Tahoe Region Visitor Volume, 1996-2000	11-39
11-14	Guideline Matrix	11-51

List of Figures

Chapter One: INTRODUCTION

1-1	TRPA's Mission and Principles	1-3
1-2	TRPA Regional Plan Map	1-5
1-3	ETCC Attainment Status	1-10
1-4	Threshold Attainment Trends	1-10
1-5	Thresholds in Need of Attainment	1-11
1-6	Pathway 2007 Schedule	1-15

Chapter Three: WATER QUALITY

3-1	Lake Tahoe Turbidity Monitoring Stations	3-22
3-2	Desert Research Institute Turbidity Study Sampling	3-25
3-3	TRG Pelagic Monitoring Stations.....	3-32
3-4	Annual Average Secchi Depth at Index Station and Mid-Lake Station, Lake Tahoe	3-33
3-5	Winter (Dec – Mar) Secchi Depth 1968-1987.....	3-34
3-6	Winter (Dec – Mar) Secchi Depth 1988-2000.....	3-35
3-7	Primary Productivity and Secchi Depth	3-53
3-8	History of LTIMP Stream and Ground Water Monitoring Program	3-57
3-9	Trends in Total Phosphorus Concentrations	3-59
3-10	Trends in Total Nitrogen Concentrations	3-60
3-11	Trends in Suspended Sediment Concentrations	3-60
3-12	Beecher Lodi Project.....	3-66
3-13	Pioneer Trail III.....	3-67
3-14a	Selected USGS Wells	3-72
3-14b	Selected Wells vs. Nitrates	3-73
3-14c	Selected Wells vs. Phosphorus	3-73
3-15	Angora Creek vs. Pioneer III.....	3-74
3-16	Lake Tahoe Monitoring Stations and Other Lakes	3-80
3-17	MTBE Sampling in Lake Tahoe and Other Lakes 1999 – 2000	3-82
3-18	Lentic (Lake) System Terminology	3-113

Chapter Four: SOIL CONSERVATION

4-1	Excess Coverage Mitigated by Fee Since 1987	4-12
4-2	Number of Acres of SEZ restored since 1980	4-16

Chapter Five: VEGETATION

5-1	Location of Plant Communities Considered in this Evaluation	4-17
5-2	Locations of Tahoe Yellow Cress from 2000 Survey Data	4-23

Chapter Seven: WILDLIFE

7.1	Map of Waterfowl Threshold Sites	7-16
7.2	Summary of Bald Eagle Nest Activity and Population Trend 1995 to 2000	7-17
7.3	Map of Bald Eagle Activity	7-19
7.4	Number of Juvenile & Adult Bald Eagles Recorded During Winter Surveys 1986 – 2001	7-20
7.5	Total Number of Deer Counted During Fall and Spring Counts	7-21
7.6	Map of Potential Fawning Habitat (Deer).....	7-22
7.7	Peregrine Falcon and Golden Eagle Threshold Sites	7-24
7.8	Summary of Documented Northern Goshawk Territory Activity, 1976 – 2000.....	7-27
7.9	Percent of Years Between 1992 to 2000 Each Northern Goshawk Territory was Successful and/or Occupied in the Lake Tahoe Basin, CA, NV	7-28
7.10	Relative Disturbance Level Within 268m of Known Northern Goshawk Nest Sites	7-28

Chapter Seven: WILDLIFE (continued)

7.11	Relative Level of Disturbance Within 'Disturbance-Free' Zones (500 acres) of Known Northern Goshawk Nest	7-29
7.12	Northern Goshawk Map	7-30
7.13	Summary of Osprey Nest Activity Relative to TRPA Threshold & Population Trend	7-32
7.14	Relative Level of Disturbance Within 'Disturbance (Free)' Zones of Intact Osprey Nests	7-33
7.15	Map of Osprey Activity	7-34
7.16	Total Number of Species Detected in Surveys Conducted in 1999 & 2000 at Wetland Sites	7-36
7.17	Species Richness, Grouped By Habitat Association, Recorded at Wetlands Surveyed in 1999	7-36
7.18	Relative Species Diversity, Grouped by Habitat Association at Surveyed Wetlands, 1999	7-37
7.19	Species Richness, Grouped By Habitat Association, at Wetlands Surveyed, 2000.....	7-37
7.20	Relative Species Diversity, Grouped by Habitat Association at Surveyed Wetlands, 2000	7-38
7.21	Number of Species Recorded at Wetland Sites Exhibiting Reproductive Behavior, 1999-2000.....	7-38
7.22	Summary of Northern Goshawk Territory Activity (1992 - 2000) and Trend Towards Achieving TRPA's Threshold Standard.....	7-40

Chapter Ten: RECREATION

10-1	Recreation Conditions – Importance vs. Experience.....	10-16
10-2	Recreation Facilities – Importance vs. Experience.....	10-16
10-3	Recreation Facility Types.....	10-19
10-4	Recreation Facilities Providing Access.....	10-19
10-5	Visitor Origin By State/Region	10-51
10-6	Recreation Activity Participation	10-53
10-7	Attribute Importance Rating	10-55
10-8	Recreation Experience Ratings for Lake Tahoe	10-57
10-9	Attitudes On Public Expenditures	10-58

Chapter Eleven: ECONOMICS

11-1	Lake Tahoe Region And Greater Tahoe Area	11-3
11-2	Projected Average Annual Rate of Population Growth, 2000-2010	11-5
11-3	Population by Age Group, 1990-2010	11-5
11-4	School Enrollment K-12 in Lake Tahoe Region, 1994-2000	11-6
11-5	Lake Tahoe Region Employment by Major Industry Group, 1998	11-7
11-6	Lake Tahoe Region Earnings by Major Industry Group, 1998	11-7
11-7	Lake Tahoe Region Unemployment Rate, 1995-2000	11-8
11-8	Local Wages as a Percent of Total Personal Income, 1994-98	11-9
11-9	Lake Tahoe Region, Transient Occupancy Tax Receipts 1995-2000	11-10
11-10	Lake Tahoe Region Annual Gaming Revenue (winnings), 1989-2000	11-11
11-11	Alpine Ski Days in Lake Tahoe Basin, 1993-2000	11-11
11-12	Number of Residential Construction Permit Applications Received by TRPA	11-12
11-13	Single Family Homes, Condominiums, & Time Shares in Lake Tahoe Region, 1999	11-13
11-14	Median Sale Prices in Lake Tahoe Region, 1990-2000	11-14
11-15	Number of Non-Residential Construction Permit Applications Received by TRPA.....	11-14
11-16	Highway and Traffic Count Locations	11-16
11-17	Change in Average Daily Traffic, Selected Access Points 1997-1999.....	11-18
11-18	Average Daily Traffic, 1999 California Access.....	11-18
11-19	Average Daily Traffic, 1999 Nevada Access	11-19
11-20	Visitor Traffic, 1999 (Annual ADT Increment Above Average Seasonal Low)	11-20
11-21	Location of Residence, Lake Tahoe Region Employees, 1992.....	11-20
11-22	Travel Spending in Lake Tahoe Region by Type of Accommodation, 2000	11-25

Chapter Eleven: ECONOMICS (continued)

11-23 Travel Spending in Lake Tahoe Region by Type of Activity, 2000..... 11-26
11-24 Travel Generated Employment in Lake Tahoe Region, 2000 11-27
11-25 Travel Spending by Location: Lake Tahoe Region, Greater Tahoe Area, &
Sierra Nevada Region, 1999 11-28
11-26 Direct Travel-Generated Employment as Percent of Total Employment, 1999 11-28
11-27 Indirect Employment Generated by Lake Tahoe Region Visitor Spending, 2000..... 11-31
11-28 Indirect Earnings Generated by Lake Tahoe Region Visitor Spending, 2000..... 11-31
11-29 Projected Population by Visitor Region, 2010 11-34
11-30 Projected Population 50 Years of Age and Older by Visitor Region, 2010 11-35
11-31 Annual per Capita Income by Visitor Region, 1998 11-36
11-32 Persons Employed by Visitor Region, 1999 11-37
11-33 Respondent Rating of Economic Effect by TRPA Policy Area 11-46
11-34 Respondent Rating of TRPA Program Importance for Enhancing the Long Term
Lake Tahoe Economy..... 11-46

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2001 Threshold Evaluation

EXECUTIVE SUMMARY

INTRODUCTION

The Tahoe Regional Planning Compact charges the Tahoe Regional Planning Agency (TRPA) with attaining and maintaining environmental threshold carrying capacities (“thresholds”) to protect the unique values of the Lake Tahoe Basin. The nine thresholds adopted by TRPA in 1982 are for air quality, water quality, soil conservation, vegetation, fisheries, wildlife, scenic resources, noise, and recreation.

[According to the Regional Plan’s Goals and Policies](#), ~~B~~beginning in 1991 and every five years thereafter, TRPA conducts a comprehensive evaluation of whether each threshold is being achieved and/or maintained, specific recommendations to address problem areas, and directs general planning efforts for the next five-year period. TRPA assesses progress of the nine thresholds towards attainment by examining 36 specific threshold indicators.

The 2001 Threshold Evaluation presents the Agency’s threshold attainment findings, makes analytical and corrective recommendations, sets the Agency’s direction for the final years of the 1987 Regional Plan, and lays the groundwork for adoption of the next 20-year plan in 2007.

Assessment of threshold attainment occurs within the context of TRPA’s overall planning strategy. At adoption [of the thresholds](#), some ~~thresholds~~ were already in attainment or anticipated to reach attainment within a short time period; other [thresholds](#) were not anticipated to reach attainment for decades. For example, public and private entities have made substantial investment in water quality improvement projects over the last 15 years knowing that the benefits to lake clarity of those activities will not likely be seen for decades. As a result, some thresholds will not be in attainment at the end of the current 20-year Regional Plan nor is there a corrective strategy that could achieve attainment by 2007.

SUMMARY OF RESULTS

TRPA reports threshold performance in three ways. First, the straight overall picture of threshold attainment is reported. Of the 36 indicators, ~~eight~~ [seven](#) (~~22~~ [19](#) percent) of them are in attainment. Approximately 25 (70 percent) of indicators are not in attainment. However, approximately seven of those indicators are close to attainment. As for the remaining ~~three~~ [four](#) (~~8~~ [11](#) percent) of indicators, TRPA cannot determine attainment status. While a simple percentage determination is not particularly helpful in assessing where and how to direct future effort, the overall percentages of indicators in attainment have not changed substantially compared with the 1991 and 1996 Threshold Evaluations.

Second, TRPA examines the performance trend (positive, negative or neutral) of each threshold indicator. In general, indicator trends are positive or stable. Specifically, 19 indicators show a positive trend, seven indicators are moving further away from attainment, and 10 indicators show no trend. Interestingly, of the 25 indicators not in

attainment, 12 show a positive trend. Unfortunately, seven negative trends are found in indicators not in attainment.

Third, TRPA examines the thresholds with scientific evidence and technical information to determine if they are in need of amendment. It has been determined that ~~49-21~~ of the indicators need re-evaluations and/or updates. There is also a need to modify all the indicators to be consistent with the proposed adaptive management strategy and Tahoe Integrated Information Management System.

Findings and recommendations for each threshold and the economy are briefly summarized below. The threshold attainment status results are also summarized in Table 1.

1. Air Quality and Transportation:

- The air quality health-based standards, which include carbon monoxide, ozone (federal and states), and particulate matter, are in attainment as of 2000.
- TRPA's ozone standard, adjusted to protect vegetation, has been exceeded every year since this threshold was adopted.
- The standards for local visibility have improved although haze has increased on a regional basis. Wood smoke emissions and nitrogen deposition have followed a positive trend.
- For the transportation thresholds, which were originally established to help attain health-based standards, traffic flow near Stateline, CA has improved; however, Basin-wide Vehicle Miles Traveled have increased.
- TRPA recommends new and expanded research to include phosphorous, particulate matter, nitrogen species and their effects on lake clarity, and research into the effects of out-of-Basin atmospheric transport of pollutants.

2. Water Quality:

- Littoral turbidity attains threshold standards as in past evaluations; however, no trend can be established and there are concerns that the standard is set too high to be a useful indicator of Lake Tahoe's water quality.
- The rate of decline in winter average Secchi depth (Lake clarity loss) appears to have slowed since 1988. While both the winter and annual average Secchi depths continue to decline, the slowing in the rate of decline for the winter average may indicate that degradation ~~to lake clarity is leveling off and, possibly, clarity is improving in the long run~~ slowing down.
- At the same time Phytoplankton Primary Productivity continues to increase, although there is a slight leveling trend in the last few years.
- Recommendations for the deep-water thresholds are to target projects/BMPs for removal of phosphorus and fine sediment; and intensify sweeping and maintenance of right-of-ways to remove fine sediment.
- Water quality capital improvement project (CIP) expenditures have met the 1996 interim targets in seven of eight cases. Interim targets for BMP retrofit implementation and revegetation set in the 1996 Evaluation have not been met and there are recommendations for an improved program.
- Tributary water quality is not in attainment of standards; however, there are significantly positive trends.
- Stormwater runoff to both surface waters and groundwater met discharge standards for Nitrogen, Phosphorus, and suspended sediment concentration

(surface) in the majority of samples, but is still considered in non-attainment since some samples did not meet discharge standards. There are a group of recommendations to assist in attainment of these two thresholds.

- Except for single samples where Lower Echo, Upper Angora, and Fallen Leaf lakes met Nitrogen standards, the status of the other lakes threshold is unknown.

3. Soil Conservation:

- Impervious Coverage is in non-attainment, although it may be better described as being in partial attainment. All new projects since 1987 are in attainment with the Bailey coefficients for impervious coverage. The reason for the non-attainment status of this threshold is due to the pre-1972 excess coverage that has not yet been mitigated through excess coverage mitigation programs.
- The threshold standard for Naturally Functioning Stream Environment Zones (SEZs) is in non-attainment. However, a trend of restoration in disturbed SEZ's is increasing and progress is being made in restoration efforts through implementation of the EIP.

4. Vegetation:

- The vegetation conditions and patterns in the Lake Tahoe Region of today are a reflection of past and current human activities.
- The Common Vegetation threshold is not in attainment because the current second growth forest does not contain the desired mixture of forest age types.
- Uncommon Plant Communities are in attainment, and the Sensitive Plants threshold is not in attainment because there is a lack of Tahoe yellow cress populations.

5. Wildlife:

- Overall threshold indicators of wildlife status are not in compliance with the threshold standards. Recreational activities are suspected to contribute to the degradation of habitats for Northern Goshawk, waterfowl, deer, and wintering Bald Eagles.
- The threshold standards adopted for Golden Eagle and Peregrine Falcon will not likely be realized due to sub-optimal habitat conditions found in the Lake Tahoe basin (i.e., unlikely to nest 4,000 ft above sea level).
- Although considerable momentum was made towards the restoration of riparian habitats, restoration has not kept pace with identified interim targets and the adopted threshold standard.
- Recommendations identified in this evaluation call for reducing impacts associated with recreational activities, a comprehensive review of threshold standards and indicators within the context of new information, and an acceleration of EIP project implementation.

6. Fisheries:

- Of the four threshold standards for fisheries, the region is in compliance with two threshold standards, in-stream flow and Lahontan cutthroat trout.
- The quantity of Lake Tahoe's fish habitat has not significantly changed since the 1996 threshold evaluation and, therefore, is not in attainment with the threshold standard. However, research suggests that the extent of physical disturbance is considerably less than that reported in the 1996 Threshold

Evaluation. Therefore, the region is close to achieving the threshold standard for lake habitat although additional research is needed to verify this conclusion.

- ~~Likewise, in light of insufficient stream habitat data,~~ Fisheries professionals concluded that stream habitat in the region is not in attainment with the threshold standard.
- Recommendations identified in this evaluation call for the acceleration of EIP project implementation and the review of threshold standards and indicators for fisheries.

7. Scenic Resources:

- Overall, the four threshold standards for scenic resources are in non-attainment. The trends continue to be negative with the exception of the scenic roadway corridors within the urban core. Major redevelopment projects and improvements to the built environment through private investment have improved scenic quality in those areas.
- However, the opposite is occurring in the shorezone. Dramatic increase in the scale and mass of residential structures often block lake views from the roadway and are rarely adequately screened or sited to reduce visual dominance as seen from the lake.
- In addition the increase in new piers and the addition of boat lifts is creating visual clutter along the shoreline. All this has reduced the scenic quality in the shorezone and has resulted in four additional shorezone units dropping from threshold attainment.
- The same trends listed above for the shorezone areas are also having a negative affect on the mapped scenic resources. There are a series of recommendations calling for increased regulation.

8. Noise:

- Airport noise has not significantly changed, with most exceedances being due to military aircraft for which the airport has no enforcement authority.
- Single and community noise events levels (CNEL) exceeded the applicable standards; however, monitoring was extremely limited and therefore, strong conclusions cannot be made.
- TRPA recommends developing procedures for airport noise and other single events to determine when noise events should be considered or excluded in evaluating noise thresholds.
- TRPA also recommends a stringent noise monitoring program followed by a re-evaluation of the current noise thresholds.

9. Recreation:

- Based on surveys, recreational expectations of visitors and residents are generally being met but the recreation experience threshold indicator is not in attainment for implementing access improvements and recreation plans.
- Few projects requiring 'Persons At One Time' (PAOT) allocations are being constructed; however, TRPA is reserving the capacity with the PAOT allocation system. Therefore, the recreation capacity threshold indicator is in attainment.
- Although trends land acquisition for outdoor recreation are positive, there has been a lack of capital investment, operation and maintenance funds for achieving the threshold goals.

10. Economics:

- Although there is no threshold standard for economic indicators, the Compact recognizes the interdependence of environmental quality, economic health, and social well-being in the Tahoe Region. As part of the five-year threshold evaluation, TRPA monitors economic conditions and considers the impacts of the Regional Plan on the Region's economy.
- The 2001 report concludes that the economy of the Lake Tahoe Region can be characterized as being strong with above average property values and low unemployment, and has enjoyed increasing tourist visitation over the past five years (1996–2000).
- However, with recent world events, the region's economy has seen an overall slow-down with a corresponding decrease in tourist visitation.
- Overall, it can be said that the region's economy is dominated by travel expenditures. In 2000, Lake Tahoe travel expenditures accounted for over 36,000 jobs and over \$8.8 million in earnings.
- Recommendations focus on seeking a sustainable economy consistent with threshold attainment.

AGENCY DIRECTION IN LIGHT OF THRESHOLD EVALUATION RESULTS

As summarized above, TRPA concludes that the majority of thresholds remain out of attainment and significant work remains to progress towards the ultimate goals of the Compact. TRPA's strategy to achieve its mandate is three-pronged.

- Adopt the threshold specific recommendations identified in this evaluation. These recommendations will, where possible, provide near-term corrective strategies promoting threshold attainment.
- Intensify implementation of the Environmental Improvement Program. In the 1996 Threshold Evaluation, TRPA identified the EIP restoration effort as key to the long-term achievement and maintenance of thresholds. TRPA must ensure that the resources flowing into the Tahoe Basin for EIP implementation are efficiently and effectively utilized. TRPA must also continue to implement its adaptive management and real time monitoring programs.
- Plan for the future. A major conclusion of this evaluation is that many elements of the 20 year old thresholds require extensive study for either recalibration or significant amendment. As a consequence of the expiration of TRPA's Regional Plan in 2007, TRPA will complete a thorough study and update of all thresholds by 2004. If significant changes to thresholds are to occur – and we recognize in this evaluation that some changes are appropriate and needed – that will happen in the 2004 Threshold Update. TRPA will then use the Threshold Update as the platform to construct the new 2007-2027 Regional Plan.

Finally, TRPA uses its five-year review to determine whether allocation of new development (i.e. residential, commercial, tourist accommodation and bonus units) should continue apace as contemplated in the 1987 Regional Plan and accompanying Environmental Impact Statement. The Evaluation concludes that the allocations of new development and expansions of existing development should continue but be more closely linked to key recommendations, such as accelerated EIP implementation, BMP program upgrades, transit improvements, and new scenic standards.

A. Residential Allocations

In December 2001, it is recommended that TRPA adopt a one-year extension consistent with the performance review recommendations, which are 300 allocations minus one for Douglas County. [\(Completed December 2001\)](#)

In February 2002, it is recommended that TRPA adopt allocations for 2003, 2004, 2005, and 2006, [using a base allocation of 150 units that can go up \(to a maximum of 294\) or down \(to a minimum of 78\) at 300 units/year](#) contingent on [baseline performance](#). EIP progress and progress on key Evaluation recommendations.

B. Commercial Allocations

In February 2002, it is recommended that TRPA adopt allocations for 2003 through 2006 in ~~the~~ amounts ~~of~~ [up to](#) 100,000 sq. ft. for the special projects program and [up to](#) 50,000 sq. ft. for Community Plan reloads. This would be contingent on EIP progress and key Evaluation recommendations.

C. Tourist Accommodation Bonus Units

For 2003 through 2006, it is recommended that TRPA add [up to](#) the remaining 100 tourist accommodation bonus units to the special project pool with EIP findings and key Evaluation recommendations.

Table 1. Summary of Threshold Indicator Status

Environmental Threshold Compliance Indicator Trends					
Threshold		1991	Evaluations 1996	2001	Trend
I. AIR QUALITY					
AQ-1	CO	Nonattainment	Attainment	Attainment	
AQ-2	O ₃	Nonattainment	Nonattainment	Nonattainment	≡
AQ-3	Particulate	Nonattainment	Nonattainment	Attainment	
AQ-4	Visibility	Attainment	Nonattainment	Nonattainment	↓
AQ-5	U.S. 50 Traffic Volume	Nonattainment	Attainment	Attainment <u>Unknown</u>	≡
AQ-6	Wood Smoke	Nonattainment	Nonattainment	Unknown	
AQ-7	VMT	Nonattainment	Nonattainment	Nonattainment	↓
AQ-8	Atmospheric Nutrient Loading	Attainment	Attainment	Unknown	
II. WATER QUALITY					
WQ-1	Turbidity (Shallow)	Attainment	Attainment	Attainment	≡
WQ-2	Clarity, Winter	Nonattainment	Nonattainment	Nonattainment	
WQ-3	Phytoplankton PPr	Nonattainment	Nonattainment	Nonattainment	↓
WQ-4	Tributary Water Quality	Nonattainment	Nonattainment	Nonattainment	
WQ-5	Runoff Water Quality	Nonattainment	Nonattainment	Nonattainment	≡
WQ-6	Groundwater	Nonattainment	Nonattainment	Nonattainment	≡
WQ-7	Other Lakes	Unknown	Unknown	Unknown	≡
III. SOIL CONSERVATION					
SC-1	Impervious Coverage	Nonattainment	Nonattainment	Nonattainment	↓
SC-2	Naturally-Functioning SEZ	Nonattainment	Nonattainment	Nonattainment	
IV. VEGETATION					
V-1	Relative Abundance and Pattern	Nonattainment	Nonattainment	Nonattainment	
V-2	Uncommon Plant Communities	Attainment	Attainment	Attainment	
V-3	Sensitive Vegetation	Nonattainment	Nonattainment	Nonattainment	≡
V-4	Late Seral/Old Growth (New)			Nonattainment	
V. FISHERIES					
F-1	Lake Habitat	Nonattainment	Nonattainment	Nonattainment	
F-2	Stream Habitat	Nonattainment	Nonattainment	Nonattainment	
F-3	In-Stream Flows	Unknown	Unknown	Attainment	≡
F-4	Lahontan Cutthroat Trout (New)			Attainment	
VI. WILDLIFE					
W-1	Special Interest Species	Nonattainment	Nonattainment	Nonattainment	
W-2	Habitats of Special Significance	Attainment	Nonattainment	Nonattainment	
VII. SCENIC RESOURCES					
SR-1	Travel Route Ratings	Nonattainment	Nonattainment	Nonattainment	↓
SR-2	Scenic Quality Ratings	Nonattainment	Nonattainment	Nonattainment	↓
SR-3	Public Recreation Area Scenic Quality Ratings	Unknown	Unknown	Nonattainment	↓
SR-4	Community Design	Unknown	Nonattainment	Nonattainment	
VIII. NOISE					
N-1	Single Event (Aircraft)	Unknown	Nonattainment	Nonattainment	
N-2	Single Event (Other)	Attainment	Attainment	Nonattainment	≡
N-3	Community Noise	Nonattainment	Nonattainment	Nonattainment	≡
IX. RECREATION					
R-1	High Quality Recreational Experience	Unknown	Unknown	Nonattainment	
R-2	Capacity Available to the General Public	Attainment	Attainment	Attainment	
Positive Trend		Negative Trend ↓		No Trend ≡	

Chapter 1

INTRODUCTION

This report presents the results of the Tahoe Regional Planning Agency's third comprehensive evaluation of environmental threshold carrying capacities, which were adopted in 1982, and the subsequent Regional Plan package, adopted in various parts from 1984 to the present.

The 2001 Threshold Evaluation Report provides information and recommendations to the TRPA Governing Board to assist in making necessary adjustments to the environmental threshold carrying capacities and the Regional Plan package, in compliance with the provisions of the Tahoe Regional Planning Compact. The 2001 Evaluation Report consists of 11 chapters, which include the evaluation results for the nine categories of threshold standards and the economy of the region. A summary of the individual threshold's status and recommendations are found in the tables and figures at the end of this Introduction. A more detailed analysis, compliance forms, and recommendations are found in each of the individual threshold chapters.

There are ~~three~~ [four](#) appendices prepared pursuant to Chapter 32 of the Code of Ordinances. Appendix A contains the master list of compliance measures; Appendix B contains a schedule of implementation for the many recommendations of the 2001 Evaluation Report; ~~and~~ Appendix C is the cumulative accounts report; [and Appendix D contains the cumulative effects report.](#)

BACKGROUND

The Tahoe Regional Planning Compact, along with other state and federal environmental legislation, establishes TRPA's mission. TRPA's Mission and Statement of Principles is set forth in Figure 1-1. In addition to its mission under the Compact, TRPA is also responsible for certain planning activities under the Federal Clean Air Act, the Federal Clean Water Act, the California Transportation Development Act, the Intermodal Surface Efficiency Act, and the California Clean Air Act.

In August 1982, TRPA adopted Resolution No. 82-11, which adopted environmental threshold carrying capacities for the Lake Tahoe Region. The Compact defines "environmental threshold carrying capacity" as:

...an environmental standard necessary to maintain a significant scenic, recreational, educational, scientific or natural value of the region or to maintain public health and safety within the region.

Throughout the Regional Plan package and this report, TRPA commonly refers to "environmental threshold carrying capacities," "threshold standards," or simply "thresholds." These terms are interchangeable.

Prior to adopting Resolution 82-11, TRPA considered lengthy public testimony, an Environmental Impact Statement (EIS), and a study report on the establishment of the

threshold standards. The thresholds set forth in Exhibit A of Resolution 82-11 address the following nine components of the environment of the Tahoe Region: water quality, soil conservation, air quality, vegetation preservation, wildlife, fisheries, noise, recreation, and scenic resources.

The threshold standards guide virtually all aspects of TRPA's planning and operating functions. Article V(c) of the Compact requires TRPA to amend the Regional Plan so that:

...at a minimum, the plan and all of its elements, as implemented through agency ordinances, rules and regulations, achieves and maintains the adopted environmental threshold carrying capacities. Each element of the plan shall contain implementation provisions and time schedules for such implementation by ordinance.

Article V(d) of the Compact also requires the Regional Plan to "provide for attaining and maintaining Federal, State or local air and water quality standards, whichever are strictest, in the respective portions of the region for which the standards are applicable." Each element of the plan, where applicable, must identify the means and time schedule by which air and water quality standards will be attained.

Finally, Article V(g) of the Compact requires TRPA to make specific written findings prior to approving any project in the region. These findings must "insure that the project under review will not adversely affect implementation of the Regional Plan and will not cause the adopted environmental threshold carrying capacities of the region to be exceeded."

Although the thresholds do not address the economy of the Tahoe Region, TRPA recognizes the interdependence of environmental quality, economic health, and social well-being in the Tahoe Region. The Regional Plan Goals and Policies (1986) provide that TRPA will monitor economic conditions, report on the state of the region's economy, consider the impacts of the Regional Plan on the region's economy, and consider adjustments to the Regional Plan consistent with the attainment of the threshold standards.

Resolution 82-11 states that the threshold standards shall be reviewed at the time of adoption of the Regional Plan to ensure that the plan and the thresholds are consistent, and at least every five years thereafter. The thresholds shall be amended where scientific evidence and technical information indicate:

- (a) two or more thresholds are mutually exclusive; or
- (b) substantial evidence to provide a basis for a threshold does not exist; or
- (c) a threshold cannot be achieved; or
- (d) a threshold is not sufficient to maintain a significant value of the region or additional thresholds are required to maintain a significant value.

The Regional Plan Goals and Policies (Monitoring and Evaluation Subelement) and the Code of Ordinances, Chapter 32, also require TRPA to evaluate the thresholds and the Regional Plan package at least every five years. Although Regional Plan litigation in the mid-1980s created uncertainty as to the date of the first five-year review, the Water Quality Management Plan for the Lake Tahoe Region (TRPA, 1988) established the date for the first evaluation as September, 1991.

Figure 1-1. TRPA's Mission and Principles

Statement of Mission

THE TAHOE REGIONAL PLANNING AGENCY LEADS THE COOPERATIVE EFFORT TO PRESERVE, RESTORE, AND ENHANCE THE UNIQUE NATURAL AND HUMAN ENVIRONMENT OF THE LAKE TAHOE REGION

Statement of Principles

A. PREAMBLE

TRPA shall interpret and administer its plans, ordinances, rules, and regulations in accordance with the provisions of the Compact. This statement of principles is intended to confirm the policies set forth in the Tahoe Regional Planning Compact (P.L. 96-551, December 19, 1980), in its specific provisions and as a whole, so as to guide the Agency in resolving conflicts, in charting the future direction, and in enhancing public understandability. The following statement of general policy provides TRPA with direction and consistency for enactment and implementation of the Regional Plan and increases TRPA and public understanding of the TRPA Goals and Policies.

Principles.

1. The Tahoe Region exhibits unique and irreplaceable environmental and ecological values of national significance which are threatened with deterioration or degeneration.
2. The purpose of TRPA is to:
 - a. Maintain the significant scenic, recreational, educational, scientific, natural, and public health values provided by the Region; and
 - b. Insure an equilibrium between the Region's natural endowment and its manmade environment.

Together these will encourage the wise use of the waters of Lake Tahoe and the resources of the area, preserve public and private investments in the Region, and preserve the social and economic health of the Region.
3. In accomplishing its purpose, TRPA is to:
 - a. Establish environmental threshold carrying capacities, defined as environmental standards necessary to maintain significant scenic, recreational, educational, scientific, or natural values of the Region or to maintain public health and safety within the Region, including but not limited to standards for air quality, water quality, soil conservation, vegetation preservation, and noise;
 - b. Adopt and enforce a Regional Plan and implementing ordinances which achieve and maintain such capacities while providing opportunities for orderly growth and development consistent with such capacities; and
 - c. Pursue such activities and projects consistent with the Agency's purposes.

Source: TRPA Goals and Policies, 1996

THE LAKE TAHOE REGION

The Tahoe Region is a special place. To those who have visited Lake Tahoe and its surroundings, from earliest prehistory to the present, the region is an exceptional, inspiring place of spiritual proportion.

The Tahoe Region was once a place of inestimable beauty. The American author Samuel Clemens ("Mark Twain") wrote of its beauty over a century ago. Photographer Ansel Adams captured it in his photographs.

Yet, like other natural places in California and the Great Basin, its beauty has been severely compromised. As at Yosemite, Pyramid Lake, the lakes and marshes of the Pacific flyway, San Francisco Bay and the California Delta, the progress of modern life has diminished the unique values that make the Tahoe Region so extraordinary.

With ever-increasing pressure upon the region as a recreational resource and an urban center, preservation of the values of the Tahoe Region is vitally important and, at the same time, immensely difficult. The region serves as a haven for visitors from the urbanized areas surrounding it, and for others who travel from afar to appreciate it. Ironically, the millions who enjoy the area simultaneously endanger it with their very presence.

About the Tahoe Region

Located between the Carson Range on the east and the Sierra Nevada on the west, the Tahoe Region is divided by the California-Nevada state line. Approximately one-third of the region is in Nevada, and two-thirds in California. The total land area of the region is over 207,000 acres, with about 75 percent in public ownership.

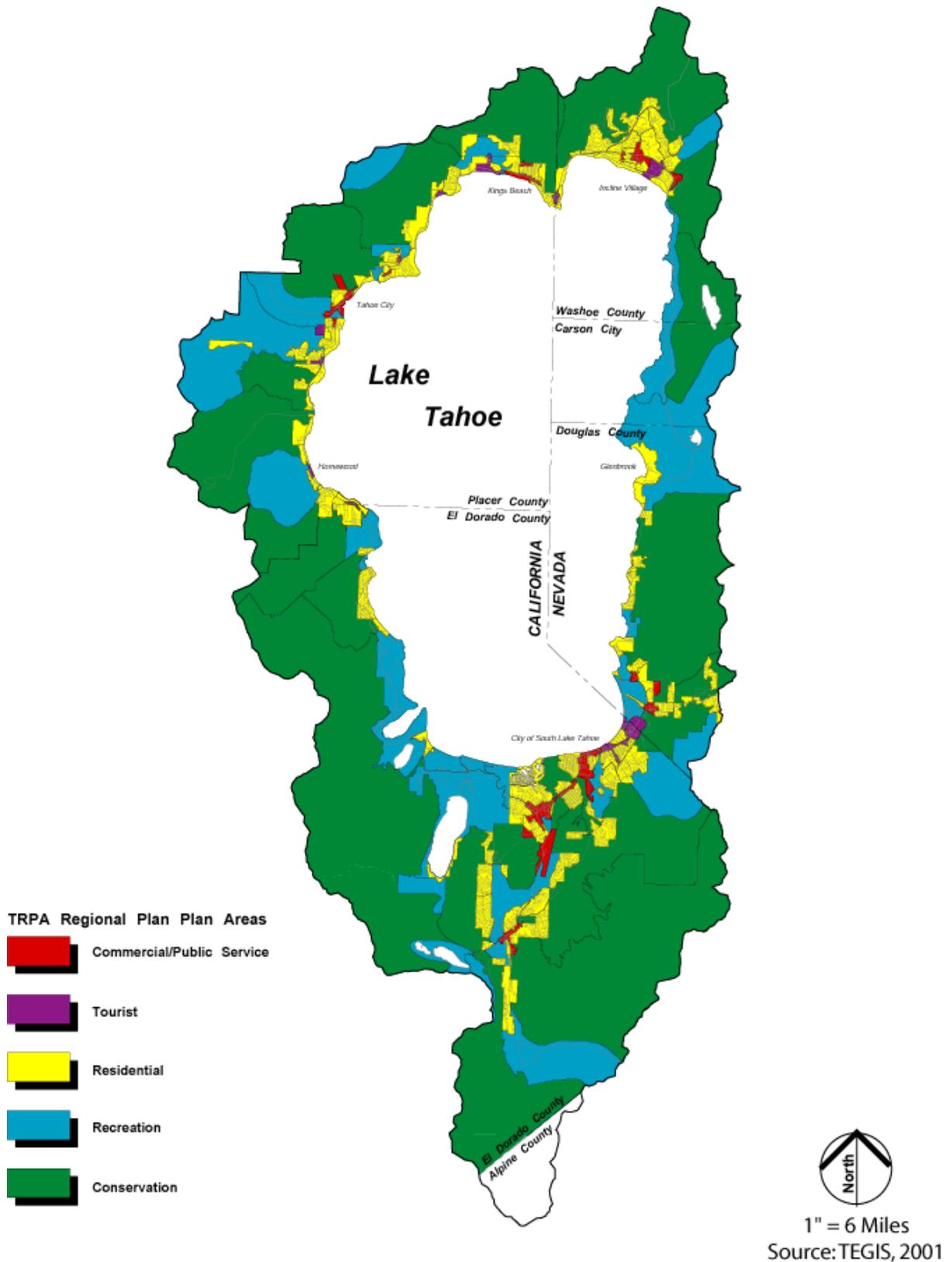
Lake Tahoe is the dominant feature of the region and is world renowned for its crystal clear water and beautiful setting. Lake Tahoe is approximately 12 miles wide and 22 miles long, with a surface area of 192 square miles and 75 miles of shoreline. With a maximum depth of 1,645 feet, Lake Tahoe is the tenth deepest lake in the world. Maximum elevation of the Lake's surface is 6,229 feet above sea level.

The topography of the region consists chiefly of steeply sloping mountains with a few flat or moderately sloping areas where most development has occurred. Elevations of the peaks surrounding Lake Tahoe range from about 8,000 feet to almost 11,000 feet above sea level.

Long, relatively mild winters and short, dry summers characterize the climate of the region. Precipitation normally falls as snow during the winter months. During the summer, there are infrequent thunderstorms. The western side of the region receives about twice the precipitation as the eastern side.

Most development and urbanization of the Tahoe Region occurred during and following the Squaw Valley Winter Olympics in 1960. Since that time the population of the region has increased over five times, with about 80 percent of the population residing in California. The residential population in 2000 is estimated at 56,000. This population doubles in the summer with the addition of visitors and second-home owners.

Figure 1-2. TRPA Regional Plan Map



There are about 20 developed towns and communities in the basin; however, the City of South Lake Tahoe is the only incorporated city. The region is home to about 42,800 residences, 9,600 vacation homes, 11,500 tourist accommodation units, and 2,500 campground units. Figure 1-2 is the TRPA Regional Plan map, which generally matches the land use pattern of the region.

Casino gaming areas are located at the north and south Stateline areas, and in Incline Village. These areas provide tourist, commercial, and indoor entertainment facilities.

The undeveloped areas of the region are predominantly publicly owned. Public ownership is increasing, largely through the efforts of federal and state land acquisition programs. Outdoor recreation use of the region is extensive.

The dominant transportation system in the region is the highway system. There are seven highways that allow access to the region, four in California and three in Nevada. The dominant form of transportation is the private automobile, but buses, taxis, and other modes accommodate some trips. The Lake Tahoe Airport, located in the City of South Lake Tahoe, serves the region.

Effects of Human Activity

There is extensive evidence of the adverse impacts of human activity in the Tahoe Region. Lake Tahoe itself suffers from cultural eutrophication, an increase in algal productivity that will continue until the Lake's nutrient budget is balanced. Even with aggressive management, Lake Tahoe's water quality trends will change slowly, due to the Lake's long residence time of approximately 700 years. Runoff from the watershed carries nutrients to Lake Tahoe; other nutrients come from the air.

Violations of water quality standards and guidelines for tributary streams and urban runoff are common. Generally, water quality is best in watersheds in undeveloped areas. Accidental discharges from sewage collection and treatment systems and discharges of toxic and hazardous substances during transport or storage have occurred and endanger water quality and public health and safety.

The region has many examples of soil conservation problems: erosion and runoff associated with urbanization; unstable cut and fill slopes, particularly those associated with roads; denuded and compacted areas; stream channelization; and damage from outdoor recreation, off-road vehicles, and grazing.

Although a portion of the region in California did not attain the federal, state, and TRPA air quality standards for carbon monoxide, due to the presence of a "hot spot" near the south Stateline-California monitoring station, recent monitoring indicates the entire region is now in attainment. The TRPA ozone standard continues to be exceeded in recent years. Based on data from more sophisticated monitors, the region appears to be in non-attainment for some standards for visual range. The region still does not meet one of the California inhalable particulate standards, a health-related standard. Other fine particles found in the air include high proportions of wood smoke for which TRPA has not met its threshold target to reduce emissions by 15 percent.

Traffic congestion is common in certain parts of the region in both summer and winter. TRPA estimates that 1.79 million vehicle miles were traveled (VMT) in the region on an average peak summer day in 1999. Although traffic improvements have occurred, the land use pattern still suffers from strip development, loss of view corridors, inefficiency in the distribution of uses, and automobile dependency. As indicated in Table 1, Summary of Threshold Indicator Status, which can be found in the *Executive Summary* of this Evaluation, TRPA still does not meet its threshold targets for VMT reductions.

Vegetation in the region suffers from poor diversity, a result of the even-aged timber stand left by logging in the late 1800s and current fire suppression practices. Insects have attacked the forest, already weakened by stress, and have killed hundreds of millions of board feet of trees. Recent data indicates that common vegetation still does not meet the threshold. In 2001, TRPA adopted an improved old growth timber threshold. As to fish and wildlife habitat, progress is being made toward attainment of thresholds which call for restoration of lands where previous human disturbance decreased the value of fish habitat and wildlife habitat.

Both single-event and cumulative noise affect the tranquility of the Tahoe Region. Although most communities meet noise criteria, some suffer from elevated noise levels from traffic, the dominant noise source in the area. With the adoption of the Lake Tahoe Airport Master Plan, many airport-related noise issues have been addressed.

Roads, buildings, signs, powerlines, and fences reduce the outstanding scenic attributes of the region. The Regional Plan designates about 50 areas for scenic restoration. 2001 surveys indicate the region has improved in the urban areas and has fallen behind in some rural and shorezone areas.

Although outdoor recreation facilities are heavily used during peak winter and summer periods, TRPA lags in meeting its targets for outdoor recreation usage. During peak summer periods, there is a shortage of developed campsites, day use facilities, and trails. During peak winter days, capacity limits at developed ski areas and on the highway system are sometimes exceeded.

Planning, Regulation and Improvement Programs

There is a long history in the Tahoe Region of concern for environmental quality, preservation of its unique values, and remediation of its most serious problems. The individuals involved in this over the years are too numerous to list. TRPA, the California Tahoe Regional Planning Agency (CTRPA), and their forerunners in the 1960s have prepared a series of comprehensive plans for the region. The U.S. Forest Service and state parks departments have planned for, preserved, and managed large tracts of land.

The Forest Service, through the Burton-Santini program, the California Tahoe Conservancy, and the Nevada Division of State Lands have purchased thousands of environmentally sensitive parcels, in order to place them under the protection of public ownership. These same agencies have contributed mightily to the ongoing program of erosion and runoff control in the watershed and have led the way with pilot projects to restore stream environment zones. Units of local government generally construct and maintain these remedial projects. These programs have evolved into the \$1.5 billion Environmental Improvement Program (EIP) that builds on the regulatory and capital improvement approaches that have been underway for the last twenty years.

From a very small program in the early 1960s, interagency monitoring efforts have grown to include water quality and air quality monitoring sites, using the most up-to-date equipment and analysis, with a cost of about \$1 million annually in 1990, to the creation of a Scientific Advisory Group (SAG) and an identified EIP research budget of \$58 million. These monitoring programs provide information to direct and evaluate the control measures of the Regional Plan.

The City of South Lake Tahoe has been a leader in redevelopment of sub-standard urban areas, and redevelopment programs in North Lake Tahoe are now in progress.

These are just a few examples of the long history of concern for environmental quality and action in the Tahoe Region.

Institutional Arrangements

The success of threshold attainment (as well as the EIP) is largely dependent on the coordination of all agencies and private sector stakeholders in the basin. Many aspects of threshold attainment through regulation, project implementation, research, operations, and maintenance, will depend on numerous agencies and organizations aligning work programs, priorities, and funding. The Compact states "in formulating and implementing the regional plan, the agency shall seek the cooperation and consider the recommendations of counties, cities and other agencies of local government, State and Federal agencies, of educational institutions and research organizations, whether private or public, and civic groups and private persons." A partial list of the cooperating agencies/stakeholders follows:

Regional Agencies

Tahoe Transportation District
Tahoe Regional Planning Agency

Federal Agencies

U.S. Environmental Protection Agency
U.S. Forest Service
Natural Resources Conservation Service
Army Corps of Engineers
U.S. Postal Service

State Agencies

Caltrans
California Water Quality Control Board-Lahontan Region
California State Lands Commission
California State Parks
California Tahoe Conservancy
Nevada Department of Transportation
Nevada Division of Environmental Protection
Nevada Division of State Lands
Nevada Public Service Commission

Local Governments

City of South Lake Tahoe (and Redevelopment Agency)
Douglas County
Carson City
El Dorado County
Placer County (and Redevelopment Agency)
Washoe County

Other Local Agencies

Douglas County Sewer Improvement District
Incline Village General Improvement District
Kingsbury General Improvement District
North Tahoe Public Utility District
South Tahoe Public Utility District
Tahoe City Public Utility District
Nevada Tahoe Conservation District
Tahoe Resource Conservation District
U.C. Davis/Tahoe Research Group
South Shore Transportation Management Association
Truckee/North Tahoe Transportation Management Association

SUMMARY OF THE 2001 EVALUATION

This Evaluation determines the attainment status of the environmental thresholds and then makes recommendations for corrective actions. The threshold specific details are found in each threshold chapter and official results are found on the compliance forms found in each threshold's chapter. An overview and summary are presented below.

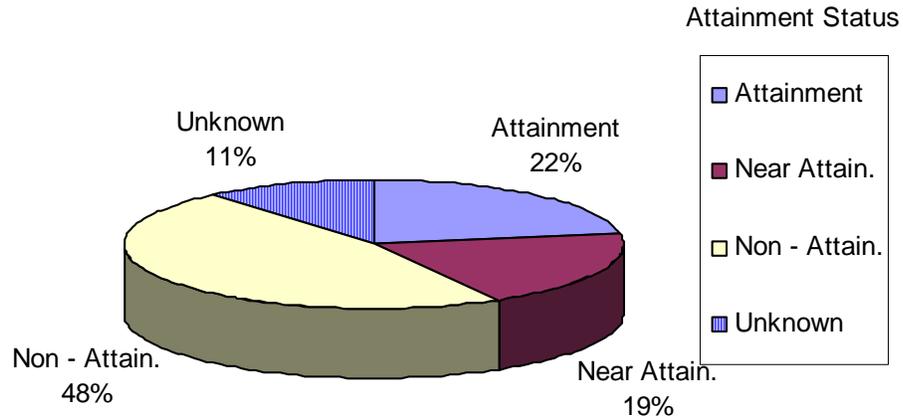
Findings

Overall, the Threshold Evaluation for 2001 finds that the results of efforts toward threshold attainment are mixed. It is the finding of this Evaluation, as documented in the compliance forms, that TRPA is not in attainment and will not achieve attainment of all thresholds in the life of the current Regional Plan (until 2007), as some thresholds are not anticipated to reach attainment for several decades. There is no immediate corrective strategy TRPA could implement that would achieve complete threshold attainment status by 2007. However, the substantial work in establishing the Environmental Improvement Program and securing funding has increased the likelihood of achieving most thresholds within the schedules found in the compliance forms.

TRPA has selected 36 indicators to track progress on the nine threshold categories (see Executive Summary, Table 1 for a listing of thresholds and indicators). TRPA tracks both overall attainment targets and interim 5-year targets for non-attainment indicators. Of the 36 threshold indicators that TRPA tracks for overall attainment, approximately ~~eight~~ seven are in attainment; this means that monitoring indicates the threshold meets the adopted standard. Monitoring results find that 25 of the indicators are in non-attainment, which means they do not meet the standard. The status is unknown for the remaining ~~three~~ four indicators, meaning TRPA did not have the data to make the determination. Some of the non-attainment indicators are close to attainment. If a 'near attainment' category is

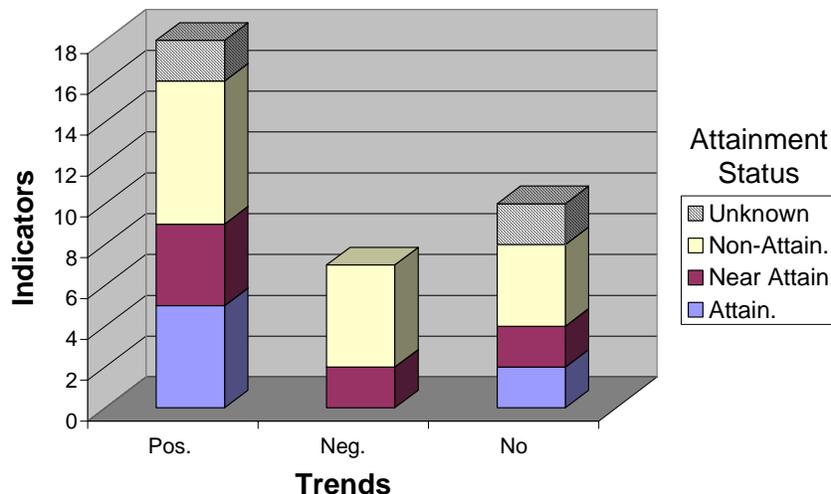
considered for indicators that are very close to the standard, then eight of these are in near attainment and 17 are in significant non-attainment. Significant non-attainment includes indicators that will not be attained in the near future, have negative trends, or are not making interim targets. Approximately 20 out of 26 of the indicators did not meet their interim targets.

Figure 1-3. ETCC Indicator Attainment Status



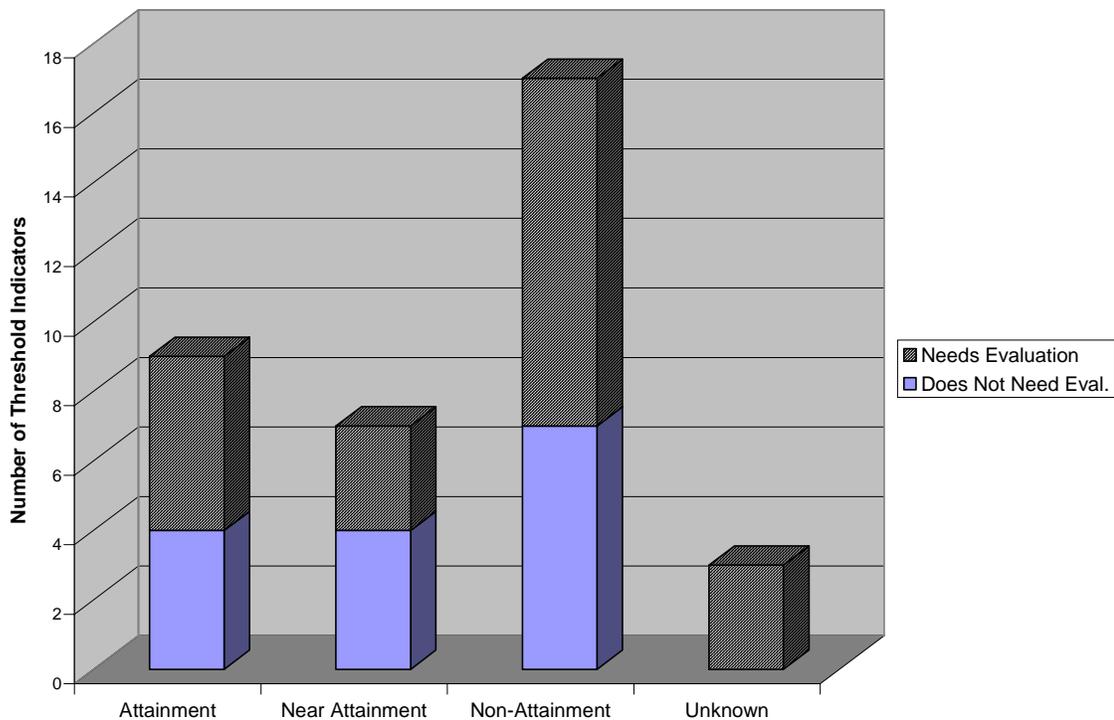
Although half of the indicators are in significant non-attainment, it is important to note that TRPA started with most of the indicators in non-attainment and generally the trends are improving or stable as shown below. Nineteen of the indicators have a positive trend with seven having a negative trend. In determining trends, TRPA must account for mixed trends and no trends. In some cases, most notably water clarity, the overall trend is negative but evidence shows that the negative trend is shifting toward a positive trend which we classify as a positive trend (see Figures 3-5 & 3-6). In the case of scenic resources, there are positive trends (roadway units) and negative trends (shorezone units) within the indicator. In this case it is shown both ways and counted as a non-attainment trend.

Figure 1-4. Threshold Attainment Trends



Compounding the problem of threshold attainment is that approximately ~~20~~ 21 of the 20-year old threshold indicators have been found to be in need of further evaluation and/or update. Six recommended updates of the threshold indicators relate to water quality and the assumptions for attainment of the clarity threshold. Others relate to adjusting current thresholds to an adaptive management strategy, which is now being proposed. After almost twenty years, and after the completion of the Watershed Assessment and other studies, there is evidence that some thresholds need re-evaluation. At this time TRPA does not have the documentation to recommend major changes; however, updates and programs are being put in place to complete a Threshold Update for 2004. ~~Millions of dollars~~ Substantial budgets are ~~being spent~~ programmed now and over the next few years for evaluations to ~~fix these problems~~ revise them.

Figure 1-5 Thresholds In Need of Update



RECOMMENDATIONS

As summarized above, TRPA concludes that the majority of thresholds remain out of attainment and significant work remains to make progress towards the ultimate goals of the Compact. The recommendations that follow are proposed in response to the findings.

TRPA's strategy to achieve its mandate is three-pronged. First, there are a series of recommendations (similar to those in previous evaluations) proposed by this evaluation. Second, there is a recommendation to intensify the implementation of the Environmental Improvement Program. Last, there is a recommendation that a long-term comprehensive program is needed for threshold attainment. TRPA is developing a strategy called "Pathway 2007" in response to needs identified in this evaluation. This program approaches the problem of threshold attainment and the 2007 Regional Plan update in a comprehensive strategy over the next five years.

1. Evaluation Recommendations

Immediately adopt the threshold specific recommendations listed below. Pursue implementation of the recommendations identified in the Chapters of this Evaluation on the schedule set forth in Appendix B. Link key recommendations such as EIP implementation, BMP program upgrades, transit improvements, or scenic standards to future development. These recommendations will, where possible, provide near-term corrective strategies promoting threshold attainment.

A. Residential Allocations

- In December 2001, adopt a one-year extension consistent with the performance review recommendations, which allows for up to 300 allocations for 2002. ([Adopted December 2001](#))
- ~~In February 2002, adopt allocations for 2003, 2004, 2005, 2006 at up to 300 units/year contingent on progress on EIP and key Evaluation recommendations.~~
- [In July 2002, adopt an allocation system for 2003-2006 that establishes a performance test for each jurisdiction to receive allocations. The total allocations may range from 75 to 300 allocations per year depending on performance on BMP implementation, EIP implementation, transit ridership and compliance.](#)

B. Commercial Allocations

In February 2002, adopt allocations 2003–2006 for 100,000 sq.ft. for the special projects program and 50,000 sq.ft. for Community Plan reloads. This would be contingent on EIP progress, [sensitive land restoration](#), and key Evaluation recommendations.

C. Tourist Accommodation Bonus Units

For 2003 through 2006 [do not](#) add the remaining 100 tourist accommodation bonus units to the special project pool with EIP findings.

D. Residential Bonus Unit (BU) Allocation Amendment [\(Adopted 4/02\)](#)

Since 1987 there have been several plan areas that have used all of their original BU allocations and have needed PAS amendments to transfer BU allocations in from other plan areas. There have also been several plan areas that have not had the opportunity to use any of their bonus unit allocations, as well as other plan areas that may have been able to take advantage of bonus unit allocations if they had been given the multi-residential incentive program special designation in 1987.

In an effort to adapt to changing multi-residential development needs, and to continue encouraging affordable housing development in the Region, staff recommends that all bonus units be removed from individual plan areas and be placed into one common BU pool.

E. Scenic Resource Program Amendments

Amend regulations, to improve the process for scenic quality review of projects. The amendments will establish a process for the level of analysis and when visual simulations and other documents are required.

Amend Chapter 30, Design Standards, to ~~prohibit the use~~ [control the color and glare](#) of metal roofs on structures visible from the Lake.

Amend Chapter 4, Project Review and Exempt Activities, to allow alteration in structure color and roof materials visible from scenic corridors and recreation areas/bike trails, provided they meet the TRPA Design Standards.

For projects visible from non-attainment and at-risk areas, require security equal to the cost of scenic mitigation measures and a five-year check on their continued presence.

F. Vegetation Program Amendments [\(Adopted 4/02\)](#)

The current vegetation protection measures exist mainly as guidelines and are not specified within the Code. The improvement of these protection measures, such as improved protective fencing for vegetation, will likely facilitate the review and compliance of projects and allow for a clear basis for action from the Compliance Division.

Amend the Vegetation Threshold to include Galena Creek rockcress and short-petaled campion species on the sensitive plant threshold list, and remove *carex paucifructus* from the list. Also, add the Taylor Creek Marsh, Upper Truckee Marsh, Pope Marsh, and Hell Hole as threshold communities under the uncommon plant communities threshold list.

G. Water Quality Mitigation Fee Amendment [\(Adopted 4/02\)](#)

The last water quality fee update was in 1996 with the last evaluation. The current fee is \$1.34/sq.ft. of new land coverage based on an established formula. The recommended increase is \$1.54/sq.ft.

H. Air Quality Mitigation Fee Amendment ([Adopted 4/02](#))

During each five-year threshold evaluation, the Air Quality mitigation fees are reevaluated to determine what the costs would be to offset the development that would be approved during the subsequent five-year period. The recommendation is that the cost to mitigate additional vehicle trips approved in the Region increase from \$25 per daily vehicle trip end (DVTE) to \$30 per DVTE for commercial-type trips, and from \$240 per DVTE to \$270 per DVTE for residential-type production trips.

I. [BMP Implementation Enhancement Amendments](#)

[The TRPA BMP retrofit program, which is behind schedule, is critical to achieving water quality thresholds. Based on the recommendations of this Report, TRPA strengthened the compliance procedures in May and proposes to require a BMP disclosure procedure as part of real estate sale requirements and to consider moving the date for Priority 3 areas to be consistent with the current Regional Plan expiration date \(2006\).](#)

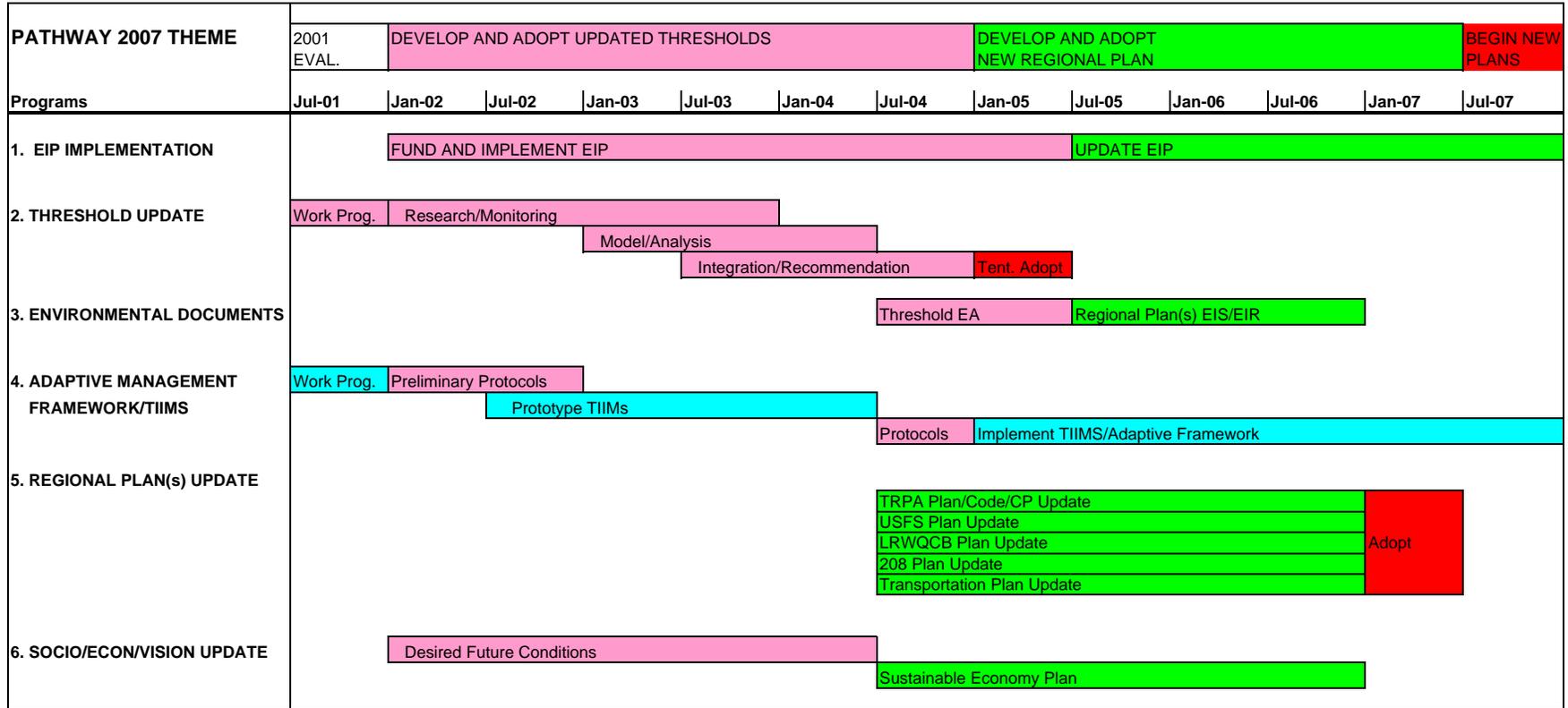
2. Environmental Improvement Program

Intensify implementation of the Environmental Improvement Program. In the 1996 Threshold Evaluation, TRPA identified the EIP restoration effort as key to the long term achievement and maintenance of thresholds. For the period from 1996-2001, TRPA focused on organizing and securing funding for the EIP. Now, TRPA must ensure that the resources flowing into the Tahoe Basin for EIP implementation are efficiently and effectively utilized so that significant progress toward threshold attainment may be demonstrated in 2006.

3. Pathway 2007

A major conclusion of this evaluation is that many elements of the 20-year old thresholds require extensive re-evaluations for either recalibration or significant amendment. As a consequence of the expiration of TRPA's Regional Plan in 2007, TRPA will complete a thorough evaluation and update of all thresholds by 2004. If significant changes to thresholds are to occur – and we recognize in this evaluation that some changes are appropriate and needed – that will happen in the 2004 Threshold Update. TRPA will then use the Threshold Update as the platform to construct the new 2007-2027 Regional Plan. Basic to this strategy is that TRPA and its partners will develop and implement the proposed adaptive management strategy and Tahoe Integrated Information Management System. Figure 1-6 lays out a proposed schedule for the programs of Pathway 2007

Figure 1-4. Pathway 2007 Schedule



Chapter 2

AIR QUALITY/TRANSPORTATION

I. INTRODUCTION

An evaluation of air quality control plans and measures must begin with a firm understanding of the mechanisms at work in the Tahoe Air Basin that dictate air quality conditions at any given time. The unique characteristics of the Tahoe Region Airshed and the air quality processes that form the basis for air quality management in the region are described below. In the Background section below, current air quality policies, standards, and management strategies are introduced.

AIR QUALITY PROCESSES

Air and Water Quality Relationships

Data collected in recent years suggest that deposition of bio-available airborne nitrogen, phosphorous, and insoluble fine particles contribute to much of the water clarity degradation of Lake Tahoe, with the remainder due to pollutants transported to the lake via surface and groundwater. The most recent nutrient budget by the Tahoe Research Group of University of California, Davis (UCD-TRG) indicates that more than 50 percent of the nutrient nitrogen and 27 percent of nutrient phosphorous in Lake Tahoe may originate from the atmosphere (*Allison et. al. 2000*)

Airborne inputs to Lake Tahoe come from three groups of sources. Populated areas in the Basin generate airborne anthropogenic materials such as road dust, vehicle exhaust, chimney smoke, etc. Undeveloped areas in the Basin may also produce airborne dust and smoke, some of which is “natural,” and some which results from the direct and indirect effects of land management practices (prescribed fires, road work, etc.) Finally, airborne materials generated in upwind areas, including the San Francisco Bay area and the Central Valley, are carried into the Sierra by the region’s prevailing winds.

Airborne materials are unusually important in the Tahoe Basin, as the topography is well suited to trapping air near Lake Tahoe’s surface. In summer, the cold lake, coupled with down slope air drainage, causes a nighttime accumulation of a shallow, stable layer of air over the Lake; this layer usually dissipates by midday due to solar heating. In winter, the longer nights make the down slope air drainage much stronger, so that even though the Lake may be warmer than the overlying air, the inversion is still very persistent. This nocturnal lake inversion is present most days of the year, often made visible by the smoke that accumulates in and near populated areas. The effect of the combination of down slope drainage winds and the Lake inversion is to hold air pollutants in close contact with the Lake surface much of the time; thus, the potential for airborne impacts on Lake water quality are amplified by the effects of terrain.

The impact of ~~the atmosphere~~ [atmospheric deposition](#) on water quality is one of the least understood aspects of air quality in the Basin. Establishing the magnitude of the nutrient impacts of each of the major source groups (urban, wildland, out-of-Basin) is the first order of business in resolving the airborne impacts to Lake Tahoe.

Airshed Model

From The Lake Tahoe Air Quality Research Scoping Document, (Allison et. al. 2000):

Air and water quality modeling of the Tahoe Basin is difficult due to the nexus among lake clarity, forest health, visibility, and human health. Recently, a parameterized air quality model specific to the conditions in the Lake Tahoe airshed was developed as part of the Lake Tahoe Watershed Assessment (Murphy and Knopp (Eds.), 2000). In the U.C. Davis Lake Tahoe Airshed Model (LTAM), the Lake Tahoe Basin is divided into 1,248 km² (1 mi²) cells. The individual cells are used for calculating pollutant concentration for this portion of the watershed. The cells cover an area of 72 km (45 miles) north to south (Truckee to Echo Summit) and 42 km (26 miles) west to east (Ward Peak to Spooner Summit). The Truckee River runs from its headwaters near Carson Pass, about 15 miles south of Lake Tahoe, northward through the Tahoe Basin, then drains through a canyon west and north from Tahoe City, between the Sierra crest and Mt. Pluto. Therefore, all but the most southern end of the watershed (Carson Pass area) is taken into account by the model. The LTAM uses transportation data and limited air quality measurements taken from 1967 to the present to calculate the movement of atmospheric pollutants. Free variables (traffic flow, acres burned in the forest, population density, etc.) are assumed to be linear with pollutant emissions.

The UCD Lake Tahoe Airshed Model has two major goals:

- 1. To identify the relative fraction of in-Basin and out-of-Basin, and natural and anthropogenic components of the atmosphere, and*
- 2. To evaluate the effects of atmospheric pollutants in the Lake Tahoe Air Basin on lake clarity, visibility, human health and forest health. (Cliff and Cahill, 2000).*

The LTAM has provided valuable predictions about the basin's atmospheric quality, descriptions of likely roles of pollutant sources and cleansing processes, and hypotheses that can be tested in future empirical studies. A thorough description of the model and outputs from scenarios are given in the Air Quality chapter of the Watershed Assessment (Murphy and Knopp (Eds.), 2000).

The LTAM is designed as a parameterized pollutant transport model that does not take into account complicated transformation mechanisms and sink reactions, other than deposition, once a pollutant is emitted to the atmosphere. The purpose of the LTAM is to gather together the air quality information that currently exists at Lake Tahoe into a consistent framework. For example, the impact that current traffic patterns and current point source emissions (such as prescribed fires) have on downwind receptors can be evaluated by looking at the atmospheric transport of pollutants from the source to the receptor (typically lake or forest). The LTAM is also useful when

~~considering what the long-term effects of current pollutant emissions will be if management strategies designed to improve air quality are not adopted. The LTAM is currently limited by poor knowledge of meteorological conditions, emission inventories (e.g. forest fire particulate nitrogen and phosphorous emission), deposition parameters, and pollutant concentrations for some important species (e.g. phosphorous) at Lake Tahoe. Presently, the LTAM is only able to predict pollutant concentration in a given location as a measure for the potential for deposition to the surface. Despite these shortcomings, valuable insight is gained from the construction and exercising of the LTAM. For example, the LTAM predicts that traffic along the highway 89 corridor may have substantially greater influence on pollutant concentration in the Basin than would be predicted based solely on vehicle counts due to transport of pollutants from the well-traveled Interstate 80 corridor. This preliminary finding points to a relatively little-studied area with respect to air quality within the Basin. Furthermore, long-term deposition measurements have been made at Ward Creek by the Tahoe Research Group at U.C. Davis indicating a substantial atmospheric input of pollutants tied to the loss of lake clarity. Therefore, the LTAM is an investigative tool used to help identify what air quality research is necessary to construct scientifically sound management based models.~~

BACKGROUND

TRPA Planning Compact

The TRPA Compact, amended in 1980, called for TRPA to adopt environmental threshold carrying capacities ("thresholds") to protect the values of the region. TRPA adopted a comprehensive set of thresholds in August 1982. In order to determine to what extent air quality thresholds are being met, it was determined that a monitoring program must be established and maintained.

Based on air quality monitoring data, TRPA is required to propose amendments to the Regional Transportation Plan – Air Quality Plan to assure compliance with TRPA threshold standards and federal, state, and local standards for air quality and visibility. Air Quality Monitoring programs are discussed in detail in Section III of this chapter.

The Compact requires that the goal of transportation planning shall be to reduce dependency on the automobile and, to the extent feasible, reduce air pollution caused by motor vehicles.

TRPA Goals and Policies

The TRPA Goals and Policies is a key Regional Plan Document for the Lake Tahoe Region. Article V(c)(1) of the Tahoe Regional Planning Compact calls for a "land use plan for the...standards for the uses of land, water, air space and other natural resources within the Region..." The Land Use Element includes the Air Quality subelement that is introduced with the following language:

The Air Quality Element of the integrated Regional Transportation Plan– Air Quality Plan focuses on the need for air quality control strategies required to meet the air quality related goals for the Tahoe Region.

The Transportation Element of the TRPA Goals and Policies lists five regional goals and ten policies and objectives. One of the goals calls for attaining and maintaining Environmental Threshold Carrying Capacities (thresholds). Policies and objectives focus on regional coordination, alternative transportation, land use changes to promote alternative transportation, limiting highway improvements, and providing mobility for transit-dependent populations.

Regional Transportation Plan - Air Quality Plan for the Lake Tahoe Region

The purpose of the integrated Regional Transportation Plan – Air Quality Plan (RTP-AQP) is to attain and maintain the pertinent thresholds established in 1982, and all applicable federal, state, and local standards established for transportation and air quality. TRPA thresholds, federal National Ambient Air Quality standards (NAAQS), and state standards establish 23 separate air quality standards for 14 air quality parameters, including carbon monoxide (CO), ozone, particulate matter less than 10 microns in size (PM₁₀), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), visibility, lead, hydrocarbons, sulfates, hydrogen sulfates, oxides of nitrogen (NO_x), wood smoke, suspended soil particles and NO_x transport.

Tahoe Regional Planning Agency

TRPA is responsible for short- and long-range transportation planning in the Basin and is the designated Metropolitan Planning Organization. In California, TRPA is the Regional Transportation Planning Agency (RTPA) in the Basin portions of -El Dorado and Placer Counties. TRPA is also the conduit for certain funds administered by the Nevada Department of Transportation (NDOT).

Tahoe Metropolitan Planning Organization

Under the Transportation Equity Act for the 21st Century (TEA-21), TRPA was designated as a Metropolitan Planning Organization (MPO). When addressing MPO related transportation issues, TRPA acts as the TMPO and is charged with implementing a “continuing, comprehensive and cooperative transportation planning process among states and local communities.”

The TMPO is required to produce a RTP that is fiscally constrained and meets air quality conformity standards and other state and federal requirements. The MPO designation makes TRPA eligible for broader transportation planning funding sources.

Since overall development policy precludes construction of new major roads in the Basin, transportation planning in the Tahoe Region has focused on better utilization of existing facilities and reducing vehicular emissions. These efforts include measures to reduce vehicle trips on the roadways of the region. An example is the availability of, and shift to, home mail delivery in the region. Currently, the majority of mail is delivered to post office boxes; direct delivery to physical addresses would eliminate the vehicle trips made to pick up mail. Emission reduction programs include recently adopted marine engine emission standards and efforts to convert fleet vehicles to alternative fuels.

Alternative transportation modes in the region include bicycle and pedestrian facilities, fixed route transit, and various shuttle services. On the South Shore, private shuttles (including for gaming and ski areas), fixed route transit and demand response public transit will be consolidated into the Coordinated Transit System (CTS). This system will

be on a central dispatch system, and will have a network of electronic kiosks throughout the service area to automate passenger pick-up.

In addition to the responsibilities of the TMPO, TRPA transportation planning staff maintains a role specific to the Agency, which includes monitoring for attainment and maintenance of thresholds. TRPA also maintains responsibility for the completion of a comprehensive RTP-AQP, as described on the previous page. Due to complexities of the transportation planning structure at the State level, TRPA will also maintain its role as the Regional Transportation Planning Agency (RTPA) for the California portion of the Tahoe Region. The RTPA responsibilities are very specific and relate to the programming and oversight of certain funding sources and programs.

INDICATORS

AQ-1 Carbon Monoxide

Carbon monoxide levels shall not meet or exceed the TRPA 8-hour 6.0 ppm standard. The indicative value for attainment of this standard is the second highest CO concentration that is read at the Stateline, CA station (ppm).

AQ-2 Ozone

Ozone levels shall not exceed the TRPA 1-hour standard of 0.08 ppm. Attainment is based on the number of 1-hour periods, which equal or exceed the federal, Nevada, or TRPA standard at any of the permanent monitoring sites (unitless), and the number of 1-hour periods that exceed the California standard.

AQ-3 Particulate Matter

Particulate matter concentrations shall not exceed the California and Federal standards for 24-hour concentrations (50 and 150 $\mu\text{g}/\text{m}^3$, respectively) and the annual average (30 and 50 $\mu\text{g}/\text{m}^3$, respectively). Attainment is based on the number of 24-hour periods exceeding the applicable federal or state standards at any permanent monitoring station (unitless) and the annual average PM10 concentration at any monitoring station ($\mu\text{g}/\text{m}^3$).

AQ-4 Visibility

TRPA's regional and sub-regional visibility standards shall not be violated. In addition, for regional and sub-regional visibility, wood smoke concentrations shall be reduced 15 percent below the 1981 levels for sub-regional visibility. Suspended soil particles shall be reduced 30 percent below the 1981 levels. For regional visibility, visual range is calculated from aerosol data gathered at the D.L. Bliss State Park monitoring site. For sub-regional visibility, visibility is calculated from aerosol data gathered at the Lake Tahoe Boulevard station. For state visibility standards, visual range is calculated from nephelometer data collected at Bliss State Park and Lake Tahoe Boulevard for periods in which relative humidity is less than 70 percent (miles).

AQ-5 Traffic Volume

There shall be a 7 percent reduction in traffic volume on the U.S. 50 corridor from the 1981 values. The standard uses the average traffic volume from 4 p.m. to midnight from November through February. Traffic volumes on U.S. 50, recorded at a site immediately west of the intersection of Park Avenue in the City of South Lake Tahoe (SLT), include a count of both directions during an average day. TRPA selected this indicator because the threshold appears in TRPA Resolution 82-11, under the heading “carbon monoxide”, and historically this has been the location of the only existing carbon monoxide hot spot in the region, [which occurred during the winter months](#).

AQ-6 Wood Smoke

Annual emissions from wood smoke shall be reduced 15 percent from 1981 levels. There are currently no scientifically sound direct measurements for wood smoke; however, indicative aerosol constituents are used to analyze wood smoke trends.

AQ-7 Vehicle Miles Traveled

Vehicle Miles Traveled (VMT) shall be reduced 10% below the 1981 levels. Typically, VMT is calculated directly from a traffic model. However, for the purposes of the 2001 Threshold Evaluation, TRPA utilized the 1995 VMT estimate from the TranPlan traffic model, and applied a factor to account for actual increases in traffic volumes from 1995 through 1999. Actual current traffic volumes were closer to the 1995 TranPlan-generated traffic volumes than they were to the 2001 forecasted traffic volumes. A factor was then developed comparing the 1995 model-generated traffic volumes to the current actual volumes. This relationship was then applied to the 1995 VMT estimate to account for increase in traffic in that time period, and estimate the current year VMT.

AQ-8 Particulate Matter

Dissolved Inorganic Nitrogen (DIN) load on Lake Tahoe from atmospheric sources shall be reduced by approximately 20 percent of the 1973-1981 annual average. Load is calculated using the annual average concentrations of particulate NO₃ at the Lake Tahoe Boulevard air quality monitoring station (µg/m³) and the annual average concentrations of nitrogen dioxide at a Stateline, NV monitoring station. This monitoring station was relocated in 1998; therefore the annual average concentrations from a Sandy Way, SLT station are used to determine attainment.

II. THRESHOLD SUMMARY

A. THRESHOLD MATRIX

The threshold matrix serves as a summary of the trends, status, and recommendations for individual thresholds. It displays the trend toward attainment from 1987 to present, the current status of the threshold, progress on the 1996 recommendations, future threshold recommendations, interim targets and an attainment schedule to ensure the individual indicators and/or standards for the threshold are in attainment over time.

B. MEASUREMENT AND MONITORING ACTIVITIES

Ongoing monitoring has occurred for carbon monoxide, ozone, particulate matter (mass), and visibility. For wood smoke, indirect measurements taken from aerosol filters at TRPA's SLT monitoring site and the U.S. EPA's site at D.L. Bliss State Park have been used to determine trends. However, no scientifically sound direct measurements have been developed for wood smoke in the Tahoe Basin. For atmospheric deposition, NO₃ data has been collected at the two sites listed above. Nitrogen dioxide (NO₂) is monitored in SLT at the California Air Resources Board (CARB) site at Sandy Way, and in Incline Village, NV, at a site owned by the Washoe County Health Department. Monitoring for traffic volume occurred at the intersection of Park Avenue and Highway 50 in SLT until 1997, when the traffic counter was removed. Although TRPA has estimated VMT, the model used to monitor this threshold needs to be assessed for its utility, and possibly updated.

For a more detailed summary of monitoring and the corresponding threshold status, see the second tier of the matrix for each threshold. These are brief descriptions of similar information covered in section III below, and intended as a quick reference.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

For carbon monoxide, no CO standards were exceeded on any days from 1996-2000. For ozone, exceedances of TRPA's more stringent standard have occurred every year since the threshold was adopted. No exceedances of California's standard have occurred since 1999. The Federal and Nevada standards were not exceeded on any days from 1996-2000. All particulate matter standards were in attainment as of 2000. California's 24-hour standard was exceeded every year between 1987-1998. The federal standard was never exceeded between these years. Regional visibility has remained similar to 1996 levels, though data indicates the hazy days have become hazier. The 90 percent standard has not been met. This may be in part due to transport of PM_{2.5} into the Basin from the Sacramento and San Francisco areas. Sub-regional visibility improved from 1991-1999, and both standards are being met. Trends indicate that traffic volume may be in attainment, however no data is available since 1997. Wood smoke emissions appear to have been reduced between 1991-1999, although no direct measurements are available. VMT have continued to increase in the Basin, and have likely been affected by the [increase in visitors due to the](#) increased development in [the](#) Sacramento and ~~the~~ San Francisco Bay Area. Annual mean nitrate concentrations dropped between 1989-1999. Nitrogen dioxide concentrations have remained about the same. No data is available to determine if dissolved inorganic nitrogen levels have been reduced to meet the threshold.

AQ-1: CARBON MONOXIDE

Threshold Standards	AQ-1 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
<ul style="list-style-type: none"> • States and TRPA: 6 ppm (8 hr avg.) • Federal: 9 ppm (8 hr avg.) • CA: 20 ppm (1 hr avg.) • Federal & NV: 35 ppm (1 hr avg.) 	Second highest CO concentration at Stateline, CA station (parts per million [ppm]).	N/A	States and TRPA (8-hr)	Non-Attainment	Attainment	Attainment
			Federal (8-hr)	Non-Attainment	Attainment	Attainment
			CA 1-hr	Attainment	Attainment	Attainment
			Federal and NV (1-hr)	Attainment	Attainment	Attainment
AQ-1 2001 Monitoring Status						
There are two continuous CO monitoring stations on the South Shore, operated by CARB and NDEP. The stations are: Stateline, CA (this site was relocated to Harvey's Resort Hotel in October 1999) [CARB] and Sandy Way, CA (CARB). NDEP also monitors CO at Cave Rock, NV. On the north shore, Washoe County monitors CO in Incline Village, NV with the assistance of CARB. No exceedances have occurred at any site since 1995.						
AQ-1 2001 Recommendations						
N/A						
AQ-1 2006 Attainment Schedule						
N/A						

AQ-2: OZONE

Threshold Standards	AQ-2 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
<ul style="list-style-type: none"> •Federal: 0.12 ppm (1-hr average) •CA: 0.09 ppm (1-hr average; not to be exceeded) •NV: 0.10 ppm (1-hr average) •TRPA: 0.08 ppm (1-hr average) 50 feet 	<p>Number of 1-hour periods, which equal or exceed the federal, Nevada, or TRPA standard at any of the permanent monitoring sites (unit-less).</p> <p>Number of 1-hour periods which exceed the California standard</p>	<p>TRPA shall prepare a report on ozone sources, controls, and impacts by June 2000.</p>	Federal (1-hr)	Attainment	Attainment	Attainment
			CA (1-hr)	Non-Attainment	Attainment	Attainment
			NV (1-hr)	Attainment	Attainment	Attainment
			TRPA (1-hr)	Non-Attainment	Non-Attainment	Non-Attainment

AQ-2 2001 Monitoring Status

Ozone is monitored [by CARB](#) in South Lake Tahoe, CA at Sandy Way (CARB). NDEP monitored ozone at the Horizon Casino-Hotel until 1999 when another site was installed at Harvey’s Resort. Ozone monitoring was discontinued at this site in 1999. NDEP, with the assistance of CARB, monitors ozone at Cave Rock, NV. The Washoe County Health Department monitors ozone in Incline Village, NV. [In 1999, CARB installed a monitoring site at the top of Echo Summit.](#) Exceedances of the most stringent 1-hour standard, TRPA’s 0.08 ppm, have been recorded every year at one or more of the monitoring stations since the threshold was adopted. All state and federal standards are in attainment. The 1996 interim target was not met.

AQ-2 2001 Recommendations

1. New ozone monitoring stations need to be incorporated into the air quality program to help address out-of-basin transport issues. (June 2002)

AQ-2 2006 Attainment Schedule

~~Implement the study as described in Recommendation A in Section V, which should be completed by 2004~~ [No exceedances of TRPA’s ozone standard will occur by 2006, or TRPA will use the data gathered in the study led by the California Air Resources Board to implement local and out-of-Basin control measures to reduce ozone.](#)

AQ-3: PARTICULATE MATTER

Threshold Standards	AQ-3 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
Federal: 50 µg/m ³ (ann. avg., 3 yrs. running)	Number of 24-hour periods exceeding the applicable federal or state standards at any permanent monitoring station (unitless); annual average PM ₁₀ concentrations at any permanent monitoring station (ug/m ³).	In the 1991 Evaluation, an interim target was set to not exceed 60 µg/m ³ for a 24-hour concentration (first high) during calendar year 1995. This interim target was not attained, but the numerical target will remain in place, to be met by calendar year 1999.	Federal (annual avg)	Attainment	Attainment	Attainment
Federal: 150 µg/m ³ (24-hr mean, 3 yrs. running)			CA (annual avg)	Non-Attainment	Non-Attainment	Attainment
CA: 30 µg/m ³ (ann. avg.), 50 µg/m ³ (24-hr avg.)			Federal (24-hr)	Attainment	Non-Attainment	Attainment
			CA (24-hr)	Non-Attainment	Non-Attainment	Attainment

AQ-3 2001 Monitoring Status

CARB monitors PM₁₀ mass concentrations at the Sandy Way, South Lake Tahoe station. NDEP monitored concentrations at the Stateline, NV until 1998. The Washoe County Health department currently monitors PM₁₀ in Incline Village, NV. PM₁₀ measurements by CARB show that the federal standards and the federal and California annual geometric mean standard are in attainment, and that the California 24-hour average standard has been in attainment since 1999. The 1996 interim target of 60 µg/m³ has not been exceeded since 1998.

AQ-3 2001 Recommendations

1. While in the past, efforts to reduce road salt and dust re-entrainment have fallen under the responsibility of the water quality program, more involvement by TRPA is necessary since airborne transport of materials contributes a significant amount of particulates to the Lake. This requires increased measurements of airborne particulates in the Basin, primarily during winter storm events, in order to quantify the amount of salt and sand being deposited to the surface of the lake from the atmosphere. TRPA shall develop an action plan with associated costs (Dec 2004)
2. While it is known that fires emit several constituents including particulate matter, the actual contribution to atmospheric concentrations is unknown. Therefore, some form of event characterization is needed. TRPA also needs to coordinate with other agencies in the Basin. (Dec 2004)
3. Data gathered by Air Resource Specialists, Inc. indicates increased transport of fine particulates into the Basin from the Sacramento Valley and San Francisco Area. Increased analyses on the filters from the IMPROVE modules is necessary to better identify sources. (Dec 2004)

AQ-3 2006 Attainment Schedule

~~N/A~~ [The Tahoe Region is in attainment, therefore a target date is not required.](#)

AQ-4: VISIBILITY

Threshold Standards	AQ-4 Indicator	1996 Interim Targets	Threshold Attainment Status			
<p>Regional: 1. 25 Mm⁻¹ (156 km, 97 miles) 50% of the year</p> <p>2. 34 Mm⁻¹ (115 km, 71 miles) 90% of the year.</p> <p>Sub-Regional: 1. 50 Mm⁻¹ (78 km, 48 miles) 50% of the year</p> <p>2. 125 Mm⁻¹ (31 km, 19 miles) 90% of the year.</p> <p>CA/NV: Visual Range of 30 miles. <i>(Mm⁻¹ represents an extinction coefficient, measured in inverse megameters; corresponding visual ranges are listed.)</i></p>	<p>Regional: Total extinction calculated at EPA's Bliss State Park site.</p> <p>Sub-regional: Total extinction calculated at the Lake Tahoe Boulevard station.</p>	<p>Although all visibility standards are not being met, the standards need to be revised to reflect current monitoring methods. When the new standards are in place and attainment is reevaluated, it should be determined whether or not a target date is needed.</p>	1991 Attain Status	1996 Attain Status	2001 Attain Status	
			Regional 50%	Attainment	Non-Attainment	Attainment
			Regional 90%	Attainment	Attainment	Non-Attainment
			Sub-Regional 50%	Attainment	Non-Attainment	Attainment
Sub-Regional 90%	Attainment	Attainment	Attainment			
AQ-4 2001 Monitoring Status						
<p>Data gathered by Air Resource Specialists, Inc. (ARS) including recent visibility measurements from TRPA's nephelometer indicate that the regional and sub-regional 50 percent visibility standards are being attained, and that the 90 percent sub-regional visibility ranges are being met. The 90 percent regional visibility standards (D. L. Bliss State Park) are not being met. Air Resource Specialists, Inc., reviewed TRPA's existing thresholds and revised them to match current monitoring methods. TRPA's Governing Board adopted the revised thresholds in 2000.</p>						
AQ-4 2001 Recommendations						
<p>1. Consider the adoption of seasonal visibility standards. (Dec 2004)</p> <p>2. Research indicating the transport of visibility-reducing constituents into the Basin is fairly recent. Further research needs to be done to determine in-basin versus out-of-basin sources. (Dec 2004)</p>						
AQ-4 2006 Attainment Schedule						
<p>Data indicates that transported particulates are may be contributing to the reductions in regional visibility. TRPA will report on the sources of visibility-reducing particles, including in-Basin and out of Basin sources, by December 2004. No exceedances of TRPA's visibility standards will occur by 2006, or TRPA will use the data gathered in the study led by the California Air Resources Board to implement local and out-of-Basin control measures to reduce visibility-reducing particulates.</p>						

AQ-5: TRAFFIC VOLUME

AQ-5 Indicator	Threshold Standards	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
Traffic volumes on U.S. Highway 50, immediately west of the intersection of Park Avenue in the City of South Lake Tahoe, average day, November through February, 4:00 PM to 12:00 AM, sum of both directions (number of vehicles).	7 percent reduction in traffic volume on the U.S. 50 corridor from 1981 values, winter, 4 p.m. to 12 a.m.	N/A	TRPA'S Standard	Non-attainment	Attainment	Unknown (Possible Attainment)

AQ-5 2001 Monitoring Status

In the past, a permanent count station existed on U.S. 50 at Park Avenue. This counter was removed in 1997. Data through 1997 indicate that this threshold was in attainment. Comparing recent nearby traffic volumes with volumes from 1996/97 indicates that the threshold volumes would have stayed relatively constant. Therefore, attainment of the threshold is presumed, although the exact data is not available to make the determination.

AQ-5 2001 Recommendations

1. Upon better evaluation of carbon monoxide data, determine whether or not this standard should be revised or eliminated based on effectiveness and/or relevance of standard. This management standard was developed as a means of meeting the CO threshold, and currently the CO threshold is being met. (December 2004)
2. Increase monitoring and data sharing with local entities as well as with California Department of Transportation and Nevada Department of Transportation; re-establish continuous data collection at necessary locations around/within Basin. (June 2002)

AQ-5 2006 Attainment Schedule

~~TRPA shall work with Caltrans to install a traffic counter at the intersection of Park Avenue and Highway 50 by June 2002~~ Pursuant to Code subsection 32.3C, when TRPA lacks sufficient data to evaluate an indicator, it will establish a timetable. A new counter will be installed at the intersection of Park Ave. and Highway 50 by August 2002. Data for the winter of 2002-2003 will be used to determine indicator status by June 2003.

AQ-6: WOOD SMOKE

AQ-6 Indicator	Threshold Standards	1996 Interim Targets	Threshold Attainment Status		
Aerosol data (including organic and light-absorbing carbon) collected in South Lake Tahoe and at Bliss State Park serve as indirect indicators of wood smoke.	Reduce annual emissions 15 percent from 1981 values	A new target date will be set subsequent to the levels, to be conducted by Crocker Nuclear Laboratory, during Winter 1998-99	1991 Attain Status	1996 Attain Status	2001 Attain Status
			TRPA's Standard	Non-Attainment	Non-Attainment
AQ-6 2001 Monitoring Status					
TRPA does not know whether suspended soil particles and wood smoke emissions have been reduced in sufficient amounts to attain the thresholds, above. Analysis of data in this area is ongoing. However, data from aerosol filters at South Lake Tahoe and Bliss State Park indicate that the sub-regional wood smoke levels may have been reduced by 15%, but the regional levels have not. Improvements in sub-regional visibility also indicate a reduction in wood smoke. The 1996 interim target was not met.					
AQ-6 2001 Recommendations					
1. The wood heater retrofit program needs to be updated to allow for better enforcement (i.e.- make part of Escrow that seller/buyer shall retrofit upon sale of property) and to also determine the contribution of wood smoke emissions to atmospheric PM ₁₀ . (Dec 2004)					
AQ-6 2006 Attainment Schedule					
<p style="color: red;">TRPA, in cooperation with state and local agencies, shall implement a monitoring program that will evaluate the ambient concentrations, sources, and impacts of wood smoke in the Lake Tahoe Basin by June 2002</p> <p style="color: blue;">Pursuant to Code subsection 32.3C, when TRPA lacks sufficient data to evaluate an indicator, it will establish a timetable. Since there are no methods to determine the 1981 levels of wood smoke and therefore no way to determine attainment of this indicator, TRPA will use the data gathered in the research led by the California Air Resources Board to develop an applicable wood smoke indicator which can be analyzed given current scientific methodology.</p>					

AQ-7: VEHICLE MILES TRAVELED (VMT)

Threshold Standards	AQ-7 Indicator	1996 Interim Targets	Threshold Attainment Status			
Reduce VMT 10 percent from 1981 value	VMT calculated for peak summer day TranPlan transportation model or equivalent model.	Indicator should not exceed RFP line (See Figure 2-1).		1991 Attain Status	1996 Attain Status	2001 Attain Status
			TRPA's Standard	Non-Attainment	Non-Attainment	Non-Attainment

AQ-7 2001 Monitoring Status

TRPA, Caltrans, and NDOT carry out a continuous program of traffic counting using both automatic permanent counters and spot counts. TRPA calculates vehicle miles of travel for certain years by modeling traffic volumes and trip lengths with the computerized TRANPLAN model. Thus, VMT is a calculated value that is not directly monitored. When the most recent VMT calculation was developed with a 1995 base year, forecasts were calculated for the years 2001, 2006, 2016. For the purposes of the 2001 Threshold Evaluation, TRPA utilized a previously generated VMT estimate, and factored it to a 1999 estimate based on a representative increase in traffic volumes. VMT has continued to increase in the Basin. The 1996 interim target was not met.

AQ-7 2001 Recommendations

1. Evaluate VMT and its effectiveness as a threshold standard for air quality. Determine whether another indicator would allow for better evaluation of air quality impacts (i.e., transit performance standard, Level Of Service). Determine level of significance VMT plays in visibility impacts and increased NOx concentrations. (Dec 2004).

AQ-7 2006 Attainment Schedule

~~Attainment of this threshold is not expected by 2006. Re-evaluate the applicability of this threshold to air and water quality thresholds (both current thresholds and those which will be updated in 2004) by January 2005~~ By December 2006, VMT will not exceed 1.79 million VMT. TRPA has established programs that may reduce VMT by over 200,000 VMT (see 2001 Environmental Assessment – funding is needed).

AQ-8: ATMOSPHERIC DEPOSITION

Threshold Standards	AQ-8 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
Reduction in direct DIN load on Lake Tahoe from atmospheric sources by approximately 20 percent of the 1973-1981 annual average.	Annual average concentration of particulate NO3 at the Lake Tahoe Boulevard air quality monitoring station ($\mu\text{g}/\text{m}^3$)	Indicator shall not exceed $1.27\mu\text{g}/\text{m}^3$	TRPA'S Standard	Unknown	Unknown	Unknown
			Interim Target	Attainment	Attainment	Attainment

AQ-8 2001 Monitoring Status

The Region is attaining the 1996 interim performance target for atmospheric deposition. However, it is not known whether dissolved inorganic nitrogen deposition from the atmosphere has been reduced by 20 percent of the 1973-1981 annual average. The data indicate that nitrate concentrations at the Lake Tahoe Boulevard station may have been reduced by much more than 20 percent, however, and the exact 1973-1981 annual average is not known. Using data gathered from 1975-2000 at various South Lake Tahoe sites, it appears that the annual arithmetic mean concentrations of nitrogen dioxide have decreased 15 percent.

AQ-8 2001 Recommendations

1. This threshold was created at a time when the limiting nutrient for algal growth in Lake Tahoe was nitrogen. However, recent studies have shown a switch to phosphorous as the limiting nutrient. Although this is a water quality issue, atmospheric deposition may contribute 27% of the total phosphorous that enters the lake (Reuter et al., 2000). Deposition of particulate matter may also affect lake clarity. Therefore, TRPA recommends that research on the sources and deposition of nitrogen, phosphorous, and particulate matter be conducted since these data are important to obtain for the sake of water clarity. It is likely that this threshold will be modified for the 2007 Regional Plan. (Dec 2004)

AQ-8 2006 Attainment Schedule

~~TRPA, in cooperation with state and local agencies, shall implement a monitoring program that will evaluate the ambient concentrations, species, sources, and impacts of nitrogen in the Lake Tahoe Basin by June 2004.~~ Pursuant to Code subsection 32.3C, when TRPA lacks sufficient data to evaluate an indicator, it will establish a timetable. Since there are no methods to determine the baseline levels of dissolved inorganic nitrogen and therefore no way to determine attainment of this indicator, TRPA will use the data gathered in the research led by the California Air Resources Board to develop an applicable atmospheric deposition indicator which can be analyzed given current scientific methodology by December 2004..

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

TRPA air quality thresholds are monitored by measurements of carbon monoxide, ozone, particulate matter less than 10 microns in size, nitrogen dioxide, visibility, oxides of nitrogen (NO_x), wood smoke, suspended soil particles and NO_x transport. Federal and state standards exist for all air quality thresholds in the Tahoe Basin except wood smoke emissions, vehicle miles traveled (VMT), traffic volume and atmospheric deposition.

A. AQ-1: CARBON MONOXIDE

Carbon monoxide (CO) is a tasteless, odorless, and colorless gas that is slightly lighter than air. It affects humans by reducing the supply of oxygen to the tissues of the body and is regulated because of concern for public health. The primary sources of CO emissions are the combustion of hydrocarbon fuels by motor vehicles, and home heating devices such as fireplaces, stoves, and furnaces. In the Tahoe Region, the vast majority of CO emissions (~~over 98 percent~~) are from mobile, rather than stationary, sources.

CO concentrations are significantly affected by meteorological conditions. Exceedences of CO standards tend to occur more often during inversions and cold weather. Inversions are more frequent and have the smallest mixing depths during late fall and winter. The number of motor vehicles traveling through an area, and the average vehicle speed have a significant impact on the amount of CO emitted. As average speeds decrease, CO emissions increase. In recent years, the fleet of automobiles in the United States has improved, emitting less pollutants per mile, including CO. This turnover to newer cars, known as the "cleaner fleet," is important in forecasting future CO concentrations. CO tends to disperse rapidly as distance increases from the emission source. Thus, carbon monoxide problems tend to be "micro-scale" or "hot spot" problems in the Tahoe Region, in which high CO concentrations are very localized.

1. Evaluation Criteria

The TRPA threshold for carbon monoxide states that CO concentrations shall be maintained at or below 6.0 parts per million (ppm), averaged over eight hours. This is also the California and Nevada 8-hour CO standard for the Tahoe Region. The federal 8-hour CO standard that applies to the Tahoe Basin is 9 ppm. The California and Nevada 1-hour average CO standards are 20 and 35 ppm, respectively. TRPA did not adopt interim performance targets for CO pursuant to Chapter 32 of the Code of Ordinances.

2. Measurement and Monitoring

The California Air Resources Board (CARB) monitors CO concentrations continuously on Sandy Way, adjacent to Lake Tahoe Boulevard in the City of South Lake Tahoe. CARB also monitored for CO at a site near Stateline, CA (Park Avenue and Lake Tahoe Boulevard). This second station began data collection in 1980; in 1999 it was relocated next to Harvey's Casino, Stateline, NV. The Nevada Department of Environmental Protection (NDEP) monitored CO at a station near the Horizon Casino at Stateline, NV until 1998 when the station was relocated to Cave Rock, NV. The Washoe County Health department monitors CO in Incline Village, NV.

3. Results of Measurement and Monitoring Efforts

At the Sandy Way site, average CO concentrations did not exceed 2.4 ppm in any 8-hour period during the years 1996 to 2000. CO measurements at the Stateline, CA site were highest in 1996, with an 8-hour average value of 5.1 ppm. In 1997 and 1998, 8-hour average concentrations did not exceed 4.3 ppm. CO concentrations at the Stateline, NV sites (Horizon and Harvey's casinos) did not exceed 4.6 ppm. In Incline Village, CO concentrations have remained below 2.1 ppm since 1994.

4. Trends

Steady reductions were seen in the concentrations of CO at the Sandy Way site. No violations have occurred in the region since 1995, and the region is now showing attainment of the stricter TRPA and state standards. These reductions can be attributed primarily to more stringent emission controls on vehicles and cleaner burning fuels in California. California also required oxygenated fuels, however, due to water quality issues concerning the primary oxidant, Methyl-tertiary-butyl-ether (MTBE), this program ceased in 1999. No resulting significant effects on the reduction in CO have been seen. First high concentrations for each year since 1981 are shown in Section VII (Tables 2-3 and 2-4).

5. Threshold Attainment Status

Attainment. Two 1-hour or 8-hour periods in a given year with average concentrations over the applicable state, federal, or TRPA limit are considered a violation of the standard. Exceedences are expressed in number of periods exceeding the standard, number of days in which periods exceeded the standard, and concentrations that exceeded the standard. In data collected from 1996-2000, no CO standards were exceeded on any days.

6. Effectiveness of Measures in Place

Compliance measures in place, coupled with significant improvements in vehicle emission controls, appear to be very effective.

Category: air quality
Parameter: carbon monoxide (CO)

1. STANDARD:
 States and TRPA: 6 ppm (eight-hour avg.)
 Federal: 9 ppm (eight-hr. avg.)
 California: 20 ppm (one-hr. avg.)
 Federal and Nevada: 35 ppm (one-hr. avg.)
2. INDICATOR (UNITS): Second highest CO concentration at Stateline, CA station (ppm).
3. MONITORING SUMMARY: ~~There are 3 continuous CO monitoring stations in Lake Tahoe, on the South Shore, operated by CARB and NDEP. They are: Stateline, CA and Lake Tahoe Boulevard (CARB), and Horizon Casino Hotel (NDEP). Continuous data is recorded automatically and compiled by CARB and NDEP, who issue periodic data reports. The California Air Resources Board (CARB) monitors CO concentrations continuously at a location on Sandy Way, adjacent to Lake Tahoe Boulevard in the City of South Lake Tahoe. CARB also monitored for CO at a site located near Stateline, CA (at Park Avenue and Lake Tahoe Boulevard). This second station began data collection in 1980 and in 1999 was relocated next to the Harvey's Casino, Stateline, NV. The Nevada Department of Environmental Protection (NDEP) monitored CO at a station located near the Horizon Casino at Stateline, NV until 1998 when the station was relocated to Cave Rock, NV. The Washoe County Health department also monitors CO in Incline Village, NV.~~ There are 3 continuous CO monitoring stations in Lake Tahoe. on the South Shore, operated by CARB and NDEP. They are: Stateline, CA and Lake Tahoe Boulevard (CARB), and Horizon Casino Hotel (NDEP). Continuous data is recorded automatically and compiled by CARB and NDEP, who issue periodic data reports. The California Air Resources Board (CARB) monitors CO concentrations continuously at a location on Sandy Way, adjacent to Lake Tahoe Boulevard in the City of South Lake Tahoe. CARB also monitored for CO at a site located near Stateline, CA (at Park Avenue and Lake Tahoe Boulevard). This second station began data collection in 1980 and in 1999 was relocated next to the Harvey's Casino, Stateline, NV. The Nevada Department of Environmental Protection (NDEP) monitored CO at a station located near the Horizon Casino at Stateline, NV until 1998 when the station was relocated to Cave Rock, NV. The Washoe County Health department also monitors CO in Incline Village, NV.
4. ATTAINMENT STATUS: Attainment. Two 1-hour or 8-hour periods in a given year with average concentrations over the applicable state, federal, or TRPA limit are considered a violation of the standard. Exceedances are expressed in number of periods exceeding the standard, number of days in which periods exceeded the standard, and concentrations which exceeded the standard. The first and second highest concentrations observed during the year are normally reported for each station. ~~In 1994, CO concentrations at Stateline, CA exceeded the stringent state and TRPA standard on 10 days, and the less stringent federal standard on no days. The high for the eight-hour standard in 1994 was 7.1 ppm. For 1995, there was only one day~~

~~exceeding the 6.0 ppm eight-hour standard, and it occurred at the Stateline, CA station. Because the threshold reads "the second highest" measurement, for 1995 the Region was in attainment for the eight-hour standard, with a second high reading of 5.8 ppm. The one-hour federal, and states standards are in attainment at every station. See 1996 Evaluation Report, Table 2-4 and Figures 2-1 and 2-2. Exceedances occur primarily from November through February. At the Sandy Way site, average CO concentrations did not exceed 2.4 ppm in any 8-hour period during the years 1996 to 2000. CO measurements at the Stateline, CA site were highest in 1996 with an 8-hour average value of 5.1 ppm. In 1997 and 1998, 8-hour average concentrations did not exceed 4.3 ppm. Carbon monoxide concentrations at the Stateline, NV sites (Horizon and Harvey's casinos) did not exceed 4.6 ppm. In Incline Village, CO concentrations have remained below 2.1 ppm since 1994.~~

5. TARGET DATE: The Tahoe Region has met the targets ~~that were set~~ established in 1991.
6. EVALUATION INTERVAL: Two years
7. INTERIM TARGETS: TRPA has met interim targets identified in the 1991 Evaluation, and is now meeting the threshold. No new interim targets have been set. Reasonable progress on control measures should continue to ~~assure~~ ensure maintenance of the threshold.
8. COMPLIANCE MEASURES: (See Section II for inventory)
 - a. MEASURES IN PLACE: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 16, 17, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, and 33~~ 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 94, 95, 96, 97
 - b. EFFECTIVENESS OF MEASURES IN PLACE: In the Tahoe Region, over 98 percent of CO emissions are from mobile sources. CO exceedances occur most often during inversions and cold weather accompanied by traffic

congestion. ~~Steady reductions have been seen in the concentrations of CO and the numbers of days the standards were exceeded at the Stateline-California station. These reductions are attributed primarily to more stringent emission controls on motor vehicles. The trend toward lower CO concentrations is expected to continue.~~ No exceedances have occurred since 1995 in the Tahoe Basin.

c. SUPPLEMENTAL MEASURES: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, and 32, and 33~~ 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 124, 126

d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: In 1991, TRPA predicted that the Region would attain state and TRPA eight-hour standards between 1997 and 2002, and would attain the federal eight-hour standard before 1997. By 1995, TRPA was ~~meeting the~~ in compliance with all federal and TRPA/states standards and CO emissions have continued to decline.

9. ADEQUACY OF COMPLNCE. MEASURES: According to the Regional Transportation Plan - Air Quality Plan (TRPA, May 1992), the combination of in-place and supplemental measures will be adequate to maintain the applicable CO standards.

B. AQ-2: OZONE

Ozone (O₃), an oxidant, is a product of a complex set of photochemical reactions in the air involving a variety of hydrocarbon (HC) compounds and oxides of nitrogen (NO_x). Ozone causes adverse human health effects in the form of respiratory irritation, impaired athletic performance, and possible functional changes in the respiratory system. Ozone also causes damage to vegetation, can cause injury to leaf tissue, and reduces photosynthetic activity. Ozone-induced damage is most serious on evergreen plants, particularly the Ponderosa and Jeffrey Pines, and on Quaking Aspen (Davis and Gerhold, 1976).

~~Near the Earth, h~~Hydrocarbons and NO_x (the primary precursors to ozone) are produced mainly from human activities such as from fossil fuel combustion, chemical processing, fuel storage and handling, and solvent usage. Improvements in vehicle emission controls have contributed to lower NO_x emissions. In the Tahoe Region, the evergreen forests also emit hydrocarbon compounds (terpenes) during the summer.

Ozone is a photochemical compound, forming in the air in the presence of sunlight. Sunny days create higher levels of ozone compared to cloudy days, or winter periods in general, when there is less ultraviolet radiation. Because ozone is a secondary pollutant (formed in the atmosphere from other "primary" pollutants), peak concentrations may be found miles downwind of sources of the precursor emissions. Transport of ozone and its precursors into the Tahoe Region by wind is a significant factor in determining ambient concentrations of ozone. ~~Ozone levels continue to slowly climb in SLT and have approached the point where violations have occurred. This is due, in part, to the transport of ozone precursors emitted~~ Increased development in the Sacramento Valley and San Francisco Bay Areas and the rapidly developing foothill communities east of Sacramento and Stockton may be contributing to ozone levels in the Basin during the summer months (Allison et. Al. 2000).

1. Evaluation Criteria

The TRPA thresholds for air quality include the following numerical standard:

Maintain ozone concentrations below 0.08 parts per million averaged over one hour (not to be equaled or exceeded).

The applicable California standard for ozone is 0.09 ppm, 1-hour average (not to be exceeded). The Nevada standard for the Tahoe Region is 0.10 ppm, 1-hour average (not to be equaled or exceeded). The applicable federal National Ambient Air Quality Standard is 0.12 ppm, 1-hour average (not to be equaled or exceeded). Of the four 1-hour ozone standards, the TRPA threshold is the most stringent. In 1997, the EPA revised standards for ozone. ~~The new standards include an 8-hour standard of exposure of 0.08 ppm. The EPA has added a new 8-hour ozone standard to existing standards; however, at the present time the 1-hour standard is the only federal standard being implemented.~~

2. Measurement and Monitoring

Ozone is monitored by CARB in South Lake Tahoe, CA at Sandy Way. NDEP monitored ozone at the Horizon Casino until 1999 when another site was installed at Harvey's. Ozone monitoring was discontinued at this site in 1999. NDEP, with the assistance of CARB, monitors ozone at Cave Rock, NV. The Washoe County

Health Department monitors ozone in Incline Village, NV. [In 1999, CARB installed a monitoring site at the top of Echo Summit.](#)

3. Results of Measurement and Monitoring Efforts

The following results reflect the highest recorded concentration during a given year. This “first-high” value represents the peak recorded concentration. For a summary of ozone results, see Tables 2-5 and 2-6 in Section VII.

Exceedances of the most stringent 1-hour standard, TRPA’s 0.08 ppm, have been recorded every year at one or more of the monitoring stations since the threshold was adopted. The California standard of 0.09 ppm was exceeded in 1997 and 1999. No concentrations have exceeded the Nevada state standard of 0.10 ppm since 1988. The federal 1-hour standard has not been exceeded since 1982. The new federal 8-hour standard is calculated using the 3-year average of the fourth-highest daily maximum 8-hour average of continuous ambient air monitoring data over each year. This standard was not exceeded in any year.

4. Trends

Average daily summer ozone concentrations (calculated from June 1 through August 31) have increased in the Basin during the last five years. The average daily concentrations at Sandy Way in 1996 and 2000 were 0.037 and 0.044 ppm, respectively. However, summertime ozone concentrations in 1990 and 2000 are not significantly different (0.043 and 0.044 ppm, respectively). ~~Current data indicates~~ [Although the average ozone concentrations are fairly low and have not significantly changed since 1990, the timing of peak hourly ozone measurements in the Tahoe Basin indicate](#) that the transport of ozone and ozone precursors from out-of-Basin sources during the summertime months ~~is~~ [may be](#) increasing (*Murphy and Knopp (Eds.), 2000*).

5. Threshold Attainment Status

Currently, TRPA’s 1-hour threshold standard for ozone is not in attainment in the Tahoe Region. The region does attain the California, Nevada and federal standards.

6. Effectiveness of Measures in Place

The number of days exceeding the ozone standards has generally decreased since the threshold was adopted; it appears that the measures in place have been effective. However, ozone is a secondary pollutant formed in the atmosphere, and peak concentrations may be found miles downwind of source areas of the precursor emissions (reactive hydrocarbons and oxides of nitrogen). Transport of ozone or its precursors into the region from upwind areas may be a significant factor in observed ozone concentrations. More study is needed of the contribution of upwind emissions of ozone precursors to ozone concentrations observed in the Tahoe Region. Within the region, there are large natural sources of reactive hydrocarbons in the summer; NO_x ~~emissions-concentrations~~ appear to have decreased significantly since 1982, [which may in large part be due to the technological advances in automobiles, which have resulted in reduced emissions of several constituents.](#)

Category: air quality
Parameter: ozone (O3)

1. STANDARD:
 Standard: Federal: 0.12 ppm (one-hour av.)
 California: 0.09 ppm (one-hr. av.), not to be exceeded
 Nevada: 0.10 ppm (one-hour av.)
 TRPA: 0.08 ppm (one-hour av.)
2. INDICATOR (UNITS): Number of one-hour periods which equal or exceed the federal, Nevada, or TRPA standard at any of the permanent monitoring sites (unitless).
 Number of one-hour periods which exceed the California standard.
3. MONITORING SUMMARY: ~~There are two continuous O3 monitoring stations on the South Shore, operated by CARB and NDEP. The stations are: Lake Tahoe Boulevard (CARB) and Horizon Casino Hotel (NDEP). Continuous data is recorded automatically and compiled by CARB and NDEP, who issue periodic data reports. Ozone is monitored in South Lake Tahoe, CA at Sandy Way (CARB). The Nevada Department of Environmental Protection (NDEP) monitored ozone at the Horizon Casino-Hotel until 1999 when another site was installed at Harvey's Resort. Ozone monitoring was discontinued at this site in 1999. NDEP, with the assistance of CARB, monitors ozone at Cave Rock, NV. The Washoe County Health Department monitors ozone in Incline Village, NV.~~ Ozone is monitored in South Lake Tahoe, CA at Sandy Way (CARB). The Nevada Department of Environmental Protection (NDEP) monitored ozone at the Horizon Casino-Hotel until 1999 when another site was installed at Harvey's Resort. Ozone monitoring was discontinued at this site in 1999. NDEP, with the assistance of CARB, monitors ozone at Cave Rock, NV. The Washoe County Health Department monitors ozone in Incline Village, NV.
4. ATTAINMENT STATUS: Nonattainment.
 More than one day per year with one-hour concentrations greater than the Nevada or federal standards is considered to be a violation; one one-hour period which exceeds the California or TRPA standards is considered to be a violation. The Region does not attain the threshold for ozone. ~~Nor does the Region attain the California standard every year. The Region does attain the Nevada and federal standards. Although the number of violation days is below that of 1991, there is no apparent trend in ozone concentrations recorded at the monitoring sites. In 1994, there was one day on which the TRPA standard of 0.08 ppm was exceeded, and one day at the 0.08 standard. The high reading for 1994 was 0.09, measured at the Lake Tahoe Boulevard site in California. In~~

~~1995, there were two days exceeding the 0.08 ppm standard. The Nevada data shows five periods exceeding the one-hour standard during those two days. The high for the year was .09 ppm measured at the California Lake Tahoe Boulevard site. See the 1996 Evaluation Report, Table 2-4. For a summary of ozone results, see Tables 3 and 4 in Section VII.~~

Exceedances of the most stringent 1-hour standard, TRPA's 0.08 ppm, have been recorded every year at one or more of the monitoring stations since the threshold was adopted. In 1996, the standard was exceeded by a concentration of 0.09 ppm in Incline Village, NV. In 1997, two violations occurred (0.095 ppm and 0.093 ppm) at the Sandy Way and Stateline, NV sites, respectively. In 1998, the standard was exceeded by a measurement of 0.081 at Sandy Way. In 1999, the standard was exceeded three times. A measurement of 0.095 was taken at the Sandy Way, CA site. Both the Zephyr Cove and Incline Village sites had readings of 0.09 and 0.087, respectively. In 2000, the TRPA ozone standard was exceeded once at the Zephyr Cove, NV site (0.090 ppm). In 1997 and 1999, ozone concentrations at Sandy Way exceeded the California standard of 0.09 ppm. No concentrations have exceeded the Nevada state standard of 0.10 ppm since 1988. The federal 1-hour standard has not been exceeded since 1982. The new federal 8-hour standard is calculated using the 3-year average of the fourth-highest daily maximum 8-hour average of continuous ambient air monitoring data over each year. This standard was not exceeded in any year.

5. TARGET DATE: 2006.
6. EVALUATION INTERVAL: Two years.
7. INTERIM TARGETS: No exceedances of TRPA's ozone standard will occur by 2006, or TRPA will use the data gathered in the study led by the California Air Resources Board to implement local and out-of-Basin control measures to reduce ozone. A recommendation from the 1991 Evaluation was to have TRPA prepare a report on ozone sources, controls, and impacts by September 1996. This interim target has not

~~been met, but it was has been identified as a "C" List item for this in the 1996 Evaluation, and should be completed by June 30, 2000~~

transport from upwind areas to ozone concentrations in the Region. The adequacy of compliance measures is not known, pending completion of additional studies.

8. COMPLIANCE MEASURES: (See Section II for inventory)
 - a. MEASURES IN PLACE: AIR QUALITY - ~~01, 02, 03, 04, 06, 08, 09, 10, 11, 12, 14, 15, 16, 17, 19, 22, 23, 24, 29, 31, 32, and 33~~ 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 74, 75, 76, 77, 82, 85, 87, 88, 89, 90, 91, 92, 93, 94 and 95.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: Since the number of days exceeding the ozone standards has generally decreased since the threshold was adopted, it appears that the measures in place have been effective. ~~Effectiveness of measures is hard to determine, because~~ However, since ozone is a secondary pollutant formed in the atmosphere, peak concentrations may be found miles downwind of source areas of the precursor emissions (reactive hydrocarbons and oxides of nitrogen). Thus, transport of ozone or its precursors into the Region from upwind areas may be a significant factor in observed ozone concentrations. More study is needed of the contribution of upwind emissions of ozone precursors to ozone concentrations observed in the Tahoe Region. Within the Region, there are large natural sources of reactive hydrocarbons in the summer; NOx emissions appear to have decreased significantly since 1982.
 - c. SUPPLEMENTAL MEASURES: AIR QUALITY - 01, 02, 03, 04, 06, 08, 09, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 29, ~~30, 31, and 32, and 33~~ 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 125, and 126.
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES. See discussion under (b), above. More study is needed to determine the contribution of upwind ozone precursor emissions to ozone concentrations observed in the Tahoe Region.
9. ADEQUACY OF COMPLIANCE MEASURES: TRPA should sponsor additional research into the contribution of

C. AQ-3: PARTICULATE MATTER (PM₁₀)

Particulate matter suspended in the air comes from a combination of sources including: fugitive dust, vehicle and residential combustion processes, road salt, aerosols from the conifer forest, and ~~others~~ direct and secondary formation from gases. Federal and state agencies have established particulate standards to protect the public health. These standards address inhalable particulate matter less than 10 microns in diameter (PM₁₀). Many particulates are from man-made sources, such as sand and salt applied to roadways, construction dust, wood smoke and diesel fuel emissions. Strong winds may cause soil erosion and create high particulate concentrations where vegetation has been removed or disturbed. Many factors, including population, the amount and distribution of rainfall, the amount of soil disturbance, and variations in wind speed, have a significant influence on particulate concentrations. Concentrations measured in the air are highly variable..

1. Evaluation Criteria

There is no TRPA threshold for particulate matter measured in total mass. Applicable California standards include two standards for suspended particulate matter less than 10 microns in diameter (PM₁₀): 30 µg/m³, annual geometric mean, and 50 µg/m³, 24-hour average. The corresponding federal and Nevada standards are 50 µg/m³ (annual geometric mean; three years running) and 150 µg/m³ (24-hour average; three years running), respectively. TRPA did not adopt interim performance targets for particulate matter pursuant to Chapter 32 of the Code of Ordinances.

2. Measurement and Monitoring

CARB ~~monitors-samples~~ PM₁₀ concentrations at the South Lake Tahoe Sandy Way station. NDEP ~~monitored-sampled~~ concentrations at the Stateline, NV site until 1998. The Washoe County Health department currently ~~monitors-samples~~ PM₁₀ in Incline Village, NV.

3. Results of Measurement and Monitoring Efforts

PM₁₀ ~~measurements-samples~~ taken at the CARB SLT Sandy Way site show that all standards were met in 1999 and 2000. However, the California 24-hour average standard was exceeded on four days in 1996, two days in 1997 and two days in 1998. Actual ~~measurements-samples~~ were collected every six days (following the EPA's original sampling schedule used in the IMPROVE network). Calculated measurements are the estimated number of days that a measurement would have been greater than the level of the standard had ~~measurements-samples~~ been collected every day. The number of days above the standard is not necessarily the number of violations above the standard for the year. Using calculated measurements, the state standard was exceeded on 24 days in 1996, 12 days in 1997 and 12 days in 1998. The highest values for each year are listed in Section VII, Table 2-7. The federal standards were not exceeded.

4. Trends

PM₁₀ concentrations have been decreasing over the last 16 years. The California annual average (geometric mean) steadily decreased from 19.3 µg/m³ in 1996 to 15.6 µg/m³ in 2000. The national three-year annual average (arithmetic average) has decreased from 24 µg/m³ in 1996 to 21 µg/m³ in 2000. The primary source for PM₁₀ emissions is residential combustion; improvements in wood heating facilities and the recent popularity of gas heaters have likely been the primary contributors to PM₁₀ reductions. TRPA requires that all homes sold or built in the basin replace non-complying heaters with those that meet emission standards.

5. Threshold Attainment Status

PM₁₀ measurements by CARB ~~show indicate~~ that ~~the all~~ federal ~~standards and the federal~~ and California ~~annual geometric mean~~ standards are in attainment, ~~and that the California 24-hour average standard has been in attainment since 1999.~~

6. Effectiveness of Measures in Place

The largest contributors (by mass) to PM₁₀ concentrations are wood smoke and dust. Thus, controls on wood smoke and dust are the most effective controls in place. Controls have been reasonably effective, since the applicable standards are no longer being exceeded. See Table 2-2.

Category: air quality**Parameter: particulate matter (PM10)**

1. STANDARD: Federal: 50 ug/m3 (ann. avg., three yrs. running), 150 ug/m3 (24-hr mean, three yrs. running)
California: 30 ug/m3 (ann. avg.), 50 ug/m3 (24-hr avg.)
2. INDICATOR (UNITS): Number of 24-hour periods exceeding the applicable federal or state standards at any permanent monitoring station (unitless); annual average PM10 concentrations at any permanent monitoring station (ug/m3).
3. MONITORING SUMMARY: ~~There are three PM10 samplers in the Tahoe Region: the Lake Tahoe Boulevard Station (CARB co-located with TRPA) and Bliss State Park (TRPA). Continuous data is recorded automatically and compiled by TRPA and CARB, who issue periodic data reports. CARB monitors PM₁₀ mass concentrations at the Sandy Way, South Lake Tahoe station. NDEP monitored concentrations at the Stateline, NV until 1998. The Washoe County Health department currently monitors PM₁₀ in Incline Village, NV.~~
4. ATTAINMENT STATUS: ~~Nonattainment. Attainment.~~ Two 24-hour periods which exceed the applicable standard in a given year are considered a violation of the standard. The annual average standard is not to be exceeded in any year. ~~The Region attains federal PM10 standards and the California annual geometric mean standard. The California 24-hour standard is not in attainment. CARB 1994 data showed seven days of measurements above the 50 ug/m3 standard, and NDEP showed three days. The high reading for the 24-hour measurement in 1994 was 78 ug/m3, measured at the CARB Sandy Way station. In 1995, NDEP data shows two days violating the 24-hour standard, and CARB data showed three days violating the 24-hour standard. PM₁₀ measurements by CARB show that the federal standards and the federal and California annual geometric mean standard are in attainment, and that the California 24-hour average standard has been in attainment since 1999.~~
5. TARGET DATE: ~~2006~~ [The Tahoe Region is in attainment of this indicator therefore a target date is not required.](#)
6. EVALUATION INTERVAL: Two years.
7. INTERIM TARGETS: ~~In the 1991 Evaluation, an interim target was set to not exceed 60 ug/m3 for a 24-hour concentration (first high) during calendar year 1995. This interim target was not attained, but the numerical target will remain in place, to be met by calendar year 1999. N/A~~
8. COMPLIANCE MEASURES: (See Section II for inventory).
 - a. MEASURES IN PLACE: AIR QUALITY- ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 13, 14, 15, 16, 17, 19, 20, 21, 22, 23, 26, 28, 29, 30, 31, 32, 33~~ [62, 63, 64, 65, 66, 68, 69, 70, 73, 74, 75, 76, 77, 79, 82, 85, 87, 89, 90, 91, 92, 93, 94, 95 and 96.](#)
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The largest contributors (by mass) to PM10 concentrations are wood smoke and dust. Thus, controls on wood smoke and dust are the most effective controls in place. Controls have been reasonably effective, ~~since the applicable standards are no longer being only one of the applicable standards is~~ exceeded. Control measures can be improved, however.
 - c. SUPPLEMENTAL MEASURES: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 08, 09, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 29, 30, 31, 32, and 33.~~ [98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119 and 120.](#)
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Additional controls on wood smoke and dust are the most effective supplemental measures. ~~and should be implemented according to TRPA's schedule of implementation. (See Appendix B).~~
9. ADEQUACY OF COMPLIANCE MEASURES: ~~To attain and maintain the applicable standards, TRPA should implement the supplemental compliance measures pursuant to the Regional Transportation Plan - Air Quality Plan (TRPA, May 1992). The highest priority should be on COMPLIANCE MEASURES 13, 15, and 21, and~~

~~SUPPLEMENTAL MEASURES AQ-01 through 06, 10, and 14, supplemental transportation control measures, enhanced combustion heater controls, and enhanced BMP implementation program.~~ To maintain the PM10 thresholds, TRPA should continue to implement the compliance measures in place.

D. AQ-4: VISIBILITY

Visibility, or visual range, is directly related to the ambient concentrations of fine particulate matter in the atmosphere less than 2.5 microns in diameter (PM_{2.5}). By comparison, a human hair has a diameter of about 100 microns. The main contributors to PM_{2.5} include fine sulfur aerosols, fine soils (some from roadway dust), ammonium nitrate, and smoke. Visibility is also sensitive to relative humidity. When relative humidity is above 70 percent, a significant decrease in visual range is noted. TRPA established thresholds for visibility to protect the unique aesthetic values of the Tahoe Region.

Regional visibility is defined as the overall prevailing visibility in the Lake Tahoe Basin. The primary impact of regional visibility degradation is a general reduction in clarity, contrast, and color of vistas seen through the regional haze. A layer of perceptible haze that spreads over the urbanized areas, especially the south shore of the lake, characterizes sub-regional visibility in the Lake Tahoe Basin.

1. Evaluation Criteria

The TRPA thresholds for air quality include the following visibility standards.

Regional Visibility Strategy

NUMERICAL STANDARD: Achieve an extinction coefficient of 25 Mm⁻¹ at least 50 percent of the time as calculated from aerosol species concentrations measured at the Bliss State Park monitoring site (visual range of 156 km, 97 miles); and achieve an extinction coefficient of 34 Mm⁻¹ at least 90 percent of the time as calculated from aerosol species concentrations measured at the Bliss State Park monitoring site (visual range of 115 km, 71 miles).

Calculations will be made on three year running periods using the existing 1991-1993 monitoring data as the performance standards to be met or exceeded.

Reduce wood smoke emissions by 15 percent of the 1981 base values through technology, management practices, and educational programs. [This is included in TRPA's wood smoke indicator, AQ-6.](#)

Sub-regional Visibility Strategy

NUMERICAL STANDARD: Achieve an extinction coefficient of 50 Mm⁻¹ at least 50 percent of the time as calculated from aerosol species concentrations measured at the South Lake Tahoe monitoring site (visual range of 78 km, 48 miles); and achieve an extinction coefficient of 125 Mm⁻¹ at least 90 percent of the time as calculated from aerosol species concentrations measured at the South Lake Tahoe monitoring site (visual range of 31 km, 19 miles).

Reduce suspended soil particles by 30 percent of the 1981 base values and reduce wood smoke emissions by 15 percent of the 1981 base values through technology, management practices, and educational programs. [Wood smoke is included in TRPA's 6th indicator for Air Quality.](#)

Reduce vehicle miles of travel by 10 percent of 1981 base values. [This is included in TRPA's air quality indicator for Vehicle Miles Traveled, AQ-7.](#) California and Nevada both have standards for visibility-reducing particles, applicable only in the Tahoe Air Basin. Visibility-reducing particles shall not be present in sufficient

amount to reduce visibility to less than 30 miles when the relative humidity is less than 70 percent.

The California standard states that the standard is violated if visibility-reducing particles are in a sufficient amount to produce an extinction coefficient of 0.07 per kilometer due to particles when the relative humidity is less than 70 percent. Measurement in accordance with CARB Method V. This standard is equivalent to a 30-mile nominal visual range when relative humidity is less than 70 percent (CARB Fact Sheet 38).

The Nevada standard states that the visibility must be 30 miles (48 km) when relative humidity is less than 70 percent.

2. Measurement and Monitoring

TRPA conducts a visibility-monitoring program with the cooperation of the Air Resource Specialists, Inc. (ARS), the Desert Research Institute, the UC Davis Delta Group and the U.S. Environmental Protection Agency (through IMPROVE network). The program has four primary goals: (1) to determine the extent of fine particulate mass (less than 2.5 μm) in the region, (2) to determine the extent to which fine particulates degrade visibility in the region, (3) to determine the sources of fine particulate mass, and (4) to accurately measure visual range in the region. TRPA selected two monitoring sites for the location of monitoring equipment: the South Shore site co-located with the Lake Tahoe Boulevard station, and a site at Bliss State Park on the West Shore. The South Shore site was chosen to represent sub-regional visibility. The site at Bliss State Park represents regional visibility. These sites include a nephelometer, a four-chamber aerosol sampler, and a meteorological station. The South Shore site became operational in 1989, and the Bliss site became operational in 1990, and was incorporated into the IMPROVE network in 1999. The nephelometers measure the amount of light scattering caused by aerosols (particulates) and gases in an enclosed sample volume. Monitoring with the nephelometer at both sites is continuous. The four-chamber aerosol samplers gather data on concentrations of various types and sizes of particulate matter in the air. Samples of particulate matter are collected one in every six days at the South Shore site and one in every three days at Bliss State Park.

3. Results of Measurement and Monitoring Efforts

The TRPA visibility standards require the use of speciated aerosol data and algorithms unavailable in 1981. The current TRPA visibility-monitoring program was designed to meet the needs of determining compliance with these standards. A link was needed between the method used today and the method used to set the 1981 standards. In 1998, a study designed to create this link found that there had been no apparent change in regional visibility in the Lake Tahoe Basin between 1981 and 1989-1992. Therefore, visibility measurements can be compared to 1989-92 values using current methodology to determine attainment of the threshold. Data through 1999 is used to determine threshold attainment. Visibility measurements are given in Section VII (Tables 2-8 and 2-9).

4. Trends

Sub-regional visual air quality in the Lake Tahoe Basin has systematically and dramatically improved from the 1991-1993 base period to the 1997-1999 monitoring period. The TRPA regional visibility conditions improved from 1991 to 1996, but regional visibility has decreased since 1996. The 50 percent level in the period from 1997-1999 is cleaner than the 1991-1993 base period, but the 90 percent level (haziest days) is now worse than the 1991-1993 base year. Generally, regional haze is transported into the basin from the western slope of the Sierra Nevada (Sacramento [Valley](#) and San [Francisco](#) Bay Area ~~valleys~~). Thus, increased out-of-Basin development is likely a primary contributor to reduced visibility on those days (*Murphy and Knopp (Eds.) 2000*).

5. Threshold Attainment Status

Data gathered by ARS, including recent visibility measurements from TRPA's nephelometer, indicate that the regional and sub-regional 50 percent visibility standards are being attained, and that the 90 percent sub-regional visibility ranges are being met. ~~However, the 90th percentile standard was exceeded during the three-year periods of 1996-1998 and 1997-1999.~~ The 90 percent regional visibility standard is not being met.

The stated reduction goals in wood smoke emissions and soil particulate concentrations have been added as qualitative guidelines even though they are stated in specific reduction percentages. There is no existing valid estimate of wood smoke emissions for 1981; deciding if a 15 percent reduction has occurred is essentially impossible. However, organic and LAC fine aerosol concentrations have fallen significantly (>30 percent) from the 1991-93 to 1997-99 period at the South Shore site, while on average remaining constant (but increasing on the haziest days) at the Bliss site. This may indicate that the goal of a 15 percent reduction in sub-regional wood smoke emissions has been met, but not the similar regional goal. Because no good wood smoke emission data exists, this is only a conjecture.

*The reference to "soil" is not well understood. There is no existing record of what "soil" means, i.e. PM_{10} mass, reconstructed $PM_{2.5}$ fine soil or more probably coarse mass (the difference $PM_{10} - PM_{2.5}$ gravimetric mass). Since these sections of the TRPA visual air quality standards are ill defined, the TRPA Visibility Technical Advisory Committee is still evaluating them. Assuming that by "soil" the existing standards refer to coarse mass (i.e. the difference between PM_{10} and $PM_{2.5}$ gravimetric mass), the sub-regional goal in a 30 percent reduction in suspended soil particles has not been met. (*Air Resource Specialists, Inc. 2001 evaluation of thresholds.*)*

6. Effectiveness of Measures in Place

Local controls have been effective since significant improvements in sub-regional visibility have been observed over the last 10 years. As out-of-Basin sources may be contributing to reductions in regional visibility, the current measures in place may not address all sources. Currently, out-of-Basin transport is being addressed in the air quality research program being developed by several state and local agencies. Controls on wood smoke and dust are the most effective controls in place.

Category: air quality
Parameter: visibility

1. STANDARD:

~~TRPA regional: 171 km, 50 percent of the year 97 km, 90 percent of the year TRPA sub-regional: 87 km, 50 percent of the year 26 km, 90 percent of the year California: visibility reducing particles in sufficient amount to produce an extinction coefficient of 0.07 per kilometer due to particles when the relative humidity is less than 70 percent. Measurement in accordance with CARB Method V. This standard is equivalent to a 30-mile nominal visual range when relative humidity is less than 70 percent. (CARB Fact Sheet 38). Nevada: 30 miles (48 km) when relative humidity less than 70 percent. The revised TRPA thresholds for air quality include the following visibility standards.~~

Regional Visibility

NUMERICAL STANDARD: Achieve an extinction coefficient of 25 Mm^{-1} at least 50 percent of the time as calculated from aerosol species concentrations measured at the Bliss State Park monitoring site (visual range of 156 km, 97 miles); and achieve an extinction coefficient of 34 Mm^{-1} at least 90 percent of the time as calculated from aerosol species concentrations measured at the Bliss State Park monitoring site (visual range of 115 km, 71 miles).

Calculations will be made on three year running periods using the existing 1991-1993 monitoring data as the performance standards to be met or exceeded.

Reduce wood smoke emissions by 15 percent of the 1981 base values through technology, management practices, and educational programs.

Sub-regional Visibility

NUMERICAL STANDARD: Achieve an extinction coefficient of 50 Mm^{-1} at least 50 percent of the time as calculated from aerosol species concentrations measured at the South Lake Tahoe monitoring site (visual range of 78 km, 48 miles); and achieve an extinction coefficient of 125 Mm^{-1} at least 90 percent of the time as calculated from aerosol species concentrations measured at the South Lake Tahoe monitoring site (visual range of 31 km, 19 miles).

2. INDICATOR (UNITS): For regional visibility, visual range calculated from ~~contrast measurements~~ speciated aerosol and nephelometer data measurement of light extinction transmittance from the TRPA visibility-monitoring program. For sub-regional visibility, visual range calculated from speciated aerosol and nephelometer data collected at the Lake Tahoe Boulevard station (km). For state visibility standards, visual range calculated from nephelometer data collected at Bliss State Park and Lake Tahoe Boulevard for periods in which relative humidity is less than 70 percent (miles).
3. MONITORING SUMMARY: TRPA operates integrated visibility monitoring stations at Lake Tahoe Boulevard and Bliss State Park. The monitoring stations include equipment to monitor meteorological, aerosol, and ~~perception~~ visual extinction data. For additional detail, see ~~1994~~ 2001 Evaluation Report.
4. ATTAINMENT STATUS: Non-attainment. Data gathered by Air Resource Specialists, Inc. (ARS) show that some of the visibility standards are not being met. The TRPA 90 percent standard for regional and sub-regional visibility is being met (ARS, February 1996). The TRPA 50 percent standards are not being met (ARS, February 1996). The monitoring that was in place for the 1994 Evaluation was not equivalent to what is currently in place, and actually overpredicted visibility ranges. Data gathered by Air Resource Specialists, Inc. (ARS) including recent visibility measurements from TRPA's nephelometer indicate that the regional and sub-regional 50 percent visibility standards are being attained, and that the 90 percent sub-regional visibility ranges are being met. The 90 percent regional visibility standards (D. L. Bliss State Park) are not being met.
5. TARGET DATE: 2006. Although all visibility standards are not being met, the standards need to be revised to reflect current monitoring methods. When the new standards are in place and attainment is reevaluated, it should be determined whether or not a target date is needed.
6. EVALUATION INTERVAL: Two years.

7. INTERIM TARGETS: (See discussion in Target Date, above) Data indicates that transported particulates may be contributing to the reductions in regional visibility. No exceedances of TRPA's visibility standards will occur by 2006, or TRPA will use the data gathered in the study led by the California Air Resources Board to implement local and out-of-Basin control measures to reduce visibility-reducing particulates.

8. COMPLIANCE MEASURES: (See Section II for inventory).
 - a. MEASURES IN PLACE: AIR QUALITY- ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 13, 14, 15, 16, 17, 19, 20, 21, 23, 24, 26, 28, 29, 31, 32, and 33.~~ 62, 63, 64, 65, 66, 67, 68, 69, 70, 73, 74, 75, 76, 77, 79, 80, 81, 82, 83, 84, 85, 86, 87, 89, 90, 91, 93 and 94.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: Local controls have been effective since significant improvements in sub-regional visibility have been observed over the last 10 years. Since it appears that out-of-Basin sources may be contributing to reductions in regional visibility, the current measures in place may not address all sources. Out-of-basin transport is currently being addressed in the air quality research program being developed by several state and local agencies . The largest contributors (by mass) to visibility degradation are wood smoke and dust. Thus, controls on wood smoke and dust are the most effective controls in place. ~~Controls have been somewhat effective, but should be enforced more readily.~~
 - c. SUPPLEMENTAL MEASURES: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 08, 09, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 29-30, 31, 32, and 33.~~ 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119 and 120.
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Additional controls on wood smoke, VMT and dust are the most effective supplemental measures. ~~and should be implemented according to TRPA's schedule of implementation. (See Appendix B.)~~

9. ADEQUACY OF COMPLIANCE MEASURES: ~~To maintain the applicable standards, TRPA~~

~~should implement the supplemental compliance measures pursuant to the Regional Transportation Plan – Air Quality Plan (TRPA, May 1992).~~ The highest priority should be supplemental measures that include transportation control measures, enhanced combustion heater controls, and enhanced BMP implementation program.

E. AQ-5: TRAFFIC VOLUME

Vehicles entering the Lake Tahoe Basin at seven main access points, or “cordon stations,” considerably affect traffic volumes within the region. Traffic volumes are counted at the cordon stations. Volumes vary considerably by season, and are affected by winter storms and road construction. Overall, travel on the seven main access routes increased about 20 percent from 1981 to 1995 and 8.85 percent from 1995 to 1999.

1. Evaluation Criteria

The TRPA thresholds for air quality (carbon monoxide) include the following standard.

MANAGEMENT STANDARD: Reduce traffic volumes on the U.S. 50 Corridor by 7 percent during the winter from the 1981 base year between 4 p.m. and 12 midnight, provided that those traffic volumes shall be amended as necessary to meet the respective state standards.

2. Measurement and Monitoring

Although the threshold does not specify a location of U.S. 50, or a specific winter period, TRPA traditionally looked at two different measurements to assess progress at reducing winter traffic volumes. One measurement that is helpful for comparing winter traffic from year to year is the traffic volume at the intersection of Park Avenue and U.S. 50, on the Saturday of the Presidents’ Day Weekend, from 4 p.m. to midnight. Because traffic volumes vary significantly from day to day, TRPA also analyzed the traffic volumes recorded at Park Avenue and U.S. 50 from 4 p.m. to midnight for all days during the winter months of November through February, coinciding with the period of the most frequent exceedences of the CO standards, historically. This specific measurement has been used as the indicator to determine compliance with the threshold.

TRPA and the California Department of Transportation (Caltrans) measure traffic volumes on the U.S. 50 corridor as part of their ongoing program of traffic counts. In the past, permanent counting stations have existed on U.S. 50 at Park Avenue and Rufus Allen Boulevard. TRPA has recently learned that the permanent count station that previously existed at Park Avenue is no longer in operation. The last year of full monitoring at this location was 1997.

TRPA does not have the specific information available to determine present compliance with the threshold, as the count station is no longer operable. There is one full winter’s worth of data from which to determine compliance with the threshold, since the previous evaluation.

TRPA staff is proposing to utilize the 1996-97 winter season’s data to determine compliance with the threshold for that period. In order to estimate whether the threshold may be in attainment presently, a comparison of data will be used to try to estimate how traffic may have changed during that time period. TRPA is proposing to look at several locations immediately around the Park Avenue intersection and compare recent daily traffic with that from 1995. The only published data for these other locations is either Annual Average Daily Traffic (AADT), or Peak Month Average Daily Traffic (MADT). A relationship will be developed comparing 1996 traffic counts with 1999 traffic counts, and that

relationship will be applied to the winter average from 1996-97 to estimate whether this threshold is presently being met. The same will be done to compare the Presidents' Weekend Saturday traffic volumes.

It should be noted that the compliance determination for this threshold is an estimate of what the traffic volumes have been projected to be. It is not an absolute determination of threshold compliance.

TRPA will be working with Caltrans to get the permanent count station at Park Avenue back up and running, or determine a better location to operate a continuous count station.

3. Results of Measurement and Monitoring Efforts

The traffic count data as described in the indicator for this threshold is not available for current years. The data for winter 1996-97 does indicate that the threshold was met during that time frame. The average traffic volume at the specified location from 4 p.m. to midnight, averaged from November through February, was 14,587 for the 1996-97 period. This value is approximately 7.6 percent lower than the 1980-1981 value of 15,781. Caltrans published traffic volumes for areas throughout South Lake Tahoe and, specifically, around this intersection, which show that the annual averages and peak month averages have not changed since 1996.

Traffic volumes recorded at the Park Avenue intersection for the Saturday of Presidents' Day Weekend, from 4:00 pm to 12:00 Midnight, for 1981, 1987, 1989, 1996 and 1997 are shown in Table 2-1. These volumes indicate that traffic volumes increased from 1981 to 1987, but have steadily decreased between 1987 and 1997. As stated above, the annual averages for the area did not change from 1996 through 1999, and so it is presumed that the volumes for this specific time period and location would have stayed relatively constant.

Year	Traffic Volume (4 PM to 12 Midnight)	% Change from 1981
1981	25,173	-
1987	28,605	+13.6
1989	24,756	-1.7
1996	23,353	-7.2
1997	22,384	-11.0

4. Trends

The specific traffic volumes for this threshold have fluctuated since 1981, although since 1987 they have shown a decline. It appears that in recent years the traffic volumes have actually stayed relatively constant, well below the 1981 volumes.

5. Threshold Attainment Status

Since TRPA does not have the specific data with which to make an exact determination of compliance with this threshold, the actual attainment status is unknown. However, the data that is available suggests that this threshold may be in attainment. As described above, the most recent set of data that is available for the location as defined in the indicator is for the 1996-97 winter. Using those volumes, and then applying the relationship between 1996/1997 published traffic volumes and 1999 traffic volumes shows that the volumes necessary to meet this threshold are being met.

6. Effectiveness of Measures in Place

Available data indicates that measures in place have resulted in significant reductions in traffic volumes and that this threshold is likely in attainment though data are only available through 1997.

Category: air quality**Parameter: U.S. 50 traffic volume**

1. STANDARD: TRPA, 7 percent reduction in traffic volume on the U.S. 50 corridor from 1981 values, winter, 4 p.m. to 12 a.m.
2. INDICATOR (UNITS): ~~Although the threshold does not specify a location of US 50, or the specific winter period, TRPA traditionally looked at two different measurements to assess progress at reducing winter traffic volumes. These included: Traffic volumes on U.S. 50 immediately west of the intersection of Park Avenue in the City of South Lake Tahoe, average day, November through February, 4 p.m. to 12 a.m., sum of both directions (number of vehicles). TRPA selected this indicator because the threshold appears, in TRPA Resolution 82-11, under the heading "carbon monoxide," and this location was the location of the only existing carbon monoxide hot spot in the Tahoe Region.~~ the traffic volumes recorded at Park Avenue and US 50 from 4:00 p.m. to 12:00 midnight for all days during the winter months of November through February, and on the Saturday of President's Day Weekend, coinciding with the period of the most frequent exceedences of the CO standards, historically. The latter measurement has been used as the indicator to determine compliance with the threshold.
3. MONITORING SUMMARY: ~~Caltrans operates a permanent traffic counter just west of the intersection of U.S. 50 and Park Avenue. Data are gathered continuously and reported annually. In the past, permanent counting stations have existed on U.S. 50 at Park Avenue and Rufus Allen Boulevard. TRPA has recently learned that the permanent count station that previously existed at Park Avenue is no longer in operation. The last year of full monitoring at this location was for 1997.~~ TRPA staff is proposing to utilize the 1996-97 winter season's data to determine compliance with the threshold for that period. In order to estimate whether the threshold may be in attainment presently, a comparison of data will be used to try to estimate how traffic may have changed during that time period. TRPA is proposing to look at several locations immediately around the Park Avenue intersection and compare recent daily traffic with that from 1995. The only published data for these other locations is either Annual Average Daily Traffic (AADT), or Peak Month

Average Daily Traffic (MADT). A relationship will be developed comparing 1996 traffic counts with 1999 traffic counts, and that relationship will be applied to the winter average from 1996-97 to estimate whether this threshold is presently being met. The same will be done to compare the Presidents' Weekend Saturday traffic volumes.

4. ATTAINMENT STATUS: ~~Attainment. The average traffic volume of 14,551 during 1995-96 was 7.8 percent lower than the volume of 15,781 during 1980-81. Due to the fact that Caltrans' traffic counters were not working from 1991 to 1995, it is unclear what the trend has been in traffic volumes at this location. The 1995-96 season is simply a snapshot of what was occurring at that time. Unknown.~~ (Although TRPA evidence indicates this threshold is in attainment, the actual counter was not operational and the threshold status is therefore classified as unknown.) The data for 1996-97 winter does indicate that the threshold was being met during that time frame. The average traffic volume at the specified location, from 4:00 pm to 12:00 midnight, averaged from November through February was 14,587 for the 1996-97 winter. This value is approximately 7.6 percent lower than the 1980-1981 value of 15,781. Published traffic volumes from Caltrans for areas throughout South Lake Tahoe, and specifically around this intersection, show that the annual averages and peak month averages have not changed since 1996. Traffic volumes recorded at the Park Avenue intersection for the Saturday of Presidents' Day Weekend for 1981, 1987, and 1989 indicated that traffic volumes increased from 25,173 in 1981 to 28,605 in 1987 (+13.6 percent), but decreased to 54,756 in 1989 (-1.7 percent). In 1996 traffic volumes for this time period decreased by 7.2 percent to a volume of 23,353, and decreased again in 1997 to a volume of 22,384 (-4.1 percent). As stated above, the annual averages for the area did not change from 1996 through 1999, and so it is presumed that the volumes for this specific time period and location would have stayed relatively constant, although we do not have the particular data to make the exact determination.
5. TARGET DATE: ~~No target date identified, because threshold attained during Winter 1995-96. Maintenance should be monitored annually.~~ Pursuant to Code subsection 32.3C, when TRPA lacks sufficient data to evaluate an indicator, it will establish a timetable. A new counter will be installed at the

intersection of Park Ave. and Highway 50 by August 2002. Data for the winter of 2002-2003 will be used to determine indicator status by June 2003.

6. EVALUATION INTERVAL: One year.
7. INTERIM TARGETS: TRPA shall work with Caltrans to install a traffic counter at the intersection of Park Avenue and Highway 50 by June 2002.
8. COMPLIANCE MEASURES: (See Section II for inventory)
 - a. MEASURES IN PLACE: AIR QUALITY - ~~01, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 16, 23, 24, 32, and 33. 31, 34, and 35.~~ 62, 64, 65, 66, 67, 68, 69, 70, 71, 72, 82, 89, 90, 93 and 94.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: Available data indicates that measures in place have resulted in significant reductions in traffic volumes. and that this threshold is likely in attainment. though data are only available through 1997. However, because it is not known what the 1991-95 trend is, effectiveness for the long term is hard to evaluate at this time.
 - c. SUPPLEMENTAL MEASURES: AIR QUALITY - ~~02, 03, 04, 08, 09, 10, 11, 12, 13, 14, 18, 19, 26, 27, 28, 29, 31, 32, and 33-98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119 and 120.~~
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~Traffic volumes for Winter 1995-96 showed that this threshold is in attainment. Because the trend is not known for 1991-95, TRPA should~~ continue to implement supplemental measures to maintain the threshold.
9. ADEQUACY OF COMPLIANCE MEASURES: Threshold may be in attainment. The cumulative impacts of compliance measures will result in traffic reductions.

F. AQ-6: WOOD SMOKE

Increased levels of wood smoke can cause high particulate concentrations. Residential combustion in fireplaces is the major source of wood smoke in the Tahoe Region. The most significant problems generally occur during the winter months when wood stoves are being used, and inversion layers are present. Emissions from wood burning cause degradation in visibility levels, and increased levels of particulate matter.

1. Evaluation Criteria

The TRPA thresholds for air quality, under regional and sub-regional visibility include the following:

MANAGEMENT STANDARD: Reduce wood smoke emissions by 15 percent of the 1981 base values through technology, management practices and educational programs.

2. Measurement and Monitoring

Currently, no scientifically-sound method has been determined for the direct measurement of wood smoke. However, aerosol data (including organic and light-absorbing carbon) collected in South Shore and at Bliss State Park may serve as indirect indicators of wood smoke.

3. Results of Measurement and Monitoring Efforts

TRPA does not know whether suspended soil particles and wood smoke emissions have been reduced in sufficient amounts to attain the thresholds. Analysis of data in this area is ongoing. Data from aerosol filters at South Shore and Bliss State Park indicates that the sub-regional wood smoke levels may have been reduced by 15 percent, but that regional levels have not. Improvements in sub-regional visibility also indicate a reduction in wood smoke.

4. Trends

While the attainment status of this threshold is unknown, a special study was conducted during the winter of 1996 to determine the level of wood smoke present compared with 1981 levels. Although the data were not completely conclusive, it did indicate that wood smoke levels have increased since the 1981 base year. Current aerosol data shows a reduction in organic and light-absorbing carbon; therefore, it is likely that wood smoke emissions have decreased since 1996. TRPA can not determine if current emissions have been reduced by 15 percent as no values can be established for the 1981 base year.

5. Threshold Attainment Status

It is unknown whether wood smoke emissions have been reduced in sufficient amounts to attain the thresholds. Data indicates that a reduction in wood smoke may have occurred between 1991 and 1999.

6. Effectiveness of Measures in Place

Although TRPA does not know the status of this threshold, data indicates that reductions in wood smoke have likely occurred over the last 10 years. Therefore, it appears that measures in place have been somewhat effective. The wood heater retrofit program should be more strictly enforced. Organic carbon from wood smoke is the most prevalent fine particulate species (by mass) in the Tahoe Region.

Category: air quality**Parameter: wood smoke**

1. STANDARD:
TRPA: reduce annual emissions 15 percent from 1981 values
2. INDICATOR (UNITS): ~~Concentration of a wood smoke signature element, excess fine potassium, in air samples taken by TRPA's IMPROVE aerosol monitors (ug/m3).~~ Aerosol samples analyzed for organic and light-absorbing carbon collected in South Lake Tahoe and at Bliss State Park serve as indirect indicators of wood smoke.
3. MONITORING SUMMARY: The wood smoke signature element, excess fine potassium, is monitored by TRPA's IMPROVE aerosol samplers at Lake Tahoe Boulevard and Bliss State Park in conjunction with the TRPA visibility monitoring program. TRPA does not know whether suspended soil particles and wood smoke emissions have been reduced in sufficient amounts to attain the thresholds, above. A possible method for evaluating this threshold was previously identified using the concentration of a wood smoke signature element, excess fine potassium, in air samples taken by TRPA's IMPROVE aerosol monitors (ug/m3). However, due to scientific complications, this has not been monitored as an indicator unit. However, data from aerosol filters at South Lake Tahoe and Bliss State Park (see details under Visibility attainment status) indicates that the sub-regional wood smoke levels may have been reduced by 15%, but the regional levels have not. Improvements in sub-regional visibility also indicate a reduction in wood smoke.
4. ATTAINMENT STATUS: ~~Nonattainment. Crocker Nuclear Laboratories (UC Davis) performed additional monitoring in January 1996 to see how TRPA's current monitoring compares with the monitoring sites from the 1970s and 1980s. By setting up temporary sites and comparing the data with previously collected data, it appears that the wood smoke levels have increased above levels measured in 1981 (UC Davis, February 1996). Although the exact levels of increase are not known, it appears that the Region is not meeting the wood smoke threshold. In order to know precisely how the wood smoke levels of today compare with those~~
5. TARGET DATE: ~~A new target date will be set subsequent to the levels, to be conducted by Crocker Nuclear Laboratory, during Winter 1996-1998-99. Pursuant to Code subsection 32.3C, when TRPA lacks sufficient data to evaluate an indicator, it will establish a timetable. Since there are no methods to determine the 1981 levels of wood smoke and therefore no way to determine attainment of this indicator, TRPA will use the data gathered in the research led by the California Air Resources Board to develop an applicable wood smoke indicator which can be analyzed given current scientific methodology.~~ TRPA does not know whether suspended soil particles and wood smoke emissions have been reduced in sufficient amounts to attain the thresholds, above. Analysis of data in this area is ongoing. Current data indicates a significant reduction in sub-regional wood smoke may have occurred from 1991-1999.
6. EVALUATION INTERVAL: Two years.
7. INTERIM TARGETS: ~~The interim target set in the 1991 Evaluation (to prepare a report on historic versus present wood smoke comparisons by September 1996) has not been completed at this time. A preliminary study was conducted during January 1996, but was not a full evaluation of wood smoke levels. It is anticipated that a full report will be completed during Winter 1996-97-1998-99. TRPA, in cooperation with state and local agencies, shall evaluate wood smoke levels and develop wood smoke indicators which scientifically defensible and measurable.~~ TRPA, in cooperation with state and local agencies, shall evaluate wood smoke levels and develop wood smoke indicators which scientifically defensible and measurable.
8. COMPLIANCE MEASURES: (See Section II for inventory).
 - a. MEASURES IN PLACE: AIR QUALITY - ~~13, 15, 20, 73, 75, 80 and 93~~
 - b. EFFECTIVENESS OF MEASURES IN PLACE: ~~The 1991 Evaluation recommends that compliance measures in place be strengthened pursuant to the Regional Transportation Plan – Air Quality Plan (TRPA, May 1992), which calls for more stringent wood heather retrofit requirements. Although TRPA does not know the status of this threshold, data indicates that reductions in wood smoke have likely occurred over the last 10 years.~~ TRPA does not know the status of this threshold, data indicates that reductions in wood smoke have likely occurred over the last 10 years.

Therefore, it appears that measures in place have been somewhat effective. However, the wood heater retrofit program should be more strictly enforced. Organic carbon from wood smoke is the most prevalent fine particulate species (by mass) in the Tahoe Region.

c. SUPPLEMENTAL MEASURES: AIR QUALITY - ~~14, 15, and 17.~~ None

d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~The 1996 Evaluation recommends that enhanced combustion heater controls be implemented as a high priority. Implementation of enhanced controls will reduce peak-hour wood smoke emission from the average wood heater.~~ Currently no supplemental measures have been identified.

9. ADEQUACY OF COMPLIANCE MEASURES: TRPA does not know whether compliance measures in place have resulted in progress toward, or attainment of, the applicable threshold. Peak-hour wood heater emissions (on a per-heater basis) have been reduced since 1981 by the introduction of cleaner-burning heaters. Bulk annual emissions of wood smoke is a function of many factors, including average temperature, number of wood heaters, and occupancy rates in units with wood heaters.

G. AQ-7: VEHICLE MILES TRAVELED (VMT)

Vehicle miles traveled or VMT is a computed value that measures the extent to which an area is reliant on the private automobile for trip making. The TRPA transportation model calculates number of trips made on the highway network and the distance between trip origins and destinations, for each trip purpose. Total VMT is the sum of all of the trip lengths of all trip purposes. TRPA calculates VMT for the average peak summer day. In 1981 and 1987, TRPA calculated that there were 1,649,000 and 1,813,748 VMT, respectively, on the average peak summer day in the Lake Tahoe Region. The estimate for 1995 VMT was 1,735,000. On a comparative basis, the 1981 and 1987 VMT values were derived from a similar database. The 1995 VMT was developed from a significantly different database, using more accurate spatial socioeconomic data. As a result, the VMT values for the 1995 base year are not directly comparable to the 1981 and 1987 VMT values.

TRPA currently uses the Tranplan traffic model to calculate the VMT estimate for the Lake Tahoe Region. TranPlan is a computer traffic model that calculates the number of vehicle trips and vehicle miles traveled in the Region based on productions and attractions that are estimated using housing data and employment data. A typical "production" would be a residential unit, tourist accommodation unit, or campground. Uses that attract trips are commercial and recreational uses. When the 1995 VMT estimate was calculated using Tranplan, a whole new set of data was collected that was then input into the model. Also at the time that the 1995 base year was developed, forecasts were developed for 2001, 2006 and 2016.

The estimate for 1999 VMT is 1.790 million miles (see below). It was not calculated directly from the model. Rather, it was estimated using a VMT forecast produced by the model using 1995 as the base year. TRPA staff looked at a collection of 28 traffic volumes around the Basin, consistent with those volumes that are used as the 28 cut-lines for the model validation. The sum of the total traffic volumes on the 28 cut lines was actually very close to the sum of the volumes generated by the model for these same links as the 1995 base year. For these 28 cut-line locations, traffic volumes have increased by an average of 3.2 percent from 1995 to 1999.

1. Evaluation Criteria

The TRPA thresholds for air quality, under both visibility and nitrate deposition, include the following management standard: "Reduce vehicle miles of travel by 10 percent of the 1981 base values." In 1988, TRPA adopted interim performance targets for the VMT threshold standard, as follows:

- Indicator: VMT calculated for peak summer day using QRS (Quick Response System) transportation model or equivalent model.
- Interim Target: Indicator shall not exceed RFP (Reasonable Further Progress) line. (See Figure 2-1 Tahoe Region VMT Forecast Lines by Established Base Year at the end of this chapter).

2. Measurement and Monitoring

TRPA, Caltrans, and NDOT carry out a continuous program of traffic counting using both automatic permanent counters and spot counts. TRPA calculates vehicle miles of travel for any given year by modeling traffic volumes and trip

lengths with the computerized TRANPLAN model. Thus, VMT is a calculated value that is not directly monitored. When the most recent VMT calculation was developed with a 1995 base year, forecasts were calculated for the years 2001, 2006, 2016.

Since VMT is a calculated value, derived from transportation models, TRPA can not know the exact 1981 peak summer day VMT in the region, but must attempt to calculate it. As computer models have changed and improved over the years, TRPA has modeled 1981 VMT several times. When TRPA adopted the thresholds in 1982, TRPA calculated 1981 VMT at 1.70 million miles, peak summer day. However, in 1991, TRPA incorporated technical improvements and corrections into the database and calculated 1981 VMT at 1.65 million miles, peak summer day.

In 1996, TRPA staff generated a new 1995 base year VMT value, which is not directly comparable to the 1981/1987 base year VMT. The 1995 value was generated in a similar way as the 1981 and 1987 base years; however, more spatially accurate socio-economic data was utilized. The updated 1995 base year VMT number represents significant changes from earlier model runs, which is the primary reason why the 1995 VMT value is not directly comparable to previous base year VMT values.

The 1996 Threshold Evaluation, and other recent transportation planning studies, have suggested that the VMT threshold standard be reevaluated for its effectiveness as a threshold for air quality. Because the VMT reduction threshold is a management standard associated with other thresholds, it was suggested that these evaluations should include VMT's significance in visibility and NO_x problems, and what portion of pollutants in these areas is attributable to VMT. Although it has been over five years since the last evaluation there have been many studies on air quality in general in the basin, the VMT threshold itself has not been fully evaluated. At this time, no changes are being proposed to the threshold. During the next five years, however, it is recommended that a more serious evaluation of the threshold take place so that any potential amendments to the threshold can occur prior to the next evaluation, and subsequent Regional Plan update.

Following the thoughts regarding VMT and its appropriateness and effectiveness, it was determined that completely updating the transportation model to create a new VMT base year was not feasible at this time. Doing so would be very time and resource-intensive. As there are several questions surrounding this threshold and at this time the only valid use would be for the threshold evaluation, TRPA feels the benefits of such an update do not justify the associated time and resources that are necessary to update the VMT number.

3. Results of Measurement and Monitoring Efforts

Rather than updating the base year, TRPA staff utilized the 1995 base year VMT estimate, and the corresponding forecasts that were developed. In calculating a VMT estimate utilizing a traffic model, a validation process is followed to show how close the actual ground count data is to the model-generated counts. To do this, a selection of 28 "cut-lines" around the Region are evaluated. These "cut lines" refer to a group of selected locations around the Region that will be used for comparing the model-generated results with actual ground-count traffic volumes. The locations

include the seven cordon stations (entry points into the Region) and select locations on each of the major highways in the Region (i.e., US 50, SR 28, SR 89, and SR 267). For these 28 cut-lines, the model-generated volumes are compared with the actual published traffic volumes. Depending on the volume of the roadway segment, there are certain acceptable margins of error. The validation process is used to verify that the model-generated data is within an acceptable margin of error.

TRPA staff compared the 1999 actual ground counts with the 28 cut line traffic volumes for both the 1995 base year and the 2001 forecast year. The 1999 actual ground counts, collectively, were within a small margin of error (2.3 percent) of the 1995 model-generated traffic volumes. Because these were so close, TRPA used the 1995 volumes and VMT as the base year, and then applied a factor to account for any actual growth from 1995 to 1999. The combined published traffic volumes on the 28 cut-line segments increased approximately 3.2 percent from 1995 to 1999. Correspondingly, it is presumed that VMT would have also increased by a similar percentage, to approximately 1,790,602 miles in 1999.

Taking into account the above information, TRPA calculated that, from 1981 to 1995, VMT in the Tahoe Region increased five percent, to 1.735 million miles. Further, VMT is estimated to have increased an additional 3.2 percent between 1995 and 1999, to approximately 8.5 percent above the 1981 values.

4. Trends

The VMT data available is not in a form to give us good trend information. Because of the better spatial layout of the input data for the 1995 base year, the output is not directly comparable to the previous VMT estimates. Although the 1995 VMT estimate was above the 1981 value, it was actually below what was calculated using the 1987 base year. Provided the same data set was used and keeping in mind the input data and how the model calculates VMT, the trend for VMT would be continually increasing.

5. Threshold Attainment Status

This threshold is not being met. Nor is the interim target of meeting the "Reasonable Further Progress (RFP)" line being met. As was the case in the previous evaluation, it is recommended that before subsequent review of this threshold attainment, the standard should be evaluated as to its effectiveness.

6. Effectiveness of Measures in Place

Although measures in place have kept the increase in VMT in the Tahoe Region to less than one percent annually using the computed rate of growth between 1995 and 1999, they have not been effective in meeting the applicable threshold. Implementation of supplemental measures, coupled with large capital investments, and major shifts in the way people travel to, and within, the region will be necessary to attain the threshold.

Category: air quality**Parameter: VMT (vehicle miles traveled)**

1. STANDARD: TRPA: reduce VMT 10 percent from 1981 value

2. INDICATOR (UNITS): VMT calculated by TRPA staff for peak summer day using TRANPLAN transportation model or equivalent model. [In 1988, TRPA adopted interim performance targets for the VMT threshold standard, as follows:](#)

[Indicator: VMT calculated for peak summer day using QRS \(Quick Response System\) transportation model or equivalent model.](#)

[Interim Target: Indicator shall not exceed RFP \(Reasonable Further Progress\) line.](#)

3. MONITORING SUMMARY: ~~VMT is a calculated value based on the TRANPLAN travel demand forecasting model, which uses actual and estimated values for population, land use patterns, and travel characteristics to evaluate changes in VMT, traffic volumes, and travel patterns. Caltrans, NDOT, and TRPA operate a traffic monitoring network throughout the Tahoe Region used to calibrate the model. TRPA, Caltrans, and NDOT carry out a continuous program of traffic counting using both automatic permanent counters and spot counts. (See Table 2-5.) TRPA calculates vehicle miles of travel for any given year by modeling traffic volumes and trip lengths with the computerized TRANPLAN model. Thus, VMT is a calculated value that is not directly monitored. When the most recent VMT calculation was developed with a 1995 base year, forecasts were calculated for the years 2001, 2006, 2016. For more details, see 2001 Threshold Evaluation.~~

4. ATTAINMENT STATUS: Non-attainment. ~~The computer generated VMT of 1.735 million miles for 1995 is approximately five percent higher than the 1.648 million miles that was estimated for 1981. If 1981 socioeconomic data was collected in a similar fashion to the 1995 socioeconomic data, TRPA staff estimate that the percentage increase in VMT from 1981 would be greater than five percent. TRPA calculated that, from 1981 to 1995, VMT in the Tahoe Region increased five percent.~~

[Further, VMT is estimated to have increased an additional 3.2 percent between 1995 and 1999, to approximately 8.5 percent above the 1981 values.](#)

5. TARGET DATE: [Since both residents and non-residents affect VMT, it is expected to increase regardless of the number of allocations permitted by TRPA. Therefore, attainment of this indicator is not expected to occur until 2020+. However, TRPA has established an interim target for this indicator \(see below\).](#)

6. EVALUATION INTERVAL: Two years, corresponding to updates of the Regional Transportation Plan.

7. INTERIM TARGETS: ~~See forecast by year, attached. Indicator should not exceed RFP line fall 10 percent or more below the 1995 projected VMT growth line developed in connection with the 1997 RTP-AQP. By December 2006, VMT will not exceed 1.79 million VMT. TRPA has established programs which may reduce VMT by roughly 289,000 VMT (see 2001 Environmental Assessment – funding is needed).~~

8. COMPLIANCE MEASURES: (See Section II for inventory)

a. MEASURES IN PLACE: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 16, 17, 23, 24, 26, 27, 30, 31, 32, 33, 34, 35. 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 76, 77, 82, 83, 84, 85, 89, 90, 91, 94 and 95.~~

b. EFFECTIVENESS OF MEASURES IN PLACE: Although measures in place have kept the increase in VMT in the Tahoe Region to less than one percent annually using the computed rate of growth between ~~1981 and 1995 and 1999~~, they have not been effective in meeting the applicable threshold. Implementation of supplemental measures listed below, coupled with large capital investments, and major shifts in the way people travel to, and within, the Region will be necessary to attain the threshold.

c. SUPPLEMENTAL MEASURES: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 17, 18, 19, 20, 21, 29, 30, 31, and 32, and 33. 98, 99,~~

[100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119 and 120.](#)

- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~The effectiveness of the individual and collective supplemental measures is set forth in the Regional Transportation Plan – Air Quality Plan, TRPA, May 1992, Volume V, Environmental Analysis.~~ [At this time, TRPA forecasts that VMT will continue to increase in the Region, despite the proposed program of mass transit and other transportation control measures. However, implementation of the supplemental measures will reduce the increases in VMT.](#)

9. ADEQUACY OF COMPLIANCE MEASURES: To attain and maintain a threshold of a ten percent reduction in VMT from the 1981 value it will take many years, large capital investments, and major shifts in the way people travel to, and within, the Region. For additional discussion, see the Regional Transportation Plan – Air Quality Plan, TRPA, May 1992.

H. AQ-8: ATMOSPHERIC DEPOSITION

Atmospheric deposition is a phenomenon that affects both air quality and water quality. There is concern that algal nutrients found in the air settle on, or are absorbed in, Lake Tahoe directly, contributing to water quality problems in the lake. One of the primary nutrients of concern is nitrogen, most commonly found in the air in gaseous form (i.e., NO₂ and HNO₃), and particulate form (i.e., NH₃). The other nutrient of concern is phosphorous, which is also found in the air in particulate form. Data indicate that Lake Tahoe changed from being nitrogen-limited to phosphorous-limited in the late 1970's due to excessive inputs of nitrogen caused by the increased human population in the Basin. Thus, the atmospheric deposition of phosphorous compounds has become important for both water and air quality studies. While this threshold addresses nitrogen compounds, phosphorous studies are being initiated in the Lake Tahoe Basin.

Scientists are still studying the contribution of airborne nutrients to Lake Tahoe's water quality problems. They believe that atmospheric nitrogen is a large source of that particular algal nutrient. Gaseous emissions from local and out of basin sources appear to be the most important cause of atmospheric nitrogen in Lake Tahoe's nutrient budget. Particulate nitrate is less important. In general, gaseous emissions of nitrogen compounds from automobiles and other sources react with other substances in the atmosphere and on the ground. These reactions yield both gaseous nitric acid and particulate ammonium nitrate. The portion that is not scavenged from the air by reactions with other chemicals, vegetation, or other surfaces, including water bodies, changes to the particulate form in about 24 hours. Because these particles are so small (less than 2.5 microns (2.5 millionths of a meter) in diameter, they do not settle easily and do not deposit rapidly. The major source of nitrogen is nitric acid, which forms from chemical reactions in the atmosphere and is produced by sources both within and out of the basin.

1. Evaluation Criteria

TRPA thresholds for air quality include the following standard:

MANAGEMENT STANDARD: Reduce the transport of nitrate into the Basin and reduce oxides of nitrogen (NO_x) produced in the Basin consistent with the water quality thresholds.

Water Quality Threshold

NUMERICAL STANDARD: Reduce dissolved inorganic nitrogen loading to Lake Tahoe from all sources by 25 percent of the 1973-81 annual average.

MANAGEMENT STANDARD: Reduce dissolved inorganic nitrogen loads from surface runoff by approximately 50 percent, from groundwater approximately 30 percent, and from atmospheric sources approximately 20 percent of the 1973-81 annual average. This threshold relies on predicted reductions in pollutant loadings from out-of-Basin sources as part of the total pollutant loading reduction.

To attain the TRPA threshold standard for atmospheric deposition, TRPA adopted the following interim target for atmospheric nutrient loading in 1988:

- *INDICATOR: Annual average concentration of particulate NO₃ at the Lake Tahoe Boulevard air quality monitoring station (µg/m³).*
- *INTERIM TARGET (1991): Not greater than 1.27 µg/m³.*

2. Measurement and Monitoring

TRPA monitors nitrate-nitrogen concentrations using the particulate samplers at South Shore and Bliss State Park. The particulate samplers measure concentrations of the NO₃ ion every one out of six days.

CARB monitors nitrogen dioxide and nitrogen monoxide at the Sandy Way site. NDEP monitored nitrogen dioxide concentrations at the Stateline, NV air quality monitoring site through 1997. The Washoe County Health Department monitors NO₂ in Incline Village.

3. Results of Measurement and Monitoring Efforts

Based on sampling at TRPA's particulate samplers at Lake Tahoe Boulevard from 1996 to 1999, particulate nitrate concentrations ranged from a low of 0.03 to a high of 3.079 µg/m³. The annual average for this same time period was 0.356 µg/m³. At the Bliss site, particulate nitrate concentrations ranged from a low of 0.0 to a high of 2.318 µg/m³. The annual average for the same time period was 0.231 µg/m³. The region is attaining the interim target of not greater than 1.27 µg/m³, and may be meeting the threshold, although the exact 1981 values are not known.

The Stateline, NV station was relocated to Cave Rock in 1998. At the Stateline, NV station, the annual arithmetic mean nitrogen dioxide concentrations remained 0.01 ppm from 1990 until 1997, when data collection at that site ceased. In South Lake Tahoe, California, the four highest hourly nitrogen dioxide concentrations decreased 32 percent from 1982 to 2000 and decreased 21 percent from 1996 to 2000. Data includes measurements from 3377 Tahoe Boulevard during the years 1982-1992 and from Sandy Way during the years 1993-2000. Data from the monitoring site near the intersection of Park Avenue and Highway 50 (1975-1978) and data from the site at Dunlap Drive, SLT (near the South Tahoe "Y") [1979-1981] was used to find the annual arithmetic mean for nitrogen dioxide concentrations for the years 1975-1981. (No California data exists for 1973-1974.) The annual arithmetic mean nitrogen dioxide concentration for these years was 0.0126 ppm. The annual arithmetic mean for the years 1996-1999 (Sandy Way site) was 15 percent lower at 0.0108 ppm. Data for nitrate and nitrogen dioxide concentrations are given in Section VII (Tables 2-10 and 2-11).

4. Trends

Annual mean nitrate concentrations dropped by roughly 30 percent at both monitoring sites between the years 1989-1999. However, annual mean concentrations did not change much between 1996-1999.

Over the last 15 years, the annual arithmetic mean nitrogen dioxide concentrations have decreased by 15 percent. The top four highest hourly measurements have also continued to decrease.

5. Threshold Attainment Status

The interim performance target for atmospheric deposition is in attainment. However, it is not known whether dissolved inorganic nitrogen deposition from the atmosphere has been reduced by 20 percent of the 1973-1981 annual average.

The data indicate that nitrate concentrations at the Lake Tahoe Boulevard station may have been reduced by much more than 20 percent, although the exact 1973-1981 annual average is not known.

Using data gathered from 1975-2000 at various SLT sites, it appears that the annual arithmetic mean concentrations of nitrogen dioxide have decreased 15 percent. The threshold standards require a reduction in dissolved inorganic nitrogen loading to Lake Tahoe from all sources by 20 percent of the 1973-81 annual average. However, indicators specific to nitrogen dioxide have not been created. Therefore, attainment of the threshold relative to nitrogen dioxide can not be determined.

6. Effectiveness of Measures in Place

The compliance measures in place appear to have been effective at reducing concentrations of particulate NO_3 at the Lake Tahoe Boulevard air quality monitoring station, in accordance with the interim performance target and threshold. Effect of compliance measures on NO_2 is unknown.

Category: air quality**Parameter: atmospheric nutrient loading**

1. STANDARD: Reduction in direct DIN load on Lake Tahoe from atmospheric sources by approximately 20 percent of the 1973-1981 annual average.

2. INDICATOR (UNITS): Annual average concentration of particulate NO₃ at the Lake Tahoe Boulevard air quality monitoring station (µg/m³); ~~annual average concentration of nitrogen dioxide (NO₂) at Stateline, Nevada monitoring stations (parts per million (ppm)).~~

Interim Target (1991): Not greater than 1.27 µg/m³.

3. MONITORING SUMMARY: ~~The IMPROVE aerosol sampler is used to determine annual average concentrations of particulate nitrate (NO₃) at the Lake Tahoe Boulevard station. Data are analyzed bi-weekly and reported annually. NDEP monitors NO₂ at Stateline, Nevada. TRPA monitors nitrate-nitrogen concentrations using the particulate samplers at South Lake Tahoe and D. L. Bliss State Park (described above in the discussion of visibility and visual range). The particulate samplers measure concentrations of the NO₃ ion every one out of six days.~~

The California Air Resources Board monitors nitrogen dioxide and nitrogen monoxide at the Sandy Way, South Lake Tahoe site. The Nevada Division of Environmental Protection monitored nitrogen dioxide concentrations at the Stateline, NV air quality monitoring site through 1997.

4. ATTAINMENT STATUS: ~~Attainment. The Region appeared to be in attainment of the interim performance target, below, for atmospheric deposition, as of 1995. It is not known whether nitrate deposition from the atmosphere has been reduced by 20 percent of the 1973-1981 annual average. The data indicate that nitrate concentrations at the Lake Tahoe Boulevard station may have been reduced by much more than 20 percent, however, data are still being analyzed. The exact 1973-1981 annual average is not known. Annual average NO₂ concentrations at Stateline, Nevada have decreased by at least 20 percent since~~

~~1980.~~ Unknown. The Region is attaining the 1996 interim performance target for atmospheric deposition. However, it is not known whether dissolved inorganic nitrogen deposition from the atmosphere has been reduced by 20 percent of the 1973-1981 annual average. The data indicate that nitrate concentrations at the Lake Tahoe Boulevard station may have been reduced by much more than 20 percent, however, and the exact 1973-1981 annual average is not known. The region is attaining the interim target of not greater than 1.27 µg/m³, and may be meeting the threshold. Using data gathered from 1975-2000 at various South Lake Tahoe sites, it appears that the annual arithmetic mean concentrations of nitrogen dioxide have decreased 15 percent. The threshold standards require a reduction in dissolved inorganic nitrogen loading to Lake Tahoe from all sources by 20 percent of the 1973-81 annual average. However, indicators specific to nitrogen dioxide have not been created. Therefore, attainment of the threshold relative to nitrogen dioxide can not be determined.

5. TARGET DATE: Pursuant to Code subsection 32.3C, when TRPA lacks sufficient data to evaluate an indicator, it will establish a timetable. Since there are no methods to determine the baseline levels of dissolved inorganic nitrogen and therefore no way to determine attainment of this indicator, TRPA will use the data gathered in the research led by the California Air Resources Board to develop an applicable atmospheric deposition indicator which can be analyzed given current scientific methodology.
6. EVALUATION INTERVAL: Five years.
7. INTERIM TARGETS: ~~See Figure AQ-8a and AQ-8b, forecast and target lines for NO₃. Indicator shall not exceed the forecast line. The forecast and target lines for AQ-8b, NO₂, cannot be identified at this time. TRPA, in cooperation with state and local agencies, shall evaluate dissolved inorganic nitrogen levels (DIN) and develop atmospheric deposition indicators which scientifically defensible and measurable.~~

8. COMPLIANCE MEASURES: (See Section II for inventory)
- a. MEASURES IN PLACE: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 14, 15, 16, 17, 19, 22, 23, 24, 29, 31, 32, 33, .~~ 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 74, 75, 76, 77, 79, 81, 82, 85, 86, 89, 90, 91, 92, 93, 94 and 95.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The compliance measures in place appear to have been effective at reducing concentrations of particulate NO₃ at the Lake Tahoe Boulevard air quality monitoring station, in accordance with the interim performance target and threshold. ~~Compliance measures in place appear to have been effective at reducing concentrations of NO₂ at the Stateline, Nevada station.~~ Effect of compliance measures on NO₂ is unknown.
 - c. SUPPLEMENTAL MEASURES: AIR QUALITY - ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 29, 30, 31, 32, and 32, 33.~~ 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119 and 120.
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: TRPA should continue to monitor atmospheric deposition and study the role of atmospheric deposition in Lake Tahoe's water quality. TRPA is not currently recommending implementation of supplemental control measures to attain the atmospheric deposition threshold, since there are indications of threshold attainment, pending further study. Note that implementation of these supplemental measures is nevertheless recommended for attainment and maintenance of other thresholds and standards.
9. ADEQUACY OF COMPLIANCE MEASURES: Compliance measures in place appear to be adequate to attain and maintain the threshold.

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds

Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(62) Fixed Route Transit - South Shore: STAGE provides fixed route, scheduled, service within the City of South Lake Tahoe. Ridership in FY 99/00 was approximately 506,934 annual passengers. STAGE is operated by Area Transit Management under contract to the City of South Lake Tahoe.	Yes, but there are elements that need to be improved	1,2,3,4,5,7,8	Ridership on the STAGE system has consistently reached the 500,000 mark for the last decade. With increased route service and decreased headways, ridership could greatly increase. 2 new Compressed Natural Gas fleet vehicles were ordered in FY 01/02	Improve operating efficiencies, increase marketing efforts, expand service area, program capital expenditures, acquire additional funding, and implement provisions of the CTS agreement, pursuant to the RTP—AQP. Establish year-round connector service to the North Shore
(63) Fixed Route Transit - North Shore: TART provides fixed route, scheduled service from Tahoma to Incline Village with connections to Truckee, and seasonal extensions to Meeks Bay. Ridership in FY 99/00 was 245,269 annual passengers. TART is operated by Placer County.	Yes, but there are elements that need to be improved	1,2,3,4,7,8	Ridership on the TART system has consistently reached the 200,000 mark for the last few years. With increased route service and decreased headways, ridership could greatly increase. 3 new Compressed Natural Gas fleet vehicles were ordered in FY 00/01	Improve operating efficiencies, increase marketing efforts, expand service area and hours, program capital expenditures, acquire additional funding pursuant to the RTP—AQP. Establish year-round connector service to the South Shore
(64) Demand Responsive Transit - South Shore: Bus Plus, the STAGE connection, provides demand responsive service to areas of the City of South Lake Tahoe, El Dorado County and Douglas County, not served by fixed route transit. These services are provided under contract to ATM. Ridership in FY 99/00 was 49,490 passengers annually.	Yes, but there are elements that need to be improved	1,2,3,4,5,7,8	This program is highly successful and is usually running at capacity. TRPA/TMPO staff recently developed a "Lake Tahoe Basin Americans with Disabilities Act Paratransit Plan" to ensure that each public transit service is operating in full compliance with the Act. 2 new CNG fleet vehicles were ordered in FY 01/ 02.	Improve operating efficiencies, increase marketing efforts, expand service area, program capital expenditures, acquire additional funding, and implement provisions of the CTS agreement, pursuant to the RTP—AQP.
(65) Demand Responsive Transit - North Shore: Demand Responsive service in the North Shore Region is provided by the Tahoe/Truckee Taxi Company under a contract from Placer County. Ridership in FY 99/00 was 4,097 passengers annually.	Marginal	1,2,3,4,5,7,8	A new cab company was recently hired to provide this service, which increased operating efficiencies and lowered operating cost. With additional funding, staff would like to see Placer County operate their own Demand Responsive Service.	Improve operating efficiencies, increase marketing efforts, expand service area, program capital expenditures, acquire additional funding, and implement provisions pursuant to the RTP—AQP.
(66) Seasonal Trolley Services - North and South Shores: South Shore TMA and Truckee-North Tahoe TMA provide seasonal and special event trolley services to recreational and commercial destinations and provides connector service to North and South Shores. Ridership in FY 99/00 for the South Shore Trolley was 63,603 annual riders. Ridership in FY 99/00 for the North Shore Trolley was 15,630 annual riders. Service has been expanded to Incline Village.	Yes, but there are elements that need to be improved	1,2,3,4,5,7,8	This program is highly successful on both the North and South shores. Staff would like to see all vehicles converted to CNG and all new vehicles ordered be fueled by CNG. This will be done as vehicles are replaced.	Improve operating efficiencies, increase marketing efforts, program capital expenditures and acquire additional.

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds

Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(67) Social Service Transportation: Transportation services for the elderly and handicapped residing within the Region are provided by a variety of public and private agencies.	Marginal	1,2,4,5,7,8	It has been expressed by the senior population that there is a real need for out of Basin trips for shopping and medical appointments. TRPA staff is in the process of looking for additional funding sources to provide this service through the South Lake Tahoe Senior Center	Coordinate services with existing fixed route and demand responsive services, where possible. Establish service to provide out of Basin trips through public or private agency. Seek additional funding opportunities.
(68) Shuttle programs: Shuttle services is provided to guests and patrons of tourist accommodations and commercial establishments.	Marginal	1,2,3,4,5,7,8	Increase coordination between private operators.	Implement provisions of the CTS agreement
(69) Ski shuttle services: Ski shuttles transport skiers from lodging to ski areas. Almost all ski areas in and around the Region provide ski shuttles. The services are provided by public and private providers on a contract basis or with vehicles purchased by the ski areas.	Yes, but there are elements that need to be improved	1,3,4,5,7,8	The South Shore services provided by Heavenly and Sierra at Tahoe ski areas have been highly successful since their inception. An application was submitted in FY 01/ 02 for 5 new CNG fueled vehicles for the North Shore	Implement provisions of CTS agreement for South Shore. Expand services and increase coordination between North Shore Ski Areas. Increase marketing efforts for all services.
(70) Intercity bus services: Intercity bus services include charters, "gambler's specials," and airporters. A number of private carriers serve the Region with charter or scheduled service.	Yes, but there are elements that need to be improved	1,2,3,4,5,7,8	TRPA staff is currently working with the Truckee North Tahoe Transportation Management Association to secure funding for the North Tahoe/Reno Intercity transit service.	The Tahoe Casino Express operates provides trips to South Lake Tahoe from Reno Int'l Airport, and vice versa. This program is highly successful. A North Tahoe/Reno Intercity Transit Study was completed in 1997.
(71) Passenger Transit Facilities: The City of South Lake Tahoe constructed the South Y Transit Center on US 50. The facility provides restrooms, ticket services and a waiting area for passengers. The City, Placer County, and Washoe County also maintain several bus shelters and benches.	Marginal	1,2,3,4,5,7,8	The 64 Acre Tract Environmental Impact Statement was completed in 2000.	Continue to construct bus shelters and passenger facilities where feasible.
(72) Bikeways: Bikeways consist of separated rights-of-way, restricted rights-of-ways, and shared rights-of-way. Bikeways can serve transportation and recreation purposes. There are good local bicycle systems in the Region, but the Region-side system needs to be connected so that there is a continuous facility circling the Lake.	Yes, but there are elements that need to be improved	1,2,5,7,8	Planning for future facilities is ongoing. Increase coordination with local governments as well as federal and state agencies	Expand these facilities pursuant to provisions of the RTP/AQP

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds

Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(73) Pedestrian facilities: Pedestrian facilities (sidewalks, crosswalks, landscaping, etc.) are nonexistent or are in poor condition in many commercial and other high-pedestrian use areas. Examples include but are not limited to the South Shore casino core, U.S 50, Kings Beach, and South "Y".	Yes, but there are elements that need to be improved	1,2,5,7,8	Planning for future facilities is ongoing. Increase coordination with local governments as well as federal and state agencies	Expand these facilities pursuant to provisions of the RTP/AQP
(74) Wood heater controls: Wood heater controls require new wood heaters, or replacements of existing wood heaters, to meet certain limitations for wood smoke. The Wood Heater Retrofit program requires non-complying wood burning units to be removed or replaced upon the sale of a home. This program is described in Chapter 91 of the Code.	Marginal	3,4,6	All new heaters sold in the Basin comply with emission standards. While data indicates that there is a reduction in PM10 concentrations coupled with improved visibility, the lack of enforcement of this program makes it difficult to determine the actual contribution.	See (In recommendation section V): A, E
(75) Gas heater controls: Gas heater controls require new gas heaters, or replacements of existing gas heaters, to meet certain limitations for oxides of nitrogen. This program is described in Chapter 91 of the Code.	Marginal	2,3,4,8	All new gas heaters sold in the Basin comply with emission standards. Although levels of NOx have generally been decreasing, the relative contribution of this measure is difficult to quantify.	See (In recommendation section V): A, E
(76) Stationary source controls: Stationary source controls require new or modified stationary sources to meet certain limitations for a number of pollutants. This program is described in Chapter 91 of the Code.	Marginal	2,3,4,6,8	Air quality in the Basin has been improving over the last several years, including decreases in CO, NOx and PM10 concentrations. However, the relative contribution from this measure is unknown. The compounding effects of several control measures aimed at reducing pollutant concentrations have led to significant improvements in air quality.	See (In recommendation section V): A, E
(77) U.S. Postal Service Mail Delivery: The U.S. Postal Service provides a variety of mail delivery options. Most areas of the Region have postal boxes. Neighborhood delivery centers, cluster boxes and home mail delivery are available in South Lake Tahoe and El Dorado County on the South Shore, and home mail delivery and cluster boxes are available in Incline Village.	Yes	1,2,3,4,5,7,8	A U.S. Postal Service Master Plan was completed and adopted in 12/00.	
(78) Indirect source review/air quality mitigation: All projects that may impact traffic or air quality are required to mitigate their impacts to a less than significant level. This program is described in Chapter 93 of the Code.	Marginal	1,2,3,4,7,8	Mitigation fee has not been updated per schedule listed in Chapter 93.	Update Fee.

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds

Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(79) Idling Restrictions: Idling restrictions limit idling in a portion of the south shore for more than 30 minutes, with limited exceptions. This program is described in Chapter 91.	Yes	1		
(80) Vehicle Emission Limitations(State/Federal): The federal government and the State of California both have ongoing programs to reduce the emissions from new automobiles.	Yes	1,2,3,4,8		
(81) Open Burning Controls: Open burning controls limit the type of material that may be burned in the Region, and the circumstances which will allow open burning. This program is described in Chapters 72 and 91 of the Code.	Yes	3,4,6		
(82) BMP and Revegetation Practices: Best management practices and revegetation practices reduce erosion from project areas and, therefore, can reduce airborne dust.	Yes	3,4,8		
(83) Employer-based Trip Reduction Programs: Requirements for small and large employers to implement measures to reduce the number of vehicles traveling to and from employment sites, to achieve average ridership of 1.5 persons per vehicle. The program is described in Chapter 97.	Yes	1,2,3,4,5,7,8		
(84) Vehicle rental programs: Disincentives to motor vehicle rental within the Tahoe Region by charging fee to be used for mass transit programs. This program is described in Chapter 95.	Yes	1,2,4,5,7,8		
(85) Parking Standards: Parking standards have been implemented in areas with adopted Community Plans. Where no Community Plan exist, studies will be conducted to best manage the area.	Yes	1,4,7		
(86) Parking Management Areas: Define Parking management areas to allow for focused parking management techniques. Examples are Emerald Bay and SR 28 East Shore where uncontrolled parking has resulted in environmental degradation.	Yes	1,4,7		
(87) Parking Fees: Pursuant to the provisions of the CTS agreement, parking fees will not be implemented in the south shore casino properties, provided the casino properties participate in the CTS.	Yes	1,2,3,4,7,8		

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds				
Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(88) Parking Facilities: Planning of the 64 Acre transit facility in Tahoe City has begun and new parking facilities were constructed in Tahoe City as part of the Urban Improvements Project. Diagonal parking on SR 28 is being replaced with parallel parking.	Yes	1,4		
(89) Traffic Management Program - Tahoe City: The TNT/TMA coordinates with various entities for a traffic management program during the winter season.	Yes	1,2,3,4,8		
(90) US 50 Traffic Signal Synchronization - South Shore: The traffic signals on US 50 between Kingsbury Grade and the South Y are coordinated by computers to optimize travel time for vehicles.	Yes	1		
(91) General Aviation: The Lake Tahoe Airport provides facilities and services for general aviation operations. In 1999 there were 79 based aircraft. The number of actual based aircraft cannot exceed 115 as stated in the 1992 Lake Tahoe Airport Master Plan. In 1999 there were 26,284 general aviation operations. In 2000, a Interregional California Aviation System Plan Systems Requirements was completed.	Marginal	1,2,3,4,5,7,8	The Lake Tahoe Airport would be more effective in the reduction of vehicle miles traveled with commercial airline service	Establish commercial airline service to the Lake Tahoe Airport
(92) Waterborne excursions: Waterborne excursions are one to four hour boat trips, usually to Emerald Bay. There are four vessels with a capacity of greater than 100 passengers, and a number of smaller vessels. All are privately operated.	Yes	1,2,3,4,5,7,8	Waterborne excursion services are highly successful	
(93) Waterborne transit service: Currently, limited transit services operate on Lake Tahoe. The primary service is a ski shuttle service provided by the Tahoe Queen from south shore to Tahoe City several days per week, during the winter months.	Marginal	1,2,3,4,7,8	Hornblower Cruises is in the development of a high speed ferry service to expand service to the North and South Shores	Implement North and South Shore ferry and market service
(94) Alternate Fueled Vehicle - Public/Private Fleets and Infrastructure Improvements: Fleet Replacement: Encourage replacement of transit, public, private, utility and rental fleets. Implement infrastructure improvements to accommodate alternative fuels and for bus, public vehicle fleets, and rental car fleets to include alternative fueled vehicles.	Yes	1,2,3,8	A temporary Compressed Natural Gas fueling station was constructed on the South Shore. At this time, a Request for Proposal has been issued for the construction of a permanent South Shore facility	
(95) Tahoe Area Regional Transit Maintenance Facility: TART maintenance facility was constructed on the North Shore in 1998 to ensure dependable service and to maintain existing and expanded fleet.	Yes	1,2,3,4,5,7,8		

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds				
Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(96) Heavenly Ski Resort Gondola: Heavenly Ski Resort Gondola was constructed in 12/00 in the Park Avenue Redevelopment Area to Heavenly Ski Resort.	Yes	1,2,3,4,5,7,8		
(97) Enhance air quality studies and monitoring to support the Lake Tahoe airshed model and future air quality projects.	Marginal	1,2,3,6,8	The full extent of air quality monitoring suggested in the Lake Tahoe Air Quality Scoping Document has not been possible due to limited resources within the cooperating agencies. However, monitoring activities are currently scheduled to include a broader sampling program for atmospheric constituents and establishment of a new monitoring site on the north-west portion of the lake.	See (In recommendation section V): A, E, F
(Supplemental Measure 98) Demand Responsive Transit - North Shore: Implement demand responsive transit service on the North Shore, similar to the CTS concept on the South Shore.	Not In Place			
(Supplemental Measure 99) Coordinated Transit System - South Shore: Implement centralized dispatch, automated vehicle location, and traveler information systems technologies for public and private transit fleets on the South Shore.	Not In Place			
(Supplemental Measure 100) Transit Passenger Facilities: Construct bus shelters Regionwide. Construct transit center as part of Park Avenue redevelopment and Heavenly Ski Resort Gondola implementation. Evaluate Kingsbury Grade transit center. Construct 64 Acre transit center in Tahoe City	Not In Place			
(Supplemental Measure 101) South Shore Transit Maintenance Facility - South Shore: Construct STAGE transit maintenance facility to service existing and expanding fleet.	Not In Place			
(Supplemental Measure 102) Transit Service - Fallen Leaf Lake: Evaluate fixed route or demand responsive transit services, in conjunction with parking management, for Fallen Leaf Lake area.	Not In Place			
(Supplemental Measure 103) Transit Institutional Improvements: Implement changes to the institutional & organizational setting for transit operations and administration in order to reduce costs and improve efficiencies.	Not In Place			
(Supplemental Measure 104) Transit Capital and Operations Funding Acquisition: Acquire additional local, state, federal and private sources of funds for transit operations and capital improvements	Not In Place			

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds

Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(Supplemental Measure 105) Transit/Fixed Guideway Easements - South Shore: Acquire easements along US 50 between Stateline and the South Y intersection that will be used for a dedicated Right-of-Way for rubber-tired or fixed-guideway transit services	Not In Place			
(Supplemental Measure 106) Visitor Capture Program: Planning and Implementation of a shuttling system for visitors to the Region, including basin entry fees, parking program development and other services needed to intercept visitors and transfer them to public transportation upon arrival to the Tahoe Region	Not In Place			
(Supplemental Measure 107) Pedestrian and Bicycle Facilities--South Shore: Including, but not limited to: Park Avenue redevelopment area; Ski Run redevelopment area; U.S.50 - Stateline to Kahle Drive; U.S.50 - Stateline to South Y; Al Tahoe Boulevard; Johnson Boulevard; Lyons Avenue; lower Kingsbury Grade; Bijou Park Bike Trail; Pioneer Trail - Ski run Boulevard to U.S.50; Rufus Allen/Tree Haven Bike Trail; Lake Tahoe Bikeway 2000; and projects pursuant to the Bicycle Master Plan for the Lake Tahoe Region.	Not In Place			
(Supplemental Measure 108) Pedestrian and Bicycle Facilities--North Shore: Including, but not limited to: Tahoe City urban area; Tahoe City Lakeside Bike Trail; Kings Beach area; Incline Village; North Stateline area; Dollar Hill to North Regional Park Bike Trail; Tahoe Vista; Lake Tahoe Bikeway 2000; and other projects pursuant to the Bicycle Master Plan for the Lake Tahoe Region.	Not In Place			
(Supplemental Measure 109) Parking Inventories and Studies Standards: Conduct parking inventories and studies to provide parking demand and supply information for the Lake Tahoe Region. Establish parking design standards for commercial and public service uses for minimum and maximum number of parking spaces.	Not In Place			
(Supplemental Measure 110) Parking Management Areas: Define areas for implementation of parking management. These areas shall include, but not be limited to: SR 28-East Shore; Emerald Bay; Fallen Leaf Lake; Lake Tahoe Bikeway 2000 enhancement; Meyers; South Shore transit enhancement; Tahoe City; Tahoe Vista; Carnelian Bay	Not In Place			
(Supplemental Measure 111) Parking Fees: Establish parking fees for areas identified for implementation of a parking management program. Fees shall be collected on site or through a sticker program or other suitable means	Not In Place			
(Supplemental Measure 112) Establishment of Parking Task Force: Administration and Enforcement: Establish a parking task force to address policy and management issues. appropriate entity with responsibility for implementation, administration and enforcement of parking management.	Not In Place			

Table 2-2. Effectiveness of Measures in Place for Air Quality Thresholds

Compliance Measure	Effectiveness	AQ Indicators	Explanation	Recommendation
(Supplemental Measure 113) Construct parking facilities for parking management areas that do not have appropriate size or location.	Not In Place			
(Supplemental Measure 114) Intersection improvements--South Shore: Including, but not limited to: US 50 at South Tahoe Wye; US 50 at Tahoe Keys Boulevard; US 50 at Ski Run Boulevard; US 50 at Kingsbury; US 50 at Elk Point Road; US 50 at Al Tahoe Boulevard; US 50 at Johnson Boulevard; Ski Run Boulevard at Tamarack Avenue	Not In Place			
(Supplemental Measure 115) Intersection improvements--North Shore: Including, but not limited to: SR 28 at SR 89; SR 28 at Bear Street; SR 28 at Coon St; SR 28 at National Ave; SR 28 at SR 267	Not In Place			
(Supplemental Measure 116) Intersection improvements--North Shore: Including, but not limited to: SR 28 at SR 89; SR 28 at Bear Street; SR 28 at Coon St; SR 28 at National Ave; SR 28 at SR 267	Not In Place			
(Supplemental Measure 117) Roadway Improvements - North Shore: National Avenue; SR 28 - Kings Beach; SR 28 - Carnelian Bay; SR 28 - Tahoe Vista; SR 28 - Stateline.	Not In Place			
(Supplemental Measure 118) Loop Road - South Shore: Examine feasibility of constructing either Loop Road project or modification to Loop Road project. Establish Technical Advisory Committee to evaluate direction to proceed on this project	Not In Place			
(Supplemental Measure 119) Montreal Road Extension: Construct roadway from south Loop Road to Needle Peak/Pioneer Trail	Not In Place			
(Supplemental Measure 120) Kingsbury Connector: Construct roadway from Kingsbury to South Loop Road	Not In Place			
(Supplemental Measure 121) Commercial Air Service: Negotiate with commercial airlines for implementation of Part 132 commercial air service and, if service is expected, maintain commercial air service certifications consistent with Airport Master Plan	Not In Place			
(Supplemental Measure 122) Commercial Air Service: Maintain commercial air service that does not require Part 132 certifications should Part 132 commercial service not be provided.	Not In Place			
(Supplemental Measure 123) Expansion of waterborne excursion service: Expansion of waterborne excursion services must be consistent w/Regional Transportation Plan-Air Quality Plan, as amended.	Not In Place			
(Supplemental Measure 124) Re-instate the oxygenated fuel program with alternative oxygenates determined to not have deleterious effects on other thresholds.	Not In Place			
(Supplemental Measure 125) Management Programs: Enhance air quality and monitoring studies as recommended by the Science Advisory Group (SAG) aimed at implementation of the EIP.	Not In Place			
(Supplemental Measure 126) Around the Lake Transit; implement transit system which circumnavigates the Lake and/or connects the North and South Shores.	Not In Place			

IV. STATUS OF 1996 RECOMMENDATIONS

Below is a list of recommendations made in the 1996 Threshold Evaluation. Following, in italics, is a summary of the status of that recommendation.

AQ-1: Carbon Monoxide

1. To attain and maintain CO thresholds and federal and state standards, TRPA should implement the Regional Transportation Plan - Air Quality Plan, including the plan to complete the Loop Road System. *The RTP/AQP is certainly in effect but the Loop Road System had been eliminated due to high costs and because the TRPA CO standard has been met.*
2. Because there is only one year's worth of data to support attainment of the stricter 6.0 ppm standard, TRPA should continue to implement control measures aimed at reducing CO concentrations. *Continuous monitoring has provided many years worth of data to show that the standard has been met.*

AQ-2: Ozone

1. To attain and maintain the threshold, TRPA should implement the control measures of the Regional Transportation Plan - Air Quality Plan, recognizing that there are strong indications that transport from upwind areas may be a significant contributor to ozone concentrations in the region. *The RTP/AQP is ongoing but ozone is not a "motivating" factor, as the plan implementation will not really affect ozone levels or detectability.*
2. TRPA should support additional research into both the mechanisms that contribute to ozone concentrations in the Tahoe Region, and the environmental effects of ozone within the region, particularly on vegetation. Further analysis should also be conducted to determine how much of the local ozone concentrations is generated in the Tahoe Region, and how much is generated elsewhere and transported into the Tahoe Region. *In July 2000 the Lake Tahoe Air Quality Research Scoping Document discussed airborne transport and proposed research into several constituents, including ozone. This will be addressed in the research and monitoring network being coordinated with local, state and federal agencies (see 2001 Recommendation A).*

AQ-3: Particulate Matter (PM₁₀)

1. TRPA should revise wood heater retrofit program to allow for better enforcement of regulations, and consider options to delegate to local governments or develop an education and incentive program. *No action has been taken beyond meetings with realtors to discuss potential methods of improving the ordinance. TRPA is looking at better ways to measure the contribution of wood smoke to air constituents.*
2. TRPA should emphasize controls on wood smoke and soil particles, which are controllable sources of particulate matter. Control of soil particles can be achieved by both reducing the amount of exposed soil and by reducing vehicle miles of travel, since vehicles traveling on the highway system are one cause of airborne dust. *The Air Quality program has not pursued the*

controls on soil particles. This has been left to the water quality program to combine with erosion control and revegetation projects. The RTP/AQP projects should reduce VMT.

3. TRPA should consider adding an additional element to the particulate sampling program to determine what levels of sand and salt attributable to local road maintenance exist in local particulate samples. *Currently this is not being done, however it is being pursued as part of the research planned for the Basin (see 2001 Recommendation A).*

AQ-4: Visibility

1. TRPA should continue to monitor visibility and suspended fine particulate at its two stations. The threshold visibility standards were developed using contrast measurements from photometric data, and the current monitoring program measures visibility using optical and particulate data. The numerical visibility standards should be revised so that the standards better correspond with the current monitoring methods. *In 1998 a study was conducted by Air Resource Specialists to compare current monitoring methods to the methods used during the creation of the threshold value. It was found that values in 1989-92 correspond well to values in 1981 when the threshold was established. New standards were adopted by TRPA in 2000.*
2. Because visibility ranges vary so much from season to season, TRPA should consider having seasonal visibility standards. Research should be conducted to determine if it would be appropriate to have seasonal standards and what the standards should be. *The creation of seasonal standards is not likely at this time. However, this may be considered for the 2005 threshold changes. This project is also addressed in TRPA's Environmental Improvement Program.*
3. TRPA should develop monitoring procedures for agencies involved in prescribed burns. By establishing monitoring programs for prescribed burns, the impacts from individual projects can better be evaluated. *This has not begun. Prescribed burning has been very limited recently. TRPA is working to coordinate with other local agencies to address smoke management in the Basin.*
4. TRPA should expand and enhance wood heater controls, review the open burning provisions of the Regional Plan, review and revise controls on off-highway vehicles, and achieve better dust control through both Best Management Practices and programs to control vehicle miles traveled (VMT). *Efforts are ongoing.*

AQ-5: Traffic Volume

1. Because carbon monoxide levels have been reduced so significantly, TRPA should reevaluate the necessity of this threshold. The standard was set at a level that should bring the area into attainment of the CO threshold. Due to reasons other than this management standard, the CO levels have come down and are in compliance. TRPA should determine whether this management standard is still necessary if the numerical standard for which it was created is being met. If it is determined that it is no longer necessary, the reduction of U.S. 50 traffic volumes should be withdrawn as a management

standard for the CO threshold. *Eligible for removal as a surrogate/symbiotic CO threshold. This is not an extremely high priority to change before 2005.*

2. To attain and maintain this threshold standard, TRPA should implement the provisions of the Regional Transportation Plan - Air Quality Plan, specifically the improvements to the Loop Road system. *The RTP/AQP is certainly on effect but the Loop Road System had been eliminated due to RTS high costs and because the TRPA CO standard has been met.*

AQ-6: Wood Smoke

1. TRPA should revise wood heater retrofit program to allow for better enforcement of regulations, and consider options to delegate to local governments or develop an education and incentive program. *TRPA is looking at better ways to measure the contribution of wood smoke to atmospheric constituents, which will in turn be used to update the retrofit program.*
2. TRPA should evaluate the possibility of having a wood smoke standard that would allow for wood smoke levels attributable to wild fires or prescribed burns. *Nothing has been done on this recommendation due to a lack of resources and staff.*

AQ-7: Vehicle Miles Traveled (VMT)

1. TRPA should evaluate the VMT standard and its effectiveness as a threshold for air quality. Other measurements should be evaluated to determine if there is a better standard than the reduction of VMT. Included in these evaluations should be VMT's significance in visibility and NO_x problems, and what portion of pollutants in these areas is attributable to VMT. *The VMT threshold has not been fully evaluated as an air quality threshold. Discussions regarding its appropriateness have been ongoing, but no official evaluation has taken place to develop a more suitable threshold. It is recommended that the threshold be fully evaluated and a recommendation be made regarding any proposed amendments by 2004.*
2. TRPA should continue to do everything within its power to reduce reliance in the region on the private automobile (as mandated in the Tahoe Regional Planning Compact), and to attain and maintain the VMT threshold in the future, including implementation of EIP Projects. *TRPA continues to pursue implementation of alternative transportation modes through its efforts to improve the public transit systems, and bicycle and pedestrian facilities. Facilitation of EIP project implementation is ongoing.*
3. TRPA should also study whether there are additional indicators of transportation system performance that could be adopted as thresholds. *As stated above in #1, alternatives to the VMT threshold will be proposed at such time that the VMT threshold itself is evaluated. Recommendations for additional indicators of the transportation system performance should be developed prior to 2004.*
4. In order to effectively monitor region-wide VMT, TRPA should maintain its traffic modeling capabilities on an on-going basis. *TRPA has maintained its Tranplan traffic model. However, the model has not been updated with new input (socio-economic) data since the 1995 update. TRPA is proposing to*

evaluate Tranplan as its traffic model. If it is recommended to keep TranPlan, the model will be updated with new socio-economic data. If a new model is recommended, it will have to be fully developed with new data.

5. The ongoing update of the Regional Transportation Plan - Air Quality Plan (RTP-AQP) is the recommended vehicle for describing the programs needed to control VMT. There is no single answer to controlling and eventually reducing VMT. TRPA should adopt ordinances to increase controls on parking, expand employer programs, and create disincentives for rental cars; conduct a study of inter-city bus service; expand the STAGE and TART transit systems; expand bicycle and pedestrian facilities; emphasize additional home mail delivery; update traffic mitigation requirements; and implement the other provisions of the RTP-AQP. *TRPA has not updated the TRPA RTP-AQP since the 1992 Plan. However, since receiving MPO designation, there are numerous other transportation planning documentation requirements. A new Regional Transportation Plan, and a Federal Transportation Plan have been created to meet state and federal planning requirements, respectively. TRPA is proposing to fully update the TRPA RTP-AQP by 2004 so that there is ample time to incorporate the recommendations into the 2007 Regional Plan.*

AQ-8: Atmospheric Nutrient Loading

1. TRPA should conduct a study to determine what the NO_x levels were between 1973 and 1981. *Since this threshold will very likely be changed as new research regarding phosphorous (the limiting nutrient) and nitrogen species is being performed in the Basin, TRPA has determined this study is not feasible at this time.*
2. TRPA should continue to monitor atmospheric deposition and study the role of atmospheric deposition in Lake Tahoe's water quality. *This is being addressed in the airshed model document and an expanded air quality network is currently being designed in cooperation with several other Basin agencies.*
3. TRPA should add annual average nitrogen dioxide concentrations as an indicator of threshold attainment. *Changes will be postponed until 2004 when TRPA evaluates new research.*

V. 2001 RECOMMENDATIONS

The following recommendations are made to complement the existing compliance measures and supplementary measures recommended to be in place. Recommendations may not be given for all thresholds if they are in attainment and trends indicate that levels will remain in attainment.

[See Appendix B for the revised 2001 Recommendation List.](#)

~~A. Develop and implement an integrated air quality research and monitoring network for 2004 Threshold Update~~

~~Responsible Entity: California Air Resources Board (CARB); TRPA; Lahontan Water Quality Control Board; U.S. Forest Service; U.S. EPA~~

~~Funding/Cost: \$1,600,000; TRPA Staff Time: 1700 Hours~~

~~Completion Date: Data Collection 4/2002-4/2003~~

~~Deposition and Source Estimates 12/2004~~

~~Airshed Model 2005~~

~~Threshold Indicator: AQ 2, AQ 3, AQ 4, AQ 6, AQ 7, AQ 8, New indicator(s) likely~~

~~**Recommendation:** Develop and implement the monitoring and research program discussion below (after products).~~

~~**Products:** Products include a quality assured database of observed concentrations of P, PM, and N and the other gaseous PM and gaseous species of interest, estimates of the mass and forms of nitrogen and phosphorous deposition to the lake surface, estimates of the local vs. regional contributions of N, a completed and quality assured data set for in-Basin meteorological observations, source identification and a working model which can provide improved estimates of total N deposition to the Lake and the ability to model the effects on concentrations and deposition that would result from hypothetical changes in emissions either in Basin or upwind.~~

The Integrated Air Quality Research and Monitoring Network

~~The TRPA, California Air Resources Board (CARB), Lahontan Water Quality Control Board, U.S. Forest Service and the U.S. Environmental Protection Agency are working together to develop an integrated air quality monitoring network in the Lake Tahoe Air Basin. The proposed research will address the concentrations, sources, airborne movement and impacts of the following to both human and lake health: ozone, wood smoke, nitrogen (N), phosphorous (P) and particulate matter (PM). Currently, the CARB has drafted a proposal based on research plans and objectives developed by the various Lake Tahoe agencies. This research plan proposes to apply a hybrid approach to studying air quality and atmospheric deposition in the Tahoe basin. This will include direct measurement of important pollutant species, meteorological conditions and source-specific emissions, development of a mechanistic model to extrapolate those measurements into basin-wide deposition calculations, construction of a basin-specific emission inventory, and detailed source apportionment.~~

~~The research program will answer the following questions as they relate to TRPA's air quality thresholds and EIP projects:~~

~~**OZONE (AQ 2):** The average ozone concentrations have been steadily increasing in the Tahoe Basin. Because ozone is a secondary pollutant (formed in the atmosphere from other "primary" pollutants), peak concentrations may be found miles downwind of~~

~~sources of the precursor emissions. Transport of ozone into the Tahoe Region by wind is a significant factor in determining ambient concentrations of ozone. The increase in ozone is in part due to the transport of ozone precursors emitted in Sacramento and San Francisco areas and the rapidly developing foothill communities east of Sacramento and Stockton (Allison et. al. 2000).~~

~~*Sources and Impacts of Ozone (EIP Project Numbers: 10116, 10103)*~~

- ~~• What are the local sources of ozone its precursors?~~
- ~~• How much ozone is transported into the Basin?~~
- ~~• What levels of ozone cause damage to vegetation in the Tahoe Basin?~~

~~PARTICULATE MATTER (AQ-3): PM standards were originally promulgated to protect human health and ensure the aesthetics of the Basin are maintained. Although PM₁₀ standards are currently in attainment, new information suggests that PM plays a significant role in the decline in lake clarity. For this reason, staff is proposing that additional research on PM concentrations and their associated effect on water quality be done. Research needs include studying the atmospheric sources and deposition rates of PM₁₀ and PM_{2.5}. Suspected sources include residential wood smoke, road sand and salt, roadway dust re-entrainment, prescribed burns and wildfires and out-of-Basin transport (primarily PM_{2.5}).~~

~~*Wood Smoke Emissions (EIP Project Number: 804)*~~

- ~~• What is the relative contribution of wood smoke emissions to atmospheric N, P, PM₁₀ and PM_{2.5} concentrations?~~
- ~~• How does this impact visibility and lake clarity?~~

~~*Road Salt and Dust re-entrainment (EIP Project Number: 805)*~~

- ~~• What is the relative contribution of road sand and salt to atmospheric N, P, PM₁₀ and PM_{2.5} concentrations?~~
- ~~• How does this impact lake clarity?~~

~~*Prescribed Burns and Wildfires (EIP Project Numbers: 802, 805)*~~

- ~~• What is the relative contribution of wood smoke from prescribed burns and wildfires to atmospheric N, P, PM₁₀ and PM_{2.5} concentrations?~~
- ~~• How does this impact human health, visibility and lake clarity?~~

VISIBILITY (AQ-4)

~~*In-Basin vs. Out-of-Basin Sources:*~~

- ~~• What are the in-Basin sources of visibility reducing constituents?~~
- ~~• How does out-of-Basin transport affect visibility?~~

~~WOOD SMOKE (AQ-6): See Particulate Matter (above).~~

VEHICLE MILES TRAVELED (AQ-7)

~~*VMT relationship to atmospheric nutrient and particulate concentrations:*~~

- ~~• How does VMT affect atmospheric deposition of nutrients and particulates into Lake Tahoe?~~

ATMOSPHERIC NUTRIENT LOADING (AQ-8)

Lake Clarity (EIP Project Numbers: 805, 10104)

- ~~• What are the concentrations, sources and impacts of atmospheric phosphorous on lake clarity?~~
- ~~• What are the concentrations, sources and impacts of atmospheric nitrogen on lake clarity?~~
- ~~• What are the concentrations, sources and impacts of atmospheric particulate matter on lake clarity?~~

B. Seasonal visibility standards

Responsible Entity: ~~TRPA/CARB~~
Funding/Cost: ~~TRPA Staff Time: 170 Hours~~
Completion Date: ~~December 2004~~
Threshold Indicator: ~~AQ-3, AQ-4, AQ-6~~

Recommendation: ~~Evaluate the need for seasonal visibility standards. The increased monitoring efforts included in Recommendation A will provide the data necessary for the Visibility Technical Advisory Group (TAC) to evaluate seasonal visibility standards.~~

Product: ~~Report on seasonal visibility trends including any recommendations for seasonal standards.~~

C. Evaluate the necessity for a management standard for traffic volume

~~The traffic reduction management standard was developed specifically to assist the Tahoe Region in attaining our carbon monoxide (CO) standards. The monitoring site for this indicator was located at the Casino Core on Highway 50. This was the site of a historical CO "hot spot" for the basin. Because the monitoring equipment was removed in 1997, staff is unable to verify attainment of this indicator at this time. However, the data collected during the sites last year of operation (1997) indicated attainment and the Basin has been in attainment with the CO standards for the last five years, it appears that the attainment of this threshold is not necessary to attain the CO standards.~~

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~TRPA Staff Time: 85 Hours~~
Completion Date: ~~December 2004~~
Threshold Indicator: ~~AQ-5~~

Recommendation: ~~As stated above, the numerical standards for which this management standard was created have been met for over five years. Although data suggests that this threshold is being attained, the level to which the CO concentrations have come down would indicate that attainment of the numerical standard has not necessarily resulted primarily from the reduction of traffic volumes on Highway 50 during the hours specified in the threshold indicator. For these reasons, it is recommended that this threshold be evaluated for its necessity in attaining and maintaining the carbon monoxide standards.~~

Product: ~~Update of this threshold in the 2007 Regional Plan.~~

D. Reinstitution of traffic volume monitoring

Responsible Entity: ~~TRPA/Caltrans/NDOT~~
Funding/Cost: ~~TRPA Staff Time: 100 Hours~~
Completion Date: ~~June 2002~~

Threshold Indicator: ~~AQ 5, AQ 7~~

~~**Recommendation:** This threshold indicator relies on detailed traffic volumes being collected on a regular basis. If the threshold remains intact, the TRPA should work with Caltrans to reinstate the permanent count station at the Park Avenue intersection. Even if the determination is made that this particular threshold is no longer necessary, there remains a need to develop a network of permanent count stations in the urbanized areas of the South Shore and throughout the Tahoe Region. Regardless of the outcome of the current threshold, additional permanent count stations should be installed in the Tahoe Basin in order to monitor the impacts of vehicle traffic. Staff will continue to work with Caltrans and the Nevada Department of Transportation (NDOT) on monitoring traffic activity in and around the Basin.~~

~~**Products:** Traffic counter reinstalled at the intersection of Park Avenue and Highway 50 in South Lake Tahoe, CA, as well as a network of continuous count stations that will provide TRPA with data to analyze traffic growth. Work with Caltrans and NDOT on the installation of additional count stations to assist TRPA in their environmental improvement programs.~~

~~**E. Update enforcement of the wood heater retrofit program**~~

~~Responsible Entity: TRPA
Funding/Cost: TRPA Staff Time: 170 Hours
Completion Date: December 2004
Threshold Indicator: AQ 3, AQ 4, AQ 6~~

~~**Recommendation:** TRPA's wood heater retrofit program requires all wood heaters used in the basin meet emissions requirements for particulate matter (with the exclusion of open-burning fireplaces which are not the primary heat source) upon sale of the home. This program currently lacks enforcement. TRPA needs to update the current regulations to include verification and enforcement language. This will require coordination with the various stakeholders in the Basin.~~

~~**Product:** An amendment to TRPA's wood stove ordinance that provides verification and enforcement protocol for this program.~~

~~**F. Evaluation of VMT as an air quality threshold**~~

~~The indicator to reduce vehicle miles traveled (VMT) in the Basin is a management standard related to numerical standards for both visibility and nitrate deposition. At the time that the thresholds were developed, it was determined that a reduction in VMT would help achieve and maintain the visibility and nitrate deposition thresholds. In order to estimate VMT, a traffic model for the Basin is necessary. Developing such a model is very time and resource intensive for the Agency. The types of models that TRPA has used in the past provide VMT estimates, but have not provided very much else, and are not accurate for use in determining impacts from specific projects.~~

~~Responsible Entity: TRPA
Funding/Cost: \$40,000; TRPA Staff Time: 2500 Hours
Completion Date: December 2004
Threshold Indicator: AQ 7~~

~~**Recommendation:** It is recommended that TRPA evaluate the threshold itself, and determine its effectiveness in improving visibility or nutrient loading to the lake. This will include analysis of the effects of VMT on air and water quality, which will be addressed in Recommendation A, and an updated traffic model (which is very time intensive).~~

~~**Product:** Threshold standard that addresses the effects of VMT on other environmental thresholds and provides for the reduction of those effects.~~

~~**G. Research the environmental and social impacts of snowmobile use in the Basin**~~

~~Currently, research on snowmobile impacts outside of the Basin has indicated that current levels of use in the Basin may result in significant human health, environmental health and social impacts (Bluewater Network 1999a; Bluewater Network 1999b; Ingersoll 1998).~~

~~Responsible Entity: TRPA/US Forest Service~~

~~Funding/Cost: \$250,000; TRPA Staff Time 250 Hours~~

~~Completion Date: Research: December 2003~~

~~Integration with revised thresholds: December 2004~~

~~Threshold Indicator: AQ-7~~

~~(New/Revised thresholds possible in 2004 update)~~

~~**Recommendation:** TRPA shall work with the Forest Service, local snowmobile operators and private snowmobile users to implement a research program designed to evaluate the air quality, water quality, wildlife, noise and recreational impacts of snowmobile use. Research shall include updated measurements of snowmobile VMT in the Basin.~~

~~**Product:** TRPA shall report on the findings from the above research and recommend any relevant updates/revisions to thresholds for the 2007 Regional Plan.~~

VI. EIP INTEGRATION

COMPLETED EIP PROJECTS AND CONTRIBUTION TO THRESHOLDS

TRPA records indicate two air quality/transportation projects have been completed to date costing a total of: \$ 17,705,389. They are:

- Tahoe City Urban Improvement Project (AQ/T #796). This project provided improved traffic flow through the area and enhanced pedestrian and bicycle opportunities. Water quality also benefited from this project.
- Tahoe Meadows Linear Park (AQ/T #507). The City of Lake Tahoe (CLST) redevelopment created a linear park along Tahoe Meadows frontage that included an 8-foot wide multiple use trail, landscaping, and a new fence on Tahoe Meadows. CLST constructed 2,200 linear feet of new class 1 bicycle trail to connect Ski Run public beach with Tahoe Meadows linear park trail. The project also includes wetlands restoration and interpretive displays.

These projects contribute to the carbon monoxide and VMT threshold by enhancing pedestrian and bicycle opportunities contributing to a decreased automobile dependence in the Basin.

MOST CRITICAL EIP PROJECTS

The Air Quality/Transportation EIP contains 103 projects. Most of these projects are geared towards reducing VMT and enhancing pedestrian and bicycle facilities, thus contributing to carbon monoxide reductions. Many other projects include determining 1981 levels of atmospheric constituents to match the threshold standards along with increased research into atmospheric deposition. Since the carbon monoxide threshold has been in attainment for over 5 years, projects related to this threshold are less important for CO emission reductions than they are for VMT and traffic reduction.

There are several EIP projects that are critical to the attainment of current thresholds and establishment of new thresholds. It is important to note that the funds assigned to specific agencies are only preliminary estimates, and therefore are not yet available and changes may be made. Below is a list of projects and their threshold unit of benefit:

Carbon Monoxide

EIP Project Numbers: 736, 738, 748-753, 756, 758, 760-767, 769-771, 773, 775, 777-779, 781-782, 784, 786-788, 791, 795, 797, 799-800, 806, 809, 812, 814-816, 819, 820, 822-826, 828, 83-836, 838-839, 841, 845-848, 854-857, 10018-10021, 10023-10028, 10030-10042, 10105, and 10153. Due to the extensive number of projects, the reader is referred to the TRPA EIP document for details. Most of the projects that reduce CO emissions involve transportation improvements addressing improvements to traffic flow, and increases in pedestrian and bicycle facilities and alternative transportation.

Ozone

EIP Project Number: 10116 This project creates a study to determine what role transport plays in the ozone levels within the basin. The estimated cost is \$50,000 and funding will need to be provided by TRPA. Currently, no funding is available to pursue this study, however this research is included in Recommendation A.

Particulate Matter

EIP Project Number: 802 Tahoe's unique geographical and localized meteorological features make prescribed burns a major emission event for the region. Prescribed burns may easily impact population centers. Impacts to lake clarity are also suspected. This program involves developing multidisciplinary team monitoring procedures for prescribed burn activities that attempt to balance and guide burners so that those impacts do not exceed determined levels. The estimated cost is \$50,000 with funding provided by TRPA. However, no funding is currently available. Other threshold units of benefit from this project include Vegetation 1-A, AQ-4 (Visibility) and AQ-6 (Wood smoke).

EIP Project Number: 10145 This project quantifies nitrogen deposition, PM2.5/10 and wet deposition to the Lake which is essential to the EIP Watershed Assessment and Water Clarity Model (EIP Project Numbers 959, 960, and 627). The estimated cost is \$1,750,000 all of which is funded and conducted by CARB.

Visibility

EIP Project Number: 10120 This project evaluates the feasibility of creating seasonal visibility thresholds. Seasonal thresholds were recommended by the Science Advisory Group and the Visibility Technical Advisory Group to account for seasonal differences in local meteorological conditions. This project has an estimated cost of \$300,000 with two funding sources including \$50,000 from TRPA and \$250,000 from the California Air Resources Board. However, the data and associated costs necessary for the thresholds to be evaluated will be collected in the research listed under Recommendation A.

Traffic Volume

EIP Project Numbers: 814, 826, 750, 812, 835, 10019, 10020, 10021, 10024, 767, 795, 797, 809, 816, 828, 838, 841, 857, 10025, 736, 769, 820, 831, 834, 10037, 10026, 10035, 781, 784, 823, 832, 10027, 10032, 10033, 10040, 778, 782, 839, 10034, 752, 770, 10036, 749, 751, 786, 753, 819, 822, 771, 777, 779, 10105, 806, 10028, 10030, 799, 800, 10023, 824, 825. (Note: Due to the large number of EIP projects recommended for this threshold, individual descriptions are not provided in this document. Please refer to Volume II of TRPA's EIP document for further details).

Most Transportation/Air Quality EIP projects will assist in reducing vehicle trips in the Region through enhancements to the existing network and by enhancing the available alternatives to the private automobile. The projects listed above, however, do focus on the South Shore Area, because the indicator for the Traffic Volume Threshold is measured at Park Avenue and US Highway 50 on the South Shore of Lake Tahoe.

Wood Smoke

EIP Project Number: 802 See discussion above under particulate matter.

Vehicle Miles Traveled (VMT)

EIP Project Numbers: 814, 826, 830, 833, 750, 763, 812, 835, 848, 856, 10018, 10019, 10020, 10021, 10024, 10153, 767, 795, 797, 809, 816, 828, 838, 841, 857, 10025, 10042, 736, 758, 760, 762, 769, 773, 788, 820, 831, 834, 10037, 10041, 787, 10026, 10035, 10038, 738, 781, 784, 823, 832, 854, 10027, 10032, 10033, 10040, 765, 778, 782, 836, 839, 845, 10034, 752, 766, 770, 847, 10036, 846, 748, 749, 751, 756, 786, 753, 791, 819, 822, 764, 771, 855, 10039, 777, 779, 761, 775, 815, 10028, 799, 800,

10023, 10105, 2003, 824, 825. (Note: Due to the number of EIP projects recommended to assist with the maintenance of the VMT threshold, each of the project descriptions is not provided in this document. For full descriptions of each of the above listed projects, please refer to Volume II of TRPA's EIP document).

All EIP Projects listed above will assist in the reduction of Vehicle Miles Traveled within the Tahoe Basin in on form or another. EIP projects listed range from the increased acquisition of transit vehicles to reduce the dependency on the private automobile to the expansion of pedestrian and bicycle facilities around the Lake Tahoe Basin to assist in making the region more pedestrian friendly. These projects in turn, will also assist in the attainment of Water Quality Thresholds as well as additional Air Quality Thresholds.

EIP Project Number: 805 This research program is focused on determining the atmospheric sources that may degrade Lake Tahoe's famed water clarity. The shift to phosphorous limitation has caused TRPA to examine its existing VMT threshold. The research effort is designed to allow for eventual policy adoption that better accounts for air depositional effects. The participants in research include TRPA, UC Davis Delta Group, Tahoe Research Group, Desert Research Institute, California Air Resources Board, Nevada Department of Environmental Protection, the U.S. Forest Service, the U.S. EPA, the Lahontan Water Quality Control Board and any other research institutions that may become interested. The implementation includes monitoring at new and existing sites, new monitoring equipment, analysis and reporting. All research must come to some conclusions before 2004 so that new policy development may proceed for the 2007 Regional plan. Monitoring and analysis that continues after 2004 will need to be captured as an expanded monitoring program when it is appropriate to do so. The estimated cost is \$1,600,000. Funding sources include TRPA, CARB , Lahontan Regional Water Quality Control Board, U.S. Forest Service, and the U.S. Environmental Protection Agency.

Atmospheric Deposition

EIP Project Number: 805 See discussion above under Vehicle Miles Traveled.

EIP Project Number: 10145 See discussion above under particulate matter.

EIP Project Number: 10104 This project quantifies nitrogen deposition to the Lake which is essential to the EIP, Watershed Assessment, and Water Clarity Model (EIP Project Numbers: 959, 960, and 627).

RECOMMENDATIONS FOR EIP UPDATE

1. Regional visibility has been declining in the Tahoe Region. Transport from the valleys west of the Sierra Nevada mountain range is suspected as a major contributor to poor visibility on the haziest days. For this reason, we are proposing research that will examine the role of transport of visibility-reducing constituents into the region.
2. No projects in the EIP currently include evaluation of the wood heater retrofit program. Currently, the true success of this program is unknown due to problems with both data analysis and enforcement. If TRPA plans to continue with its current retrofit program, it may be feasible to study the effects of the program relative to the thresholds it supports (PM₁₀, visibility and wood smoke). This would require a great deal of staff time and increased monitoring efforts to provide supportive data. Research on wood smoke levels is included in Recommendation A.
3. Currently, research on snowmobile impacts outside of the Basin has indicated that current levels of use in the Basin may result in significant human health, environmental health and social impacts (Bluewater Network 1999a; Bluewater Network 1999b; Ingersoll 1998). Research in the Basin is necessary to quantify the true human and environmental health impacts, along with the impacts associated with conflicting recreational uses. This research would also complement existing research and projects aimed at addressing VMT in the Basin by including the air and water quality effects of snowmobiles. No current EIP projects specifically include this research.

EIP UNITS OF BENEFIT

Another area of need is for benefit unit tracking within EIP Projects. Units of benefit are intended to be quantifiable measures of project value in relation to particular TRPA Environmental Threshold indicators. The benefit units are derived from or contribute to the indicator, which is measurable in relation to the threshold in question. Indicators have a direct quantifiable relationship to attainment or maintenance of that threshold or local, state, or federal air or water quality standards. Thus the units of benefit are intended to evaluate how the EIP is performing in terms of contributions toward attaining or maintaining thresholds and applicable standards. The units of benefit for projects and programs are based on the specific threshold standards under each environmental threshold program. The following table summarizes the Unit of Benefit from EIP Projects as they contribute to air quality thresholds.

EIP Units of Benefit		
TH Index	TH Indicator	TH Unit of Benefit
Air Quality		
AQ1	Carbon Monoxide	* Improved Level of Service
AQ2	Ozone	* < Hydrocarbon, NO _x Emissions
AQ3	Particulate	* < Stationary Burning, Dust Cont., > water clarity
AQ4	Visibility	* >Dust Control, < SO ₂ Emissions
AQ5	US50 Traffic Volume	* Park/U.S. 50 Volume Reductions
AQ6	Air Quality - Wood Smoke	* < Wood Heater Emissions, Burn Time, > water clarity
AQ7	Vehicle Miles Traveled	VMT Reduced, > water clarity
AQ8	Atmospheric Nutrient Loading	* NO ₃ Emission Reductions, > water clarity

VII. SUPPLEMENTAL INFORMATION

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AIR QUALITY APPENDIX CONTENTS:

Table 2-3 – Carbon Monoxide (1 hour)

Table 2-4 – Carbon Monoxide (8 hours)

Table 2-5 – Ozone (hourly)

Table 2-6 – Ozone (8 hours)

Table 2-7 – Particulate Matter, 10 microns or less (PM10) [24-hour average]

Table 2-8 – TRPA Regional Visibility Standard Analysis, Bliss State Park

Table 2-9 – TRPA Regional Visibility Standard Analysis, South Lake Tahoe

Table 2-10 – Nitrate (annual mean)

Table 2-11 – Nitrogen Dioxide (hourly)

Figure 2-1 – Tahoe Region VMT Forecast Lines by Established Base Year

Table 2-3. Carbon Monoxide (1 hour)

Location	YEAR																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Sandy Way, CA													8.0	5.1	5.2	4.2	3.2	3.6	3.2	2.1
Bijou	9.0	10.0	11.0	9.0	11.0	7.0	8.0	8.0	8.0											
Lake Tahoe Blvd		21.0	20.0	16.0	17.0	12.0	11.0	11.0	9.0	10.0	7.0	8.0								
Stateline, CA	25.0	22.0	30.0	23.0	23.0	20.0	19.0	19.0	17.0	18.0	14.0	15.0	13.0	11.3	9.3	10.4	7.7	7.5		
Stateline, NV (Horizon)	10.0	8.0	9.5	11.2	12.3	10.2	8.8	8.3	7.9	6.5	6.6	7.0	10.1	5.5	4.5	4.5	3.7	4.4		
Incline Village, NV													4.2	3.8	2.8	3.7	3.2	2.5	2.5	2.3
Stateline, NV (Harvey's)																			10.3	9.8

Standards: CA - 20 ppm; NV - 35 ppm; NAAQS – 35 ppm; TRPA – N/A
 Measured in parts per million (ppm); First High

Table 2-4. Carbon Monoxide (8 hours)

Location	YEAR																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Sandy Way, CA													3.3	2.6	2.6	2.43	2.43	2.31	2.44	1.88
Bijou	5.1	5.8	6.0	4.4	5.0	4.0	4.0	4.0	3.8											
Lake Tahoe Blvd		12.4	11.3	8.1	6.1	5.0	3.9	4.9	4.9	3.9	3.9	3.6								
Stateline, CA	15.4	16.4	17.4	14.8	16.3	12.5	13.0	12.5	11.3	10.1	9.2	9.9	7.5	7.1	6.3	5.1	3.8	4.3		
Stateline, NV (Horizon)	7.1	7.3	3.6	6.8	6.7	6.5	5.4	4.0	5.4	5.0	3.7	3.4	3.7	3.6	2.6	2.3	1.8	1.9	2.1	
Incline Village, NV													2.5	1.8	2.1	1.8	2.1	1.6	1.2	
Stateline, NV (Harvey's)																			4.6	4.2

Standards: CA – 6.0 ppm; NV – 6.0 ppm; NAAQS – 9.0 ppm; TRPA – 6.0 ppm
 Measured in parts per million (ppm); First High

Table 2-5. Ozone (hourly)

Location	YEAR																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Sandy Way, CA													0.09	0.086	0.092	0.083	0.095	0.081	0.095	0.083
Lake Tahoe Blvd			0.08	0.08	0.09	0.09	0.09	0.08	0.10	0.09	0.09	0.10								
Stateline, NV																0.084	0.093	0.078	0.074	
Zephyr Cove Cave Rock, NV																			0.09	0.090
Incline Village, NV													0.08	0.09	0.08	0.088	0.076	0.078	0.087	0.077
Echo Summit, CA																				<u>0.089</u>

Standards: CA – 0.09 ppm; NV – 0.10 ppm; NAAQS – 0.12 ppm; TRPA – 0.08 ppm
 Measured in parts per million (ppm); First High

Table 2-6. Ozone (8-hours)

Location	YEAR																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Sandy Way, CA												0.050	0.071	0.079	0.089	0.073	0.071	0.077	0.079	0.072
Lake Tahoe Blvd			0.070	0.065	0.078	0.080	0.078	0.076	0.085	0.080	0.081	0.082								
Stateline, NV																0.07	0.07	0.07	0.06	
Zephyr Cove, NV																			0.07	
Rock, NV																				
Incline Village, NV																	0.07	0.07	0.07	
Echo Summit, CA																				0.077

Standards: NAAQS – 0.08 ppm;
 Measured in parts per million (ppm); First High

Table 2-7. Particulate Matter, 10 microns or less (PM10) [24-hour average]

Location	YEAR																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Sandy Way, CA													92	78	71	72	55	59	41	50
Lake Tahoe Blvd					116	124	177	95	73	84	78	85								
Stateline, NV									30	55	76	66	72	104	95	73	59	66		
Incline Village, NV													33	42	58	57	71	56	34	

Standards: CA – 50 µg/m³; NV – N/A; NAAQS – 150 µg/m³; TRPA – N/A
 Measured in micrograms per meter cubed (µg/m³); First High

Table 2-8. TRPA Regional Visibility Standard Analysis^a.

**Bliss State Park Cumulative Frequency of Reconstructed B_{ext} and Visual Range
Three Year Rolling Windows, 1991-1999**

Period	Number of Days	<u>Cleanest Day</u>		<u>10th Percentile</u>		<u>50th Percentile</u>		<u>90th Percentile</u>		<u>Haziest Day</u>	
		b_{ext} (Mm^{-1})	Visual Range (km)	b_{ext} (Mm^{-1})	Visual Range (km)	b_{ext} (Mm^{-1})	Visual Range (km)	b_{ext} (Mm^{-1})	Visual Range (km)	b_{ext} (Mm^{-1})	Visual Range (km)
1991-1993	256	12.2	321	16.3	240	24.9	157	33.8	116	53.9	73
1992-1994	261	12.2	321	15.7	249	24.8	158	32.9	119	58.9	66
1993-1995	263	12.7	308	15.5	252	23.4	167	33.4	117	59.1	66
1994-1996	246	12.2	321	14.9	263	23.2	169	34.2	114	62.8	62
1995-1997	227	12.2	321	15.2	257	23.6	166	34.2	114	62.8	62
1996-1998	212	10.7	366	15.7	249	24.1	162	35.4	111	62.8	62
1997-1999	171	10.7	366	15.6	251	24.2	162	35.4	111	68.5	57

Table courtesy of Air Resource Specialists, Inc. (ARS).

Table 2-9. TRPA Sub-Regional Visibility Standard Analysis^a.

South Lake Tahoe Cumulative Frequency of Reconstructed B_{ext} and Visual Range

Three Year Rolling Windows, 1991-1999

Period	Number of Days	Cleanest Day		10 th Percentile		50 th Percentile		90 th Percentile		Haziest Day	
		b_{ext} (Mm ⁻¹)	Visual Range (km)	b_{ext} (Mm ⁻¹)	Visual Range (km)	b_{ext} (Mm ⁻¹)	Visual Range (km)	b_{ext} (Mm ⁻¹)	Visual Range (km)	b_{ext} (Mm ⁻¹)	Visual Range (km)
1991-1993	302	25.1	156	33.3	117	50.4	78	131.2	30	211.8	18
1992-1994	303	20.5	191	32.4	121	49.0	80	117.9	33	211.8	18
1993-1995	291	20.5	191	31.6	124	46.0	85	102.6	38	211.8	18
1994-1996	279	20.5	191	29.6	132	44.0	89	86.6	45	168.0	23
1995-1997	279	19.4	202	28.5	137	42.6	92	85.4	46	133.4	29
1996-1998	256	19.4	202	28.3	138	42.2	93	85.9	46	133.4	29
1997-1999	218	19.4	202	28.5	137	41.9	93	79.1	49	133.4	29

Table 2-10. Nitrate (annual mean)

Location	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
South Lake Tahoe (SOLA)	0.473	0.506	0.565	0.557	0.569	0.518	0.403	0.360	0.377	0.356	0.330	
Bliss State Park		0.364	0.304	0.312	0.318	0.276	0.291	0.204	0.243	0.214	0.261	

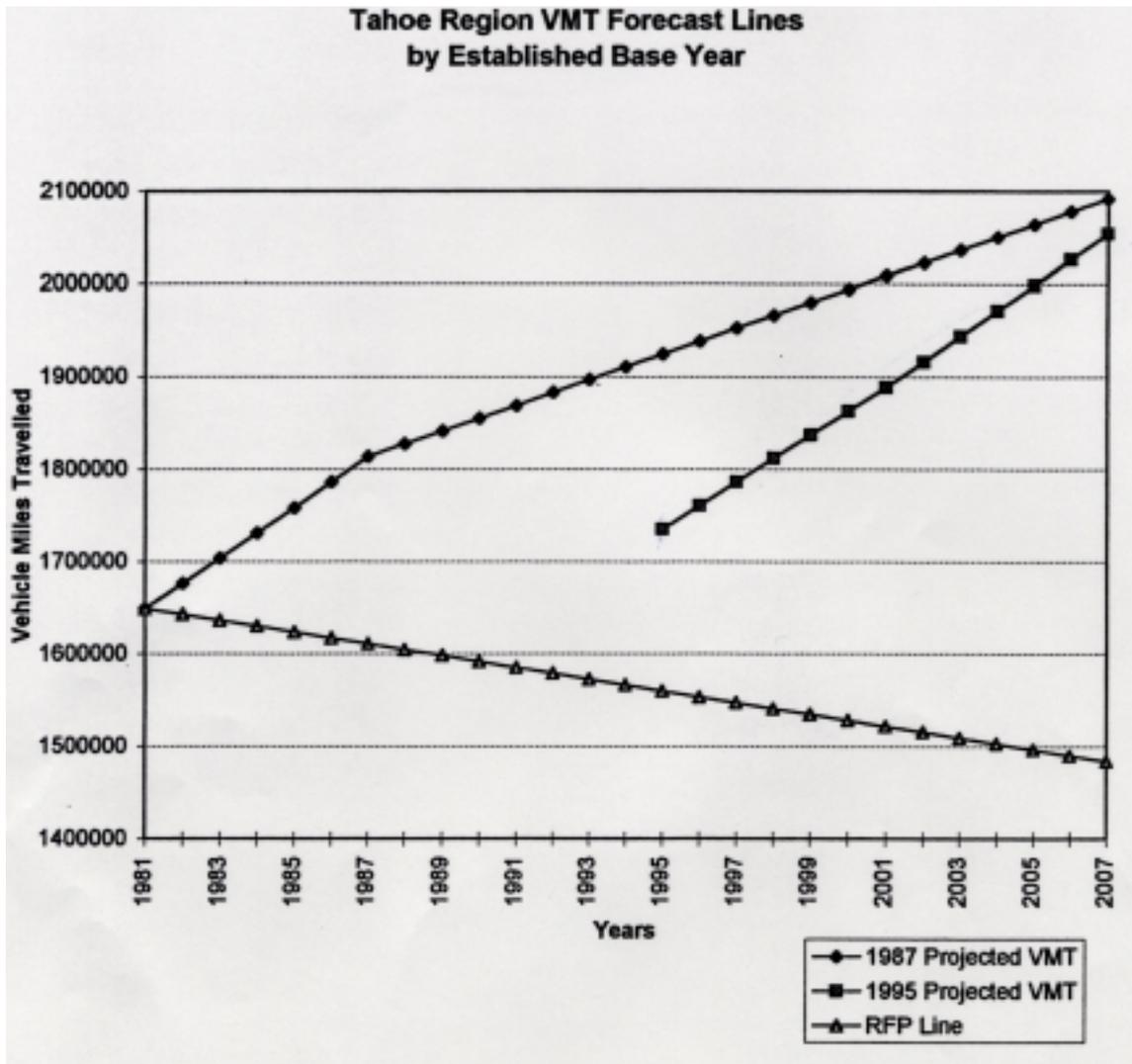
Standards: TRPA – Interim Target (1991): Not greater than 1.27 µg/m³.
 Measured in micrograms per meter cubed (µg/m³); First High

Table 2-11. Nitrogen Dioxide (hourly)

Location	YEAR																			
	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	2000
Dunlap Dr., SLT	0.06																			
Sandy Way, CA													0.06	0.06	0.06	0.06	0.05	0.05	0.06	0.05
Lake Tahoe Blvd		0.08	0.08	0.06	0.08	0.08	0.08	0.07	0.07	0.15	0.06	0.06								
Stateline, NV	0.14	0.13	0.01	0.012	0.011	0.01	0.012	0.01		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			
Incline Village, NV																			0.01	

Standards: CA – 0.25 ppm; NV and NAAQS – 0.05 ppm (annual average, all hours)
 Measured in parts per million (ppm); First High

Figure 2-1.



Chapter 3

WATER QUALITY

I. INTRODUCTION

An evaluation of water quality conditions in the Lake Tahoe Region should start with a firm understanding of the mechanisms at work in Lake Tahoe, its watershed, and its airshed, which dictate water quality conditions at any given time. TRPA has developed and continues to refine a conceptual process model that summarizes what is known—and not known—about the mechanisms which drive water quality trends. A background section describing this model can be found in Section VII of this chapter, which explains Lake Tahoe's unique characteristics and the water quality processes that form the basis for water quality management in the Region.

In the following sections, current water quality policies, standards, and management strategies are introduced, fully describing the current physical and political climate that determines the fate of Lake Tahoe's water quality. This evaluation begins to shape this climate towards optimizing manageable factors that will result in improvement of the water quality environmental threshold carrying capacities and water quality in general.

WATER QUALITY POLICY, STANDARDS, AND MANAGEMENT STRATEGIES

TRPA Planning Compact

In 1969, California and Nevada created the Tahoe Regional Planning Compact (P.L. 91-148; 83 Stat. 360), which named the Tahoe Regional Planning Agency (TRPA) as the regional land use and environmental resource-planning agency for the Lake Tahoe Region. In 1974 the Governors of California and Nevada designated TRPA as an area-wide planning agency under Section 208 of the Clean Water Act. TRPA prepared a 208 Plan that was adopted in January 1978. The Clean Water Act requires state certification and federal approval of 208 plans. After extensive amendments to the Tahoe Regional Planning Compact in 1980 (P.L. 96-551; 94 Stat. 3233), TRPA adopted a revised 208 plan in May 1981. The United States Environmental Protection Agency (USEPA) approved the TRPA plan, with conditions, in September 1981. In 1988 TRPA updated the 208 Plan.

TRPA Goals & Policies

The TRPA Goals and Policies is a key document of the Regional Plan. Article V(c)(1) of the Tahoe Regional Planning Compact calls for a "land use plan for the...standards for the uses of land, water, air space and other natural resources within the Region..." The Land Use Element includes the Water Quality subelement, which is introduced with the following language:

The purity of Lake Tahoe and its tributary streams helps make the Tahoe Basin unique. Lake Tahoe is one of the three clearest lakes of its size in the world. Its unusual water quality contributes to the scenic beauty of the Region, yet it depends today upon a fragile balance among soils, vegetation, and man. The focus of water quality enhancement and

protection in the Basin is to minimize man-made disturbance to the watershed and to reduce or eliminate the addition of pollutants that result from development.

The TRPA Compact established several policies related to water quality planning and implementation programs. Relative to standards, the Compact states that the Regional Plan shall provide for attaining and maintaining federal, state, or local water quality standards, whichever are the strictest.

In addition to the establishment of Numerical, Management, and Policy standards for water quality, there are two water quality goals:

GOAL #1: Reduce loads of sediment and algal nutrients to Lake Tahoe; Meet sediment and nutrient objectives for tributary streams, surface runoff, and sub-surface runoff, and restore 80 percent of the disturbed lands.

Eight policies follow this goal that address wastewater discharge, implementation of Best Management Practices (BMPs), restoration of disturbed lands, fertilizer use, off road vehicle use, and airborne emissions.

GOAL #2: Reduce or eliminate the addition of other pollutants that affect, or potentially affect, water quality in the Tahoe Basin.

Ten policies follow this goal that address snow disposal, waste water spill prevention, road salt, underground storage tanks, solid wastes, toxic wastes, dredging, holding tank discharges, evaluation of settling ponds, and reduction of impacts from motorized watercraft. Since their inception, there had been few changes to the above Goals and Policies until 1999. Policy #10 under Goal #2 was established in February 1999 to address motorized watercraft impacts, particularly due to emissions from carbureted two-stroke engines.

Clean Water Act

In 1972 Congress enacted the Federal Water Pollution Control Act, otherwise known as the Clean Water Act (CWA) to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. At that time, point source discharges from industrial and urban sources were severely impairing lakes and streams throughout the country. Since that time great strides have been made in eliminating point sources, yet statewide assessments still show that the majority of the Nation's waters are either threatened or impaired. Much of this impairment is due to nonpoint source pollution (i.e., pollution from activities such as urban development, agriculture, silviculture, and animal feeding operations). In 1987 Congress amended the Clean Water Act to authorize programs and resources to address nonpoint source pollution. Since that time the EPA and states have encouraged communities to address nonpoint sources using a watershed approach addressing all pollution sources and crafting solutions within an entire watershed (*Lake Tahoe Source Water Protection Program Project Report, TRPA, 2000.*)

Outstanding National Resource Water

Lake Tahoe is designated as an Outstanding National Resource Water (ONRW) under the USEPA Water Quality Standards Program and the Clean Water Act. With this designation, Lake Tahoe is provided the highest level of protection under the antidegradation policy and no further degradation should be permitted. The State of California recognizes this designation, although Nevada does not. Nevada has a separate designation for Lake Tahoe under state policies. ~~A number of issues must be carefully considered before a decision is made to either restrict or ban the use of certain marine engines.~~ USEPA antidegradation guidance for ONRW waters provides that states may allow some limited activities which result in temporary and short-term changes to water quality, but such changes should not impact existing uses or alter the essential character or special use that makes the water an ONRW. The equation requires water quality to be maintained and protected in ONRWs. EPA interprets this provision to mean no new or increased discharges to ONRWs, and no new or increased discharge to ONRWs that would result in lower water quality. Temporary activities “must not permanently degrade quality or result in water quality lower than that necessary to protect the existing uses in the ONRW”. EPA’s view of ‘temporary’ is weeks and months, not years (*Water Quality Standards Handbook*, Second Edition, 1993).

Water Quality Management Plan for the Lake Tahoe Region

The water quality thresholds outlined in the Water Quality Management Plan for the Lake Tahoe Region (208 Plan), along with other environmental values and standards, identify important issues relating to water quality in the Tahoe Region. Water quality policies generally fall into two areas:

1. Reducing loads of sediments and algal nutrients to Lake Tahoe; and
2. Controlling other water pollutants affecting, or potentially affecting, water quality.

The strategies for protecting water quality are guided by the thresholds that set numerical and management standards within the pelagic and littoral zones of Lake Tahoe, its tributary streams, and for surface runoff and groundwater.

The TRPA thresholds, and the California and Nevada water quality standards, set the applicable standards for Lake Tahoe, other regional lakes and tributary streams. In general, these standards call for reductions in nutrient loading to Lake Tahoe. TRPA standards include all state and federal standards and, if TRPA standards are more restrictive, they supersede standards adopted by the California State Water Resources Control Board, the Nevada Division of Environmental Protection (NDEP), and the USEPA.

State Porter-Cologne Water Quality Control Act

The Porter-Cologne Act established the California State Water Quality Resources Control Board and the Nine Regional Water Quality Control Boards in their current form. It authorizes the State Board to formulate, adopt, and revise state water policy, which may include water quality objectives, principles, and guidelines. The Porter-Cologne Act also authorizes the State Board to adopt water quality control plans on its own initiative. Such plans supersede Regional Basin Plans to the extent of any conflict.

Water Quality Control Plan for the Lahontan Region (Basin Plan)

Article 3 of the Porter-Cologne Act directs Regional Boards to adopt, review and revise Basin Plans, and provides specific guidance on factors, which must be considered in adoption of water quality objectives and implementation measures.

Nevada Water Pollution Control Regulations

The Bureau of Water Quality Planning administers Nevada's Nonpoint Source Pollution Management Program (SMP). The Bureau of Water Pollution Control regulates the handling of reportable quantities of materials of regulated substances; however, these regulations primarily address actions required in the event of a spill.

US Environmental Protection Agency Drinking Water Standards

In 1974, Congress enacted the Safe Drinking Water Act (SDWA) and authorized EPA to set standards to protect users from any contaminant in public water systems that may have adverse health effects. The regulations stipulated that EPA develops national standards and guide implementation of the Act. Reauthorized in 1986, Congress listed 83 contaminants and required EPA to establish or revise standards for each contaminant. Reauthorized again in 1996, Congress focused on four areas of reform in the 1996 amendments which included new funding to provide infrastructure capital, a focus on prevention versus correction of problems, regulatory improvements grounded in science, and improvement of information provided to consumers. The 1996 amendments (Sections 1453 and 1454) require the states to prepare source water assessments and implement source water protection activities and programs (*Lake Tahoe Source Water Protection Program Project Report*, TRPA, 2000.)

BACKGROUND

TRPA's Water Quality Environmental Threshold Carrying Capacities

TRPA's thresholds were not created in a vacuum without a scientific basis or stakeholder involvement. Six major events took place over a period of seven years towards development of the Environmental Threshold Carrying Capacities, including water quality. These critical events are as follows:

1. The Lake Tahoe Study, U.S. EPA, 1975, was completed. In addition to describing the role of the federal government at Lake Tahoe, the concept of thresholds is discussed in this document.
2. The Lake Tahoe Environmental Assessment, Western Federal Regional Council Interagency Task Force, 1979, was completed. This document further describes the concepts of thresholds and environmental carrying capacity.
3. The 1980 Bi-State Compact required development and adoption of environmental threshold carrying capacities for the Lake Tahoe Region.
4. Reaching Consensus on Environmental Thresholds and a Carrying Capacity for the Lake Tahoe Basin – A Work Plan, Tahoe Federal Coordinating Council, 1981, was prepared.

5. Study Report for the Establishment of Environmental Threshold Carrying Capacities, Tahoe Regional Planning Agency, 1982, was prepared and adopted.
6. Resolution 82-11, Tahoe Regional Planning Agency, 1982 was adopted by the TRPA Governing Board, formalizing the Environmental Threshold Carrying Capacities for the Lake Tahoe Region.

The above events shaped the water quality thresholds as they are today. As outlined above, several steps then proceeded to adoption of Resolution 82-11, which formalized the Environmental Threshold Carrying Capacities for the Lake Tahoe Region, which included thresholds for water quality.

The *Study Report for the Establishment of Environmental Threshold Carrying Capacities* (TRPA, 1982), in addition to recommending numerical and policy standards, includes information that rationalizes the basis of the thresholds, including the following: The Basis for the Recommendation; Standard Type; and finally, Attainability. Note that the framework of several water quality thresholds mimic the conceptual water quality process model described in Section VII. The attainability descriptions indicate the lack of knowledge at that time with respect to Lake response time to mitigation measures; they include statements that indicate Lake response is shorter than what we estimate today. References to responses within drought periods indicate researchers at the time thought the Lake's response time may be as short as five years versus the 20 ± 10 -year period believed to be accurate today (*Watershed Assessment*, 2000). Early rationales for the various water quality environmental threshold carrying capacities are discussed below.

INDICATORS

WQ-1 Littoral Lake Tahoe

The ~~nearshore-shallow~~ areas (and therefore the littoral zone – out to 100 meters depth) are the first to receive nutrient and sediment loads from tributary and groundwater sources. Turbidity thresholds numerical standards were set to indicate trends in loading of sediment, and are also affected by algal productivity where the management standards are for phosphorus, ~~and~~ nitrogen, and iron loading. The basis for the recommendation ~~is~~ suggests that ~~nearshore-shallow~~ areas of the lake should show trends ~~that are similar to those in pelagic waters~~ with respect to phytoplankton and periphyton (attached) algal production that are similar to those in pelagic waters for phytoplankton. The indicator unit for this threshold is turbidity.

WQ-2 Pelagic Lake Tahoe, Deep Water

WQ-3 Pelagic Lake Tahoe, Phytoplankton Primary Productivity

Phytoplankton primary productivity and transparency standards were set to identify the desired “end state” so that it could be determined when enough has been done to protect the unique clarity of the Lake. Both pelagic and littoral thresholds call for major reductions of nitrogen and phosphorus loading measured during the early 1970s. Indicator units include Secchi Depth, and phytoplankton primary productivity.

WQ-4 Tributaries

Streams receive nutrient and sediment loads from overland flows and deliver these loads to the littoral and pelagic zones of the Lake. Indicators include annual average concentrations per California and Nevada standards for nitrogen, phosphorus, and iron, and 60 mg/l at 90th percentile for suspended sediment.

WQ-5 Stormwater Runoff, Surface Water

Surface runoff from urban areas carries chemical loads in addition to nutrients and sediment. Indicators include TRPA surface water discharge standards.

WQ-6 Stormwater Runoff, Groundwater

Infiltrated surface runoff that does not enter tributaries or the Lake directly eventually discharges to streams or the Lake over time through groundwater discharge. The indicator units, which include TRPA discharge standards to groundwater, take into consideration the filtering effect of the soil profile.

WQ-7 Other Lakes

Since the quality of other lakes of the Region affect the quality of Lake Tahoe, standards for 'Other Lakes' have been established. Indicators include water quality standards established by California and Nevada.

All of the water quality thresholds include numerical standards, most of which were established by review of monitoring data during the late 1960s/early 1970s. These standards are based on the assumption that Lake conditions during this time period are the end-goal, and that they should be attainable through implementation of compliance measures. In addition to these standards, specific indicator units introduced above, and interim targets have also been established.

II. THRESHOLD SUMMARY

A. THRESHOLD MATRIX

The threshold matrix serves as a summary of the trends, status, and recommendations for individual thresholds. It displays the trend toward attainment from 1987 to present, the current status of the threshold, progress on the 1996 recommendations, future threshold recommendations, interim targets and an attainment schedule to ensure the individual indicators and/or standards for the threshold are in attainment over time.

The recommendations are organized by threshold number and expected completion date. This non-numerical classification scheme does not indicate an importance or priority strategy. The list of recommendations identifies the scheduling time frames that can be expected for implementation of the listed programs, studies and projects.

The recommendations with expected completion dates are implemented immediately with the adoption of the 2001 Threshold Evaluation. The term 'immediately' in this case, implies there is support for, justification of, and that adequate environmental documentation exists for implementation to take affect with the adoption of the 2001 Evaluation.

The recommendations with expected completion dates after 2001 are to be implemented prior to the 2006 Evaluation. Within five years following the adoption of the 2001 Evaluation the additional research, support (\$, stakeholder, community, etc.) and environmental documentation will be scheduled and completed in order to adopt new policies/programs or implement needed projects by 2006.

The recommendations with later expected completion dates need to be completed and may be as important to threshold attainment as items with earlier expected completion dates. However, there is additional work, staff, funding, and environmental documentation that need to be accomplished, which realistically may not have the potential for accomplishment in the next five years.

B. MEASUREMENT AND MONITORING ACTIVITIES

Monitoring summaries, monitoring status, and data location are covered in the second tier of the matrix for each threshold. These are brief descriptions of similar information covered in section III below, and intended as a quick reference.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

The results of these threshold-monitoring activities are expressed in terms of attainment or non-attainment and are found under "Status" on the thresholds matrix sheet. These results are discussed in greater detail under Section III below for each threshold.

WQ-1: SHALLOW WATERS OF LAKE TAHOE, TURBIDITY

Threshold Standards	WQ-1 Indicator	1996 Interim Targets		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
TRPA: Decrease sediment load as required to attain turbidity values not to exceed 3 NTU in littoral Lake Tahoe. In addition, turbidity shall not exceed 1 NTU in shallow waters of Lake Tahoe not directly influenced by stream discharge.	Turbidity offshore at the 25-meter depth contour at 8 locations, both near the mouths of tributaries and away from the tributaries, see figure 3-1 in Section III	Not applicable	Littoral Zone Turbidity	Attainment	Attainment	Attainment
WQ-1 Monitoring Status						
Ongoing for the TRPA monitoring sites, 4 times a year, for 5 depths at the 25-foot contour interval. The Desert Research Institute Phase II turbidity study expected completion date is winter, 2001, and will provide information on the monitoring protocols for measurement and reporting of near shore turbidity for revision. The spatial and temporal elements of this study may indicate specific areas of lake to target future restoration, and the possibility of using continuous turbidity records of water purveyors to compare and enhance TRPA data.						
WQ-1 2001 Recommendations						
TRPA should determine the feasibility of utilizing water purveyors for coordination and sharing of intake turbidity data (2002). Grants or other funding should be identified to continue the spatial analysis of turbidity and utilize this data for restoration project priority, EIP # 429 (2003). Continue present monitoring for 3 years, using other data to augment TRPA data set (2003). Trend analysis of this data collection could lead to modification or discontinuation of the existing protocol (2004).						
WQ-1 2006 Attainment Schedule						
The indicator unit of turbidity is currently in attainment however the reductions of sediment nutrient loading are unknown.						

WQ-2: CLARITY, WINTER, PELAGIC LAKE TAHOE

Threshold Standards	WQ-2 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
TRPA: Average Secchi depth, December – March, shall not be less than 33.4 meters. CA: Secchi disk transparency shall not be decreased below levels recorded in 1967-71 based on comparison of seasonal and annual mean values.	Secchi depth, winter average; TRG index stations (meters).	Annual average Secchi depth shall not be less than 22.7 meters.	TRPA	Non-Attainment	Non-Attainment	Non-Attainment
			CA	Non-Attainment	Non-Attainment	Non-Attainment

WQ-2 Monitoring Status

The Tahoe Research Group conducts regular monitoring of Secchi depth at the Tahoe Research Group index station, approximately once every ten at the index station and mid-lake station every 21 days. The interim target of 22.7 meters was met by the winter average for 1998, 1999, and 2001. Secchi depths have shown a gradually decreasing trend for the winter average over the period of record.

WQ-2 2001 Recommendations

The complex factors that contribute to lake clarity need to be brought together with the completion of the clarity model in late 2001. Various components to the model such as the optical and the airshed model are critical to this completion. Management strategies and EIP implementation should utilize the results relative to particle size and importance of phytoplankton versus mineral particles to direct research and plan projects, EIP # 10107, 10108 (2004). Intensify maintenance and equipment for road sweeping operations and cooperation of an improved maintenance program, to reduce fine sediment loads to Lake Tahoe, EIP # 430 (2003).

WQ-2 2006 Attainment Schedule

Attainment of the winter average standard of 33.4 meters has not been met and is complicated by the long residence time of Lake Tahoe and complexity of lake interactions. However, the mid-winter average shows a distinct slowing in the decreasing trend since 1988, as compared with that for 1968 to 1987. The interim target of not less than 22.7 meters annual average was met by the winter average for 1998, 1999, and 2001. A target for the next evaluation period is a winter average of 24.0 meters, and 23.0 meters for the annual average.

WQ-2A: CLARITY, WINTER, PELAGIC LAKE TAHOE

Threshold Standards	WQ-2A Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
<p>TRPA: Average Secchi depth, December – March, shall not be less than 33.4 meters.</p> <p>CA: Secchi disk transparency shall not be decreased below levels recorded in 1967-71 based on comparison of seasonal and annual mean values.</p>	<p>As a related factor, progress on the Capital Improvements Programs for Erosion and Runoff Control. For each local unit of government, Caltrans, NDOT, and the US Forest Service:</p> <p>(1) total expenditures on CIP projects, including operations and maintenance;</p> <p>(2) miles of road shoulder treated with erosion and runoff control practices; and</p> <p>(3) area of public right-of-way treated with erosion and runoff control practices (acres).</p>	<p>For indicator (1), from January 1, 1997 to December 31, 2001:</p> <p>City of South Lake Tahoe: \$5.2 million</p> <p>El Dorado County: \$3.0 million</p> <p>Placer County: \$10.0 million</p> <p>Washoe County: \$4.0 million</p> <p>Douglas County: \$4.0 million</p> <p>Caltrans: \$5.5 million</p> <p>NDOT: \$4.7 million</p> <p>USFS-LTBMU: \$4.5 million</p>	(1)	Non-Attainment	Non-Attainment	Non-Attainment
			(2)	Non-Attainment	Non-Attainment	Non-Attainment
			(3)	Non-Attainment	Non-Attainment	Non-Attainment

WQ-2A Monitoring Status

TRPA monitors implementation of the CIP through project planning, funding, design, permitting, inspection, and coordination, and will now request units of benefit data in the field on miles and acres of treatment applied to projects. Total expenditures on CIP projects are compiled at the end of each year, for Erosion control projects. No tracking exists for operations and maintenance expenditures, however maintenance efficiency plans are collected by each jurisdiction related to erosion control projects.

WQ-2A 2001 Recommendations

Develop consistent and standard reporting requirements for both projects and operations and maintenance for submission of projects at the onset. Expand the annual reporting requirements for water quality score update for IPES to include this information related to all projects, not only those with IPES scores. Refine the current TEGIS database for ease in application of the updated score to GIS coverage (2002). EIP project implementation and units of benefit development (2004).

WQ-2A 2006 Attainment Schedule

Non-attainment, although for (1) tentatively 7 out of 8 of the local jurisdictions or units will attain interim expenditure targets by the end of 2001 construction season. The interim target should be revised to reflect the completion of EIP update and associated database for tracking of benefit units that will measure miles of road treated and erosion control practices by acres. New interim target could focus on specific units for WQ-2A thru F, (see Section VI table of Benefit Units).

WQ-2B: CLARITY, WINTER, PELAGIC LAKE TAHOE

Threshold Standards	WQ-2B Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
TRPA: average Secchi depth, December-March, shall not be less than 33.4 meters.	As a related factor, progress on implementation of Best Management Practices (BMPs). Based on a stratified random survey of residential, commercial, public service, and recreation properties, the percentage of properties with: (1) BMPs in place in accordance with the Handbook of Best Management Practices, (2) revegetation of areas disturbed as of July 1, 1989.	By December 31, 2001 40 % of the properties shall have BMPs in place, and 35% have revegetation of disturbed areas.	(1)	Unknown	Attainment	Non-Attainment
CA: Secchi disk transparency shall not be decreased below levels recorded in 1967-1971 based on a comparison of seasonal and annual mean values.			(2)	Unknown	Attainment	Unknown
WQ-2B Monitoring Status						
Random surveys were conducted in 1989, 1990, 1993, 1995 and 1999. TRPA has redesigned the tracking system for implementation of BMPs to using statistical data generated through the Erosion Control Team. Data in excel sheets are linked to the TEGIS system and parcel database for region wide retrofit status. For interim results from five previous surveys of 525 parcels. Show that installation and maintenance of BMPs generally increase since 1993. Attainment using statistical data indicates 25% BMP installation in El Dorado and Placer counties, 65% in Washoe county, and 25% in Douglas county. Basin wide implementation is 30%.						
WQ-2B 2001 Recommendations						
Implement new BMP evaluation protocol for Basin-wide database tracking (2002). Implement the Large Project Water Quality BMP Maintenance Action Plan for creating, implementation and tracking of water quality treatments and BMPs, EIP # 430 (2002). Require realtor disclosure and installation of BMP upon sale of property. Hire 4-person implementation crew (seasonally) (2002). Pursue enforcement of non-compliant properties in Priority 1 areas in the following order: commercial and public property, homeowner associations, residential. Hire dedicated BMP enforcement officer (2002). TRPA project review process should be amended to address more site-specific analysis of projects, BMP design and effectiveness in reducing nutrient and sediment loads from developed properties (2002). Develop and implement EIP operations & maintenance program element of the EIP (2003). Real Time Management (or Adaptive Management) implementation needs to address BMP effectiveness. See EIP WQ Project #10109 funded partly through LRWQCB (in TMDL program) on sediment and nutrient reduction effectiveness (2004).						
WQ-2B 2006 Attainment Schedule						
Attainment in terms of the random surveys has been completed. Attainment of % of residential properties having BMPs in place is less than the target of 40%. Revegetation of disturbed areas is unknown, but will be complied through the EIP and reported on an annual basis with the water quality report, beginning in 2002. See Section III, WQ-2B for complete discussion.						

WQ-3: DEEP WATERS OF LAKE TAHOE, PHYTOPLANKTON PRIMARY PRODUCTIVITY

Threshold Standards	WQ-3 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
TRPA: annual mean phytoplankton primary productivity shall not exceed 52 gC/m ² /yr.	Phytoplankton primary productivity, annual average, measured at the TRG index station (gC/m ² /yr).	Annual mean phytoplankton shall not exceed 145 gmC/m ² /yr. For WY 2000.	TRPA	Non-Attainment	Non-Attainment	Non-Attainment
CA: algal productivity shall not be increased beyond levels recorded in 1967-1971, based on a statistical comparison of seasonal and annual mean values			CA	Non-Attainment	Non-Attainment	Non-Attainment
WQ-3 Monitoring Status						
The Tahoe Research Group (TRG) conducts regular monitoring of PPR at the index station approximately every ten to fourteen days. The interim target of 145 g C/m ² /yr was not met 1996-2001. Proposed interim target of 170 gC/m ² /yr is a more realistic and achievable, and was met in 1994-1997.						
WQ-3 2001 Recommendations						
Complete the clarity model and in particular the optical model, and characterize the sediment loading and particle size distribution in terms concentration, size distribution, and percentage of mineral and organic particles, EIP 627 (2003). This information should direct the removal of sediment concentrations through erosion control projects and practices. Urban runoff data collection should be focused at a variety of scales, from watershed to project focus and be land use specific, EIP 628.						
WQ-3 Attainment Schedule						
The long-term decline of PPR for the period of record reflects the complexity of lake chemistry and long residence time, and attainment will be difficult. The dramatic increase in production after the 1997 flood, with only a smaller decrease in clarity is evidence of this. The update of the EIP and addition of WQ C-F units of benefit should improve the link to project effectiveness and BMP implementation. Completion of the clarity model should also aid in the prediction of load reductions required to reduce algal production.						

WQ-4: TRIBUTARY WATER QUALITY

Threshold Standards	WQ-4 Indicator	1996 Interim Targets	Threshold Attainment Status			
<p>CA: total nitrogen, standard range of 0.15 to 0.23 mg/L; total phosphorus range of 0.005 to 0.030 mg/L, and total iron of 0.01 to 0.07 mg/L, (annual average).</p> <p>NV: Soluble phosphorus no to exceed 0.007 mg/L (annual average.); Lake Tahoe standards for soluble inorganic nitrogen not to exceed 0.025 mg/L</p> <p>TRPA: attain a 90th percentile value for suspended sediment of 60 mg/L.</p>	<p>Annual average concentrations of appropriate constituents in any tributary stream for which states have established standards (as mg/L); 90th percentile value suspended sediment of 60 mg/L.</p>	<p>For the California total phosphorus standard, annual average concentrations shall not exceed forecast lines.</p>	1991 Attain Status	1996 Attain Status	2001 Attain Status	
			CA	Non-Attainment	Non-Attainment	Non-Attainment
			NV	Non-Attainment	Non-Attainment	Non-Attainment
TRPA	Non-Attainment	Non-Attainment	Non-Attainment			
WQ-4 2001 Monitoring Status						
<p>The USGS and the Tahoe Research Group currently monitor tributary water quality at 31 stations on 14 tributary streams. The period of record varies from stream to stream, but generally ranges from seven to sixteen years of data. For details, see USGS Fact Sheet 138-00, October 2000, reproduced in the technical appendix.</p>						
WQ-4 2001 Recommendations						
<p>Utilize the LTIMP analysis for watershed discharges that need evaluation for load reductions and restoration projects (2004) and to refine the tributary program, EIP # 626, and to assist in establishment of TMDL's (2004). Develop and adopt consistent standards for both California and Nevada, dissolved standards being preferred as the more stringent indicators. (2004). Urban areas within watersheds or intervening areas should be prioritized with respect to reductions in loading and project/restoration needs where data is available (2002). The ability to establish common tributary and discharge standards between TRPA, Lahontan, and NDEP should be explored, and if feasible relative to establishment of TMDLs for the different watersheds, common standards or approaches to nutrient and sediment load reduction should be adopted by all three agencies (2004).</p>						
WQ-4 2006 Attainment Schedule						
<p>The standards have been achieved in some tributaries, generally those with little or no development. Low water years also contribute to reduced loads to the lake. The interim target for phosphorus is more critical in light of recent information on the impacts of fine particles and shift away from a nitrogen-limiting environment to one that is phosphorus limiting for algal productivity. Long-term trend analysis indicates decreasing concentrations of total nitrogen and total phosphorus, these types of statistical analysis should continue and provide more accurate attainment indications.</p>						

WQ-5: STORMWATER RUNOFF QUALITY- SURFACE WATER

Threshold Standards	WQ-5 Indicator	1996 Interim Targets	Threshold Attainment Status			
				1991 Attain Status	1996 Attain Status	2001 Attain Status
TRPA threshold discharges to surface water (90 th percentile) Dissolved inorganic nitrogen: 0.5 mg/L <i>Dissolved phosphorus: 0.1 mg/L</i> Dissolved iron: 0.5 mg/L Suspended sediment: 250 mg/L Grease & Oil: 2.0 mg/L	Concentration of applicable constituent on samples of surface runoff (localized surface flow from rainfall and snowmelt draining small sub-watersheds) at point of discharge to surface waters (mg/L for chemical constituents), as related factors, progress on implementation of BMPs as set fourth in the 208 Plan, Volume I, and the EIP.	TRPA shall prepare a mitigation plan of urban runoff at the pint of discharge to the surface waters of the Region for inclusion in the EIP. Future focus will be on flow weighted samples and event loading from runoff, and to correlate samples with land use.	TRPA	Non-Attainment	Non-Attainment	Non-Attainment
1981 208 Plan/SWRCB Water Quality Control Plan— discharges to surface water: Total nitrogen as N: 0.5 mg/L Total phosphate as P: 0.1 mg/L Total iron: 0.5 mg/L Turbidity: 20 NTU Grease & Oil: 2.0 mg/L			208 PLAN	Non-Attainment	Non-Attainment	Non-Attainment

WQ-5 2001 Monitoring Status

The Lahontan Regional Water Quality Control Board did some runoff monitoring prior to 1982. The Lahontan Board also monitored four sites on the South Shore from 1986 to 1989. TRPA mapped the significant points of discharge to the surface waters of the Lake Tahoe shoreline area as culvert points and monitored ten of these sites periodically throughout the Region 1991-1995. The focus has shifted to storm loads and runoff treatment capacity in water quality projects.

WQ-5 2001 Recommendations

Promote pilot studies for innovative treatment options (filter media) to reduce loads carried by urban runoff (2003). Complete urban runoff model for all highly urbanized areas of the region, using coordination of all available data, EIP # 628, (2003). Complete assessment of road runoff and effective treatment related to deicing components. Develop further studies to characterize urban runoff from various lands uses (turf grasses, industrial drainage, neighborhoods, road runoff), and target mitigation measures appropriately, EIP # 10110, 10111, (2004).

WQ-5 2006 Attainment Schedule

Attainment of these strict discharge standards is extremely difficult during storm events, but with proper sweeping techniques and maintenance of treatment trains, attainment is possible. Discharges from runoff to surface waters through natural or constructed wetlands have a higher rate of success. Most of the larger projects now have monitoring components, which will provide hard evidence of threshold attainment.

WQ-6: STORMWATER RUNOFF QUALITY-GROUNDWATER

Threshold Standards	WQ-6 Indicator	1996 Interim Targets	Threshold Attainment Status		
TRPA: Surface infiltration into groundwater shall comply with Uniform Regional Runoff Guidelines, below. Where there is a direct and immediate hydrologic connection between ground and surface waters, discharges to groundwater shall meet the guidelines for surface discharges—see WQ-5. Uniform Regional Guidelines for discharges to groundwater: Total nitrogen as N: 5 mg/L Total phosphate as P: 1 mg/L Total iron: 4 mg/L Turbidity: 200 NTU Grease/Oil: 40 mg/L	Concentration of applicable constituent in samples of surface runoff (localized surface flow from rainfall and snowmelt draining small sub-watersheds) at point of discharge to groundwater's (mg/L for chemical constituents, NTU, for turbidity).	TRPA shall prepare a mitigation plan of urban runoff at the point of discharge to the ground waters of the Region, for inclusion into EIP. The current monitoring for project effectiveness shall be evaluated to include in the design of new projects.	1991 Attain Status	1996 Attain Status	2001 Attain Status
			Non-Attainment	Non-Attainment	Non-Attainment
WQ-6 2001 Monitoring Status					
This threshold assumes a treatment path for infiltration; it is not a ground water standard per se. For older monitoring see the 1999 Annual Water Quality Report. There have been some reports and data on general ground water, not related to infiltration. TRPA mapped the significant points of discharge to the surface waters of the Lake Tahoe shoreline area as culvert points and monitored ten of these sites periodically throughout the Region 1991-1995.					
WQ-6 2001 Recommendations					
Fertilizer use and management programs moved from project driven reporting to region-wide regulatory program requiring reductions in fertilizer use, and elimination on low capability land (SEZs) (2002). Vegetation working group develop incentives to convert non-native landscapes to native species to reduce dependency on irrigation and fertilizers (2003). Address discharges due to sewer exfiltration and target failing structures EIP # 638, using groundwater studies or near shore spatial turbidity, and of directing urban runoff to pre-treatment structures to meet ground water standards (2003). Impact of direct urban runoff to groundwater via infiltration facilities studies and reexamine/revised to reduce impacts (2004).					
WQ-6 2006 Attainment Schedule					
The research and studies currently in place and proposed should provide valuable data on effectiveness in infiltration devices and treatment on a variety of erosion control projects. This data will direct future implementation of projects and evaluate effectiveness of individual treatments. The most extensive monitoring of a surface water to Infiltration project (Angora Creek Project) has shown substantial reductions in nutrients through spreading flow or the infiltration through grassy swales. Current studies are focused on data collection specific to this threshold as it relates to surface water infiltration to ground water					

WQ-7: OTHER LAKES

Threshold Standards	WQ-7 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
<p>TRPA has not officially adopted specific standards for California or Nevada other lakes, and it is has been recommended to adopt the tributary standards for the watershed the lake is located. However the appropriateness of tributary standards needs further evaluation.</p>	<p>Annual average or 90th percentile concentrations of applicable constituents from samples of the other lakes in the Tahoe Region for which the states have established numerical standards (normally mg/L).</p>	<p>TRPA shall determine the status of developing standards by September, 1996.</p>	<p>TRPA</p>	<p>Unknown</p>	<p>Attainment</p>	<p>Unknown</p>
WQ-7 2001 Monitoring Status						
<p>From 1974 to 1976, EPA and USGS conducted limited monitoring of Fallen Leaf, Lilly, and Gilmore Lakes. Fallen Leaf lake easily met the total nitrogen standard. The USDA Forest Service monitored Lake LeConte, in the Desolation Wilderness in the 1980's. TRPA has collected data on total nitrogen, total phosphorus, total iron, and turbidity at Cascade, Upper and Lower Echo, Marlette, Spooner, and Fallen Leaf Lakes. For details, see the 1996 Evaluation. In 1992, TRPA and NDEP initiated additional monitoring of other lakes in Nevada, and in 1993, federal grant assistance was obtained to evaluate California lakes.</p>						
WQ-7 2001 Recommendations						
<p>Formalize the adoption of tributary standards for other lakes in the Tahoe Region if appropriate, and assist with the development of TMDL's for Tributaries and thus other lakes. Feasibility on need for additional study of other lakes water quality standards (2003). Dam operation in relation to maintenance of Instream flows necessary for fisheries (2003).</p>						
WQ-7 2006 Attainment Schedule						
<p>Attainment for Fallen Leaf Lake can be evaluated as there are adopted standards. A detailed review of the recent reports and determination of whether to apply the tributary standards for other lakes shall be completed by 2006. EIP #10117 completes a feasibility study on the establishment of water quality standards for other lakes, with a completion date of 2003.</p>						

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

TRPA water quality thresholds address algal growth potential, plankton count, clarity, turbidity, phytoplankton productivity, phytoplankton biomass, zooplankton biomass, periphyton biomass, dissolved inorganic nitrogen (DIN) loading, and nutrient loading in general. State standards for such parameters as toxic substances, taste and odor, and trace metals, also apply to Lake Tahoe. Evaluation of the majority of these compounds is beyond the scope of this report.

California and Nevada have adopted statewide anti-degradation policies, consistent with federal requirements, which require the maintenance of existing high quality waters. Federal regulations also require the maintenance of existing high quality waters, and specifically state that waters which constitute Outstanding National Resource Waters, such as Lake Tahoe, shall be maintained and protected.

In the 1988 Water Quality Management Plan for the Lake Tahoe Region, TRPA identified the precise indicators TRPA would monitor to assess attainment of threshold standards for turbidity, clarity, and phytoplankton primary productivity. They are consistent with the TRPA Goals and Policies, and discharge standards specified in Chapter 81 of the TRPA Code of Ordinances.

A major goal of the Lake Clarity Model (scheduled to be completed by February 2002) is to establish the nutrient and sediment-loading budget for the lake and predict the load reductions and major source allocations required to improve Lake Tahoe's clarity. A current estimate of the nutrient loading budget and major sources is included in Table 3-1. While estimates vary, the three largest sediment load contributions are from tributaries, shorezone erosion and direct runoff from intervening areas.

Table 3-1. Estimated Nutrient Budget (Loading As Metric Tonnes)			
	TOTAL N	TOTAL P	DISSOLVED P
Atmospheric Deposition	234 (56%)	12.4 (26%)	5.6 (37%)
Stream Loading	82 (20%)	13.3 (28%)	2.4 (16%)
Direct Runoff	42 (10%)	15.5 (33%)	3 (20%)
Groundwater	60 (14%)	4 (9%)	4 (27%)
Shorezone Erosion	1 (<1%)	1.6 (3%)	NO DATA
TOTAL	419	46.8	15.0
Revised On 11/00 From Reuter Et al. 2000. Reflects Recent DRI Study On Shorezone Erosion.			

Once the Lake Clarity Model is operational, and needed load reductions can be allocated, the management standards for individual water quality thresholds may need to be revised accordingly. Such load reductions also need to be applied to Environmental Improvement Program (EIP) projects in order to determine their efficiency in load reductions. A Total Maximum Daily Load (TMDL) or annual load approach to Lake Tahoe and the tributary watersheds may help to provide incentives to maximize treatment wherever possible based on load reduction potential of project treatments on a watershed contribution basis. However, it is likely such maximization of project load reductions would need to occur Basin-wide regardless of particular watersheds' contributions to lake loading (as opportunities present themselves). BMP or treatment load reduction measures would represent the second phase of Units of Benefit for EIP

projects discussed in section VI. Results from an intervening area study conducted by the Tahoe Research Group (TRG) of the University of California, Davis, suggest that developed intervening areas should be high priority for maximum efforts on BMPs and water quality treatment.

The Lake Tahoe Interagency Monitoring Program (LTIMP) analysis for tributaries covered under WQ-4 shows decreasing loading trends for most watersheds for nutrients, and decreasing trends for sediment loading on the Nevada side. It remains to be seen if the tributary loading reductions are sufficient relative to tributary loading to the lake. Watershed TMDLs can help allocate needed load reductions for source control, water quality treatment and restoration efforts within watersheds. Potentially, watershed restoration and stream channel/SEZ restoration efforts, such as those in Blackwood and Ward Creeks, would further reduce loading from the tributaries that are relatively undeveloped. In the more developed watersheds, implementation of BMPs on properties (WQ-2B), and right-of-way/subdivision water quality projects (WQ-2A) are expected to reduce loads from developed areas. Upland restoration, coupled with stream channel/SEZ restoration efforts, should directly contribute to tributary load reductions. The tributary monitoring is the largest volume of data and long-term trends for other load monitoring data have not been established due to the nature of the data. Further studies and monitoring may provide these trends.

The mid-winter Secchi trends since 1988, presented in Figure 3-6, suggests a slowing of the decrease in clarity, as compared with the 1967–1987 trend (Figure 3-5). However, the trend is still decreasing and the lake response time may limit the use of such trends in the short run except from loading sources. Currently, a Desert Research Institute (DRI) shorezone erosion study is carrying out particle size analysis to determine to what extent fine particles (silt and clay) may be contributed directly to the lake by shorezone erosion. These fine particles along with soluble phosphorus should become a greater focus of water quality treatment efforts, including load reduction benefits.

A. WQ-1: LITTORAL LAKE TAHOE, TURBIDITY (SHALLOW)

Turbidity is a measurement of the optical properties of a water sample that affect clarity by causing light to be scattered and absorbed. Turbidity can be affected by a number of factors (e.g., color, dissolved material, entrained air bubbles, organic matter, plankton, and other microscopic organisms), but is primarily influenced by fine suspended particles and organisms (Beschta, 1980; Standard Methods, 1989). Inorganic (sediment) particles in the 2 µm size contribute disproportionately to clarity loss due to their higher scattering efficiency and slow settling rate (*TRG Annual Progress Report, Swift et al., 2000*)

The Nephelometric Turbidity Unit (NTU) method uses the principle of light scattering to measure turbidity. The meter directs a controlled beam of light at a sample and measures the degree of light scatter at 90 degrees to the incident beam. The sensitivity of this method is 0.02 NTU in waters with turbidities less than 1 NTU and is accurate between 0-40 NTUs (Standard Methods, 1989). For evaluating the low turbidities encountered at Lake Tahoe, this method is the best technique available.

1. Evaluation Criteria

NUMERICAL STANDARD: Reduce dissolved inorganic nitrogen loading to Lake Tahoe from all sources by 25 percent of the 1973-81 annual average.

MANAGEMENT STANDARD: Reduce dissolved inorganic nitrogen loads from surface runoff by approximately 50 percent, from groundwater approximately 30 percent, and from atmospheric sources approximately 20 percent of the 1973-81 annual average. This threshold relies on predicted reductions in pollutant loadings from out-of-basin sources as part of the total pollutant loading reduction necessary to attain environmental standards, even though the Agency has no direct control over these sources. The cooperation of the states of California and Nevada will be required to control sources of air pollution that contribute nitrogen loadings to the Lake Tahoe Region.

NUMERICAL STANDARD: Decrease sediment load as required to attain turbidity values not to exceed three NTU. In addition, turbidity shall not exceed one NTU in shallow waters of the Lake not directly influenced by stream discharges.

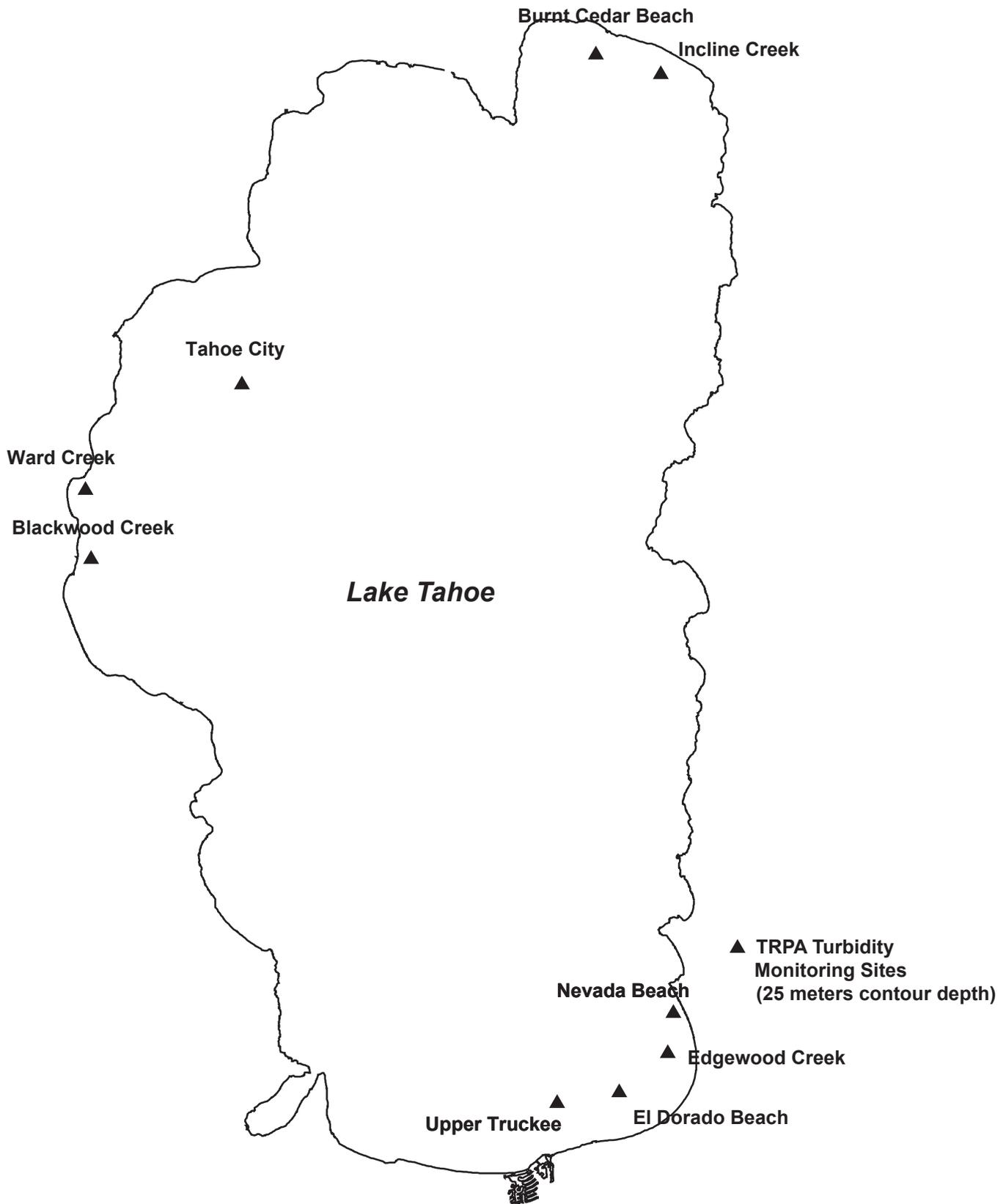
Reduce the loading of dissolved inorganic nitrogen, dissolved phosphorus, iron, and other algal nutrients from all sources to meet the 1967-71 mean values for phytoplankton primary productivity and periphyton biomass in the littoral zone.

2. Measurement and Monitoring

Turbidity, shallow waters of Lake Tahoe, requires a decrease in sediment load to attain turbidity values not to exceed 3 NTU in littoral Lake Tahoe. In addition, turbidity shall not exceed 1 NTU in shallow waters of Lake Tahoe not directly influenced by stream discharges.

TRPA initiated turbidity monitoring in the littoral zone in the spring of 1991. TRPA uses a sampling methodology, which takes into account the effect that depth and distance from the shoreline have on turbidity. To account for this effect, stratified samples are taken at different depths at the 25-meter contour for eight locations on Lake Tahoe (map, Figure 3-1). Based on the average NTU value for 15 sample runs on Lake Tahoe, there is a very slight increase in NTU where sites are influenced by a stream discharge. This very small change may be due in part to the sampling location and its distance from the shoreline, which in some cases is up to two miles. All locations are sampled at the 25-meter contour depth.

Figure 3-1. Lake Tahoe Turbidity Monitoring Stations



Some locations, such as Ward Creek on the western side of Lake Tahoe, are within 50 yards of the shoreline. For a complete description of the sites see Table 3-2. Samples are collected at the surface and at 5-, 10-, 15-, 20- and 24-meter depths.

Table 3-2. Shallow Lake Tahoe Turbidity Sites			
SITE NAME	AGENCY	LAT/LONG	DESCRIPTION
TURBIDITY SITES - All at 25-meter contour			
Upper Truckee River at Mouth at South Lake Tahoe, CA	TRPA	38 56 64 120 00 39	Sample point in direct line of riparian veg with Freel Peak
El Dorado Beach	TRPA	38 57 09 119 58 97	Bearing of 135 degrees in direct line with Freel Peak and Senior Bldg. In campground across Hwy. 50 from El Dorado Beach
Mouth of Edgewood Creek	TRPA	38 57 75 119 57 46	Bearing of 90 degrees in line with mouth of Edgewood Creek and saddle of Kingsbury Summit
Nevada Beach	TRPA	38 58 42 119 57 24	Direct line with broken pier post at north end of Nevada Beach with Castle Peak
Incline Creek mouth near Crystal Bay, NV	TRPA	39 02 34 120 08 30	Bearing of 10 degrees in line with Mt. Rose Hwy Vista Pt., mouth of Incline Creek and bare rock outcrop
Burnt Cedar Beach	TRPA	39 14 08 119 58 05	Bearing of 350 degrees in line with sam II beach house and tallest peak with small saddle on horizon
Tahoe State Recreation Area near Tahoe City	TRPA	39 09 21 120 05 46	Bearing of 280 degrees in line with State Park, 130 with Heavenly Valley, 34 with Diamond Peak, approx. 2 miles from shore
Ward Creek mouth	TRPA	39 07 28 120 05 46	Sample point in direct line with mouth of Ward Creek
Blackwood Creek mouth	TRPA		In line with dock south of Blackwood Creek lined up with Eagle rock outcrop

Historically, the Tahoe Research Group (TRG) monitored turbidity as a component of their in-lake monitoring program. TRG sampled at six locations on Lake Tahoe from 1989 to 1992. Initially, TRG sampled at the 0.5- and 2-meter depths to correspond with their periphyton monitoring locations. In the winter of 1991, the 25-meter contour interval monitoring locations were added, in part to have consistent monitoring locations with TRPA. TRG's data, like TRPA's, have shown very low turbidity values at the 0.5, 2 and 25-meter contour depths (*Annual Water Quality Report*, TRPA, September 2000).

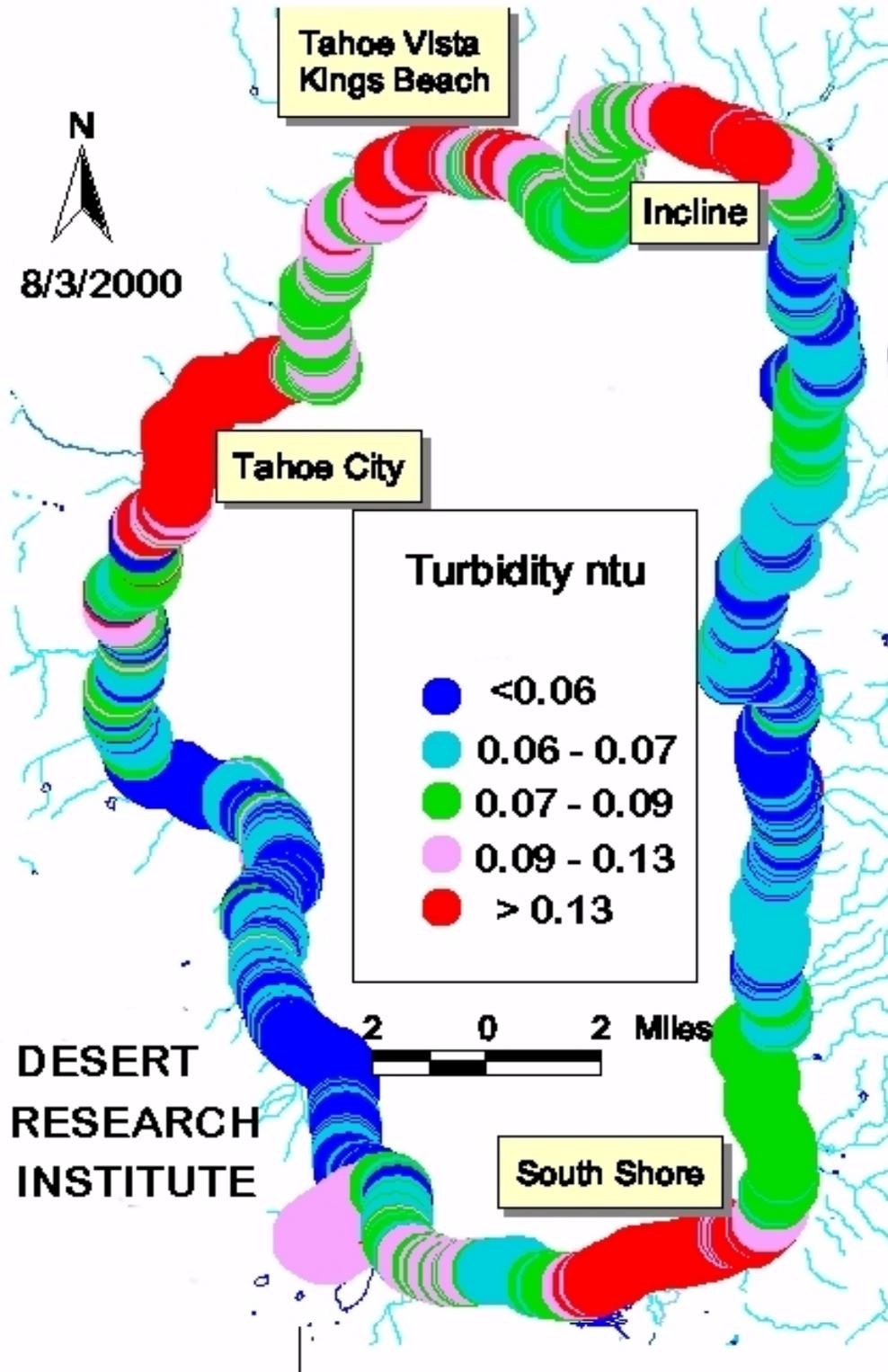
The 1996 Threshold Evaluation suggested that the turbidity monitoring sampling program be adjusted by adding sites closer to the shoreline to possibly emphasize the impact of turbidity on Lake clarity. While exploring this option, TRPA staff attempted to analyze the data set for a discernible trend, but this data analysis was unsuccessful. Desert Research Institute (DRI) was approached, and a phased study to examine TRPA's monitoring protocol was funded.

This study pointed to the limitations of the existing monitoring protocol that results in the collection of data representing a snapshot in time and space. Phase I has been completed, which reconstructed and examined turbidity data sets collected by water purveyors. Many purveyors sample turbidity at the lake intake continuously, providing a more complete picture of turbidity changes over time. The study concluded that if discrete measurements are to be used to monitor long-term changes in turbidity, then the procedures must be designed so that long-term changes are detectable above the short-term variability (Lake Tahoe Study of Turbidity in the Littoral Zone, Phase I Report, DRI, 2000). The study further concluded that detection of a gradual long-term trend by occasional turbidity measurements also requires that the change associated with the trend is larger than the day-to-day variability.

The DRI/TRPA Phase II turbidity study involves continuous monitoring of turbidity from the Burnt Cedar, Edgewood, and North Tahoe water treatment plants. Data loggers are to be installed to continuously monitor turbidity of water from lake intakes at these three sites. In addition, one *in situ* turbidity and light attenuation instrument was installed. This project is also continuing to evaluate TRPA's discrete monitoring methods for turbidity and will make recommendations for modifications as appropriate. An associated Master's thesis research study will develop statistical and data modeling methodologies to use hydrologic and meteorological data to better understand the physical processes that drive near-shore turbidity in Lake Tahoe.

An additional DRI project involves studying the spatial distribution of turbidity plumes using continuous measuring devices on watercraft. Pilot studies indicate higher levels of turbidity located offshore and adjacent to the developed areas of the South Shore, Incline Village, Kings Beach, Tahoe Vista, and Tahoe City. (See Figure 3-2.) Turbidity values adjacent to developed areas (at 1 m depth 50 to 100 meters offshore) were higher by a factor of two than those adjacent to undeveloped areas.

Figure 3-2. Desert Research Institute Turbidity Study Sampling



3. Results of Measurement and Monitoring Efforts

Since April 1991, 35 sample runs have been completed by TRPA. The data shows turbidity values well within the threshold for turbidity of 3 NTU for sites influenced by stream discharges, and 1 NTU for sites not influenced by stream discharges in the littoral zone. (See Appendix Table 1, Littoral Turbidity Monitoring Results, TRPA.) This program centers on data collection before, during, and after the spring runoff period, but also includes late summer and winter samples. However, these sample runs are carried out under relatively calm lake conditions due to the requirement to remain at a stationary location on the 25-meter contour while sampling at different depths. Thus, the standard sampling conditions may introduce non-representative results in that such conditions and relative lack of lake mixing may keep turbidity lower than the average.

DRI's data collected from purveyors indicate average turbidity values well below 1 NTU at eight locations. Contemporaneous data, Average Maximum, and Average Minimum values are shown in Table 3-3 below.

Table 3-3. Summary for Annual Cycles in Turbidity Measurements at 8 Locations in Lake Tahoe

Intake Name	Average Maximum Month	Turbidity, NTU	Average Minimum Month	Turbidity, NTU
National Ave.	July	0.24	February	0.16
Dollar Cove	April	0.25	September	0.13
Burnt Cedar	May	0.40	August	0.27
Crystal Bay	N/A	N/A	N/A	N/A
Cave Rock	May	0.19	March	0.16
Zephyr Cove	June	0.20	March	0.15
Edgewood	June	0.21	February	0.12
Kingsbury	N/A	N/A	N/A	N/A

4. Trends

DRI's turbidity study completed a trend analysis on TRPA and purveyor data. Their analysis of TRPA's data is inconclusive due to the uncertainty of single measurements to allow for a meaningful trend analysis. For this exact reason, TRPA contracted with DRI to review and recommend changes to TRPA's monitoring program to insure collection of data that yields trend information.

An analysis of long-term change was completed using measurements obtained at the Burnt Cedar and Edgewood intakes, where turbidity measurements are continuous. Although a more complete analysis is being completed as part of a second study phase, initial analysis found a large increase in turbidity starting in early 1994 that remained through mid-1997. While a detailed analysis of the causes behind this long-term change was beyond the scope of the Phase I report, it was noted that the lake-level was very low in mid-1994 and that the lake level was rising rapidly over the early-1995 to mid-1996 period, following the last drought. Lake levels have been relatively constant since 1996 (Lake Tahoe Study of Turbidity in the Littoral Zone, Phase I Report, DRI, 2000.) The discussion above suggests that changing and/or low lake levels may contribute to higher turbidity readings in the littoral zone.

5. Threshold Attainment Status

Although the indicator unit (turbidity) is in attainment, the required reductions of nitrogen (N), phosphorus (P), and other algal nutrient loading are unknown. The key management tool necessary to determine needed nutrient and sediment loading reductions, is the Lake Tahoe Clarity Model, expected to be completed in February 2002. With respect to nitrogen and phosphorus loading via atmospheric deposition, see Chapter 2, Air Quality.

Preliminary results from the intervening zone study suggest that direct runoff annual loading to the lake, is responsible for an estimated 8,333 Metric Tons (MT = 1,000 KG) of sediment loading and 15.5 MT as total phosphorus largely from developed areas. The estimated nutrient loading from the intervening zones represents 10% of the total N, 33% of total P, and 20% of dissolved P. In addition, the shorezone erosion loading is estimated to contribute 7,150 MT of sediment on an annual basis. While the estimated nutrient contribution is approximately 2 percent, a particle size analysis is being done on shorezone samples to determine the potential impact on turbidity and lake clarity.

The relationship between atmospheric deposition and water quality is also being studied, the purpose being to marry the water quality and air quality models to allow water quality prediction scenarios to fully account for the air deposition component.

For discussion on phytoplankton primary productivity, see WQ-2 below. Regarding periphyton productivity, historical and recent data by the TRG point to increasing growth of attached alga on shoreline rocks near developed areas (*Watershed Assessment, Chap. 4, Vol. 1*, Reuter and Miller, 2000). TRG has suggested that periphyton biomass be considered as an additional threshold for the littoral zone, in relation to land use and nutrient inputs through the littoral zone especially from developed intervening areas and possibly groundwater seepage.

6. Effectiveness of Measures in Place

In relation to the shallow turbidity threshold for Lake Tahoe the compliance measures are intended to reduce nutrient (dissolved inorganic nitrogen and dissolved phosphorus) and sediment discharges to the lake and its tributaries in order to meet the threshold by decreasing turbidity. See Table 3-6, Effectiveness of Compliance Measures, at the end of this section.

Most of the main water quality compliance measures apply to this threshold. The measures in place appear to have been effective in attaining and maintaining this threshold. However, recent DRI/TRG studies ~~suggest that~~ demonstrate increased nutrient and sediment loading to the lake from developed areas, and elevated nearshore turbidity suggesting that the 1-3 NTU standard may not be protective ~~may threaten this threshold~~. Trends for increasing fine sediment or nutrient loading into the littoral zone, should lead to a focus on projects to reduce loading from direct runoff from developed intervening areas and perhaps shorezone erosion if fine sediment is implicated.

Category: water quality**Parameter: turbidity, shallow waters of Lake Tahoe**

1. STANDARD: TRPA: Decrease sediment load as required to attain turbidity values not to exceed 3 NTU in littoral Lake Tahoe. In addition, turbidity shall not exceed 1 NTU in shallow waters of Lake Tahoe not directly influenced by stream discharges.
2. INDICATOR (UNITS): Turbidity offshore at the 25-meter depth contour at the following locations in littoral Lake Tahoe (NTU): (1) mouth of Upper Truck River and Trout Creek; (2) El Dorado Beach; (3) mouth of Edgewood Creek; (4) Nevada Beach; (5) mouth of Incline Creek; (6) Burnt Cedar Beach; (7) mouth of Ward Creek; and (8) Tahoe State Recreation area.
3. MONITORING SUMMARY: Turbidity has been measured at various times since 1965, with ranges ~~According to the 1982 Threshold Study Report, the Joint Studies group measured turbidity in JTU at 14 locations in the shallow waters of Lake Tahoe between 1965 and 1975. Turbidity ranged from 0.10 to 1.60. TRPA initiated monitoring of turbidity at the above locations in the littoral zone in 1991. Desert Research Institute (DRI) began spatial and temporal study of turbidity in 2000, and comparison of TRPA samples to continuous records of water purveyors. Since that time, 22 sample runs have been completed, with no values exceeding 1 NTU. The Tahoe Research group monitored littoral turbidity from 1989 to 1992. No values reached 1 NTU. For more details, see the 1996 Evaluation, and the 1999 Annual Water Quality Report.~~
4. ATTAINMENT STATUS: Attainment.
5. TARGET DATE: Not applicable.
6. EVALUATION INTERVAL: TRPA should evaluate the adequacy of the current 25-meter sampling depth, using the recent trend analysis and methods comparison in progress by the Desert Research Institute. ~~Depending on the topography of the lake bottom, sites are very close or very far from shore. This evaluation should be coordinated with the Lake Tahoe Interagency Monitoring Program (LTIMP).~~
7. INTERIM TARGETS: Not applicable.
8. COMPLIANCE MEASURES: ~~The Compliance Measures have been reworked, for a complete listing, see Table 3-6. (See Section II for inventory)~~
 - a. MEASURES IN PLACE: ~~Urban Runoff and Erosion: 01 through 15, inclusive Waste Management: 28 and 29 Natural Area Management: 30, 31, 32, 34, 35, 36, 37, and 38 Lake Tahoe and the Shorezone: 40, 41, 42, 43, 44, and 45 1-18, 48,49, 53, 54, 57-61, 214.~~
 - b. EFFECTIVENESS OF MEASURES IN PLACE: ~~See Table 3-6. The compliance measures in place include the main water quality compliance measures of the Regional Plan. The measures in place have been effective at attaining and maintaining the threshold.~~
 - c. SUPPLEMENTAL MEASURES: ~~53, 54, 57, 58, 59, 60, and 61. Urban Runoff and Erosion: 01, 02, 04, 05,08, 09, 10, 11, and 12 Natural Area Management: 19, 20, and 24 Lake Tahoe and the Shorezone: 22~~
 - d. ~~EFFECTIVENESS OF SUPPLEMENTAL MEASURES: The 1996 Evaluation does not recommend implementation of supplemental measures specifically to maintain this threshold. However, implementation of supplemental measures is recommended for other water quality thresholds.~~
9. ADEQUACY OF COMPLIANCE MEASURES: Compliance measures in place appear to be adequate to attain and maintain the threshold. Supplemental measures may be implemented in the future if necessary.

B. WQ-2: DEEP WATERS OF LAKE TAHOE

1. Evaluation Criteria

NUMERICAL STANDARD: Reduce dissolved inorganic nitrogen (N) loading from all sources by 25 percent of the 1973-81 annual average. Achieve the following long-term water quality standards:

Winter (December - March) mean Secchi disk transparency: 33.4m.

MANAGEMENT STANDARD: Reduce the loading of dissolved phosphorus, iron, and other algal nutrients from all sources as required to achieve ambient standards for primary productivity and transparency.

Load reductions as described under management standard for WQ-1.

2. Measurement and Monitoring

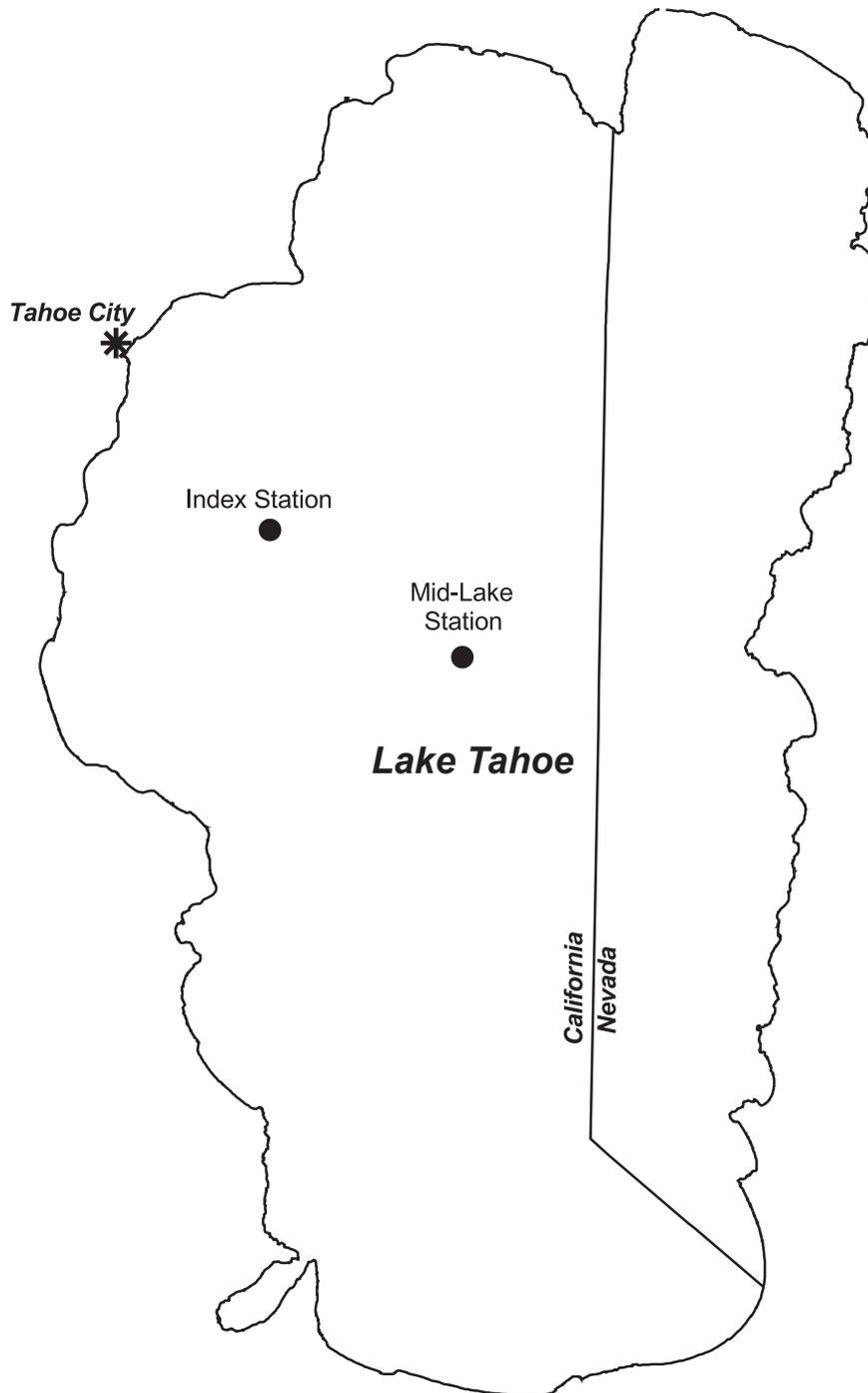
The Tahoe Research Group (TRG) monitors clarity and phytoplankton primary productivity (PPR) in the pelagic (deep) waters of Lake Tahoe. TRG maintains two pelagic zone monitoring locations (Figure 3-3), the index station since 1968, and the mid-lake station since 1980.

TRG collects data at the index station approximately every 10 days, and at the mid-lake station approximately every 21 days. TRG takes Secchi depth readings to measure clarity at both stations, but measures PPR only at the index station. Secchi depth measurements represent the average of the depths at which a 25 cm white disk disappears and re-appears as it is lowered and raised through the water column. PPR values are measured using the C14 technique described in Leonard and Goldman (1981), and are integrated throughout the euphotic zone (0 to 105 m). The technique measures how active algae are, by measuring the rate of carbon dioxide utilization.

To further understand the effects of sediment transport processes on lake clarity, and to quantitatively couple these effects with nutrient processes, the TRG is in the process of developing a Lake Tahoe Clarity Model. The model will provide a tool for evaluating management and restoration strategies in the watershed and studying ecological processes in the Lake (*TRG Annual Progress Report, 2000.*)

The Clarity Model stresses the differences between light scatter and absorption. Both processes affect water clarity and color. Waters with good clarity appear blue due to the natural absorptive qualities of pure water. Pure water absorbs visible light wavelengths in the red spectrum. Particle size distribution greatly effects scatter and absorption: The majority of particles suspended in the Lake are 2 µm or less in diameter, in the size range that scatters light most strongly. This suggests that restoration projects, BMPs and road maintenance operations need to capture fine sediments to have the greatest positive effect on water clarity; however model runs will be required to evaluate the impacts of particle size on water clarity.

Figure 3-3. TRG Pelagic Monitoring Stations

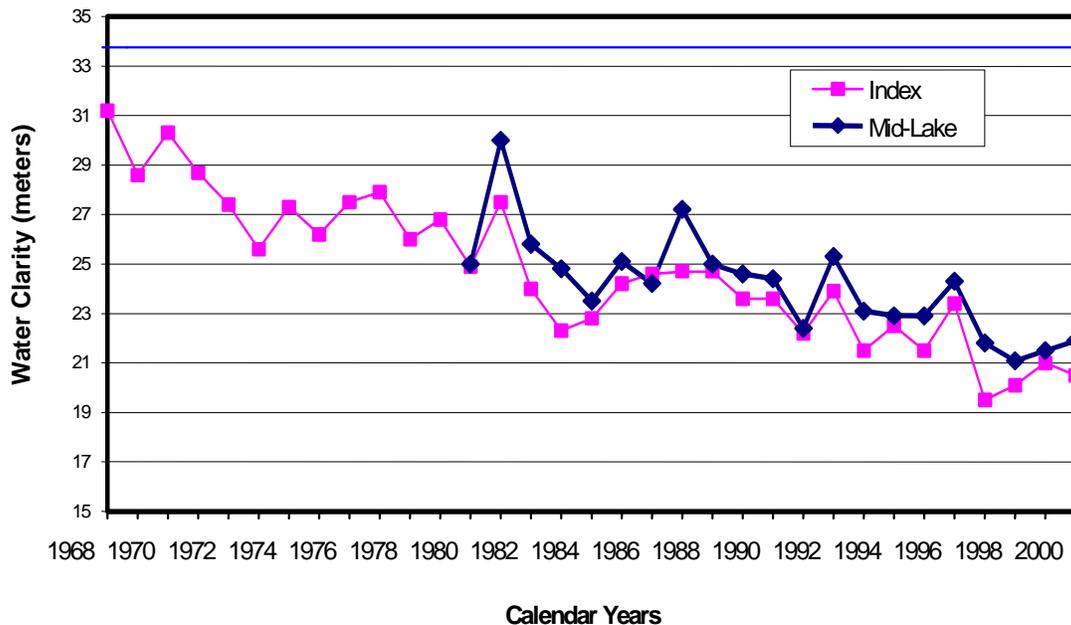


Note: Map locations are inaccurate on this figure. The Index Station is closer to the west shore (approximately 0.3 km SE of Tahoe Pines, CA; Latitude: 39 05.630 N, Longitude: 120 09.000 W). The Mid-Lake Station NE of the Index Station: Latitude: 39 09.220 N; Longitude: 120 02.120 W.

3. Results

The annual clarity at the index station has declined by 34 percent since 1968. The previous low annual clarity years of 1993 and 1995 (21.5 meters) at the index station were exceeded in 1997 (19.5 meters), with only slight improvements in the 1998–2000 period (20.1, 21.0, and 20.5 respectively (Figure 3-4). However, winter clarity was better in those years (25.8, 22.9, and 20.0 m, respectively). In the last four years winter clarity has shown more improvement than the annual clarity depths: 23.2, 24.7, 21.5 and 23.7 m for 1998–2001. A data table and statistics are provided in the Appendices for comparisons on an annual and winter basis for the entire period of monitoring. Monitoring data shows Lake Tahoe's clarity continues to decline. The Winter (December to March) Secchi depth has decreased by 29 percent, from 33.4 meters in 1968 to 23.7 meters in 2001 (Figure 3-5).

Figure 3-4. Annual Average Secchi Depth at Index Station and Mid-Lake Station, Lake Tahoe



4. Trends

Using the winter average Secchi, the trend before the 1988 implementation of the Regional Plan shows a greater slope of decreasing clarity (Figure 3-5; $y = -0.4273x + 873.33$, $R^2 = 0.57$) than does the 1988–2001 period (Figure 3-6; $y = -0.172x + 366.48$, $R^2 = 0.09$). These data ~~would~~ could suggest that the decrease in Lake clarity is slowing since the Regional Plan was implemented; however, the statistics for the second period are weak (see Appendices 3 and 4) and there is considerable variability in the seasonal data as discussed below. With the slow lake response time discussed below, it is difficult to say that the decrease in the rate of decline represents change towards an increasing secchi depth in the future. The mid-winter average was previously seen to represent the average conditions for clarity in the lake.

Figure 3- 5 Winter (Dec-Mar) Secchi Depth 1968-1987

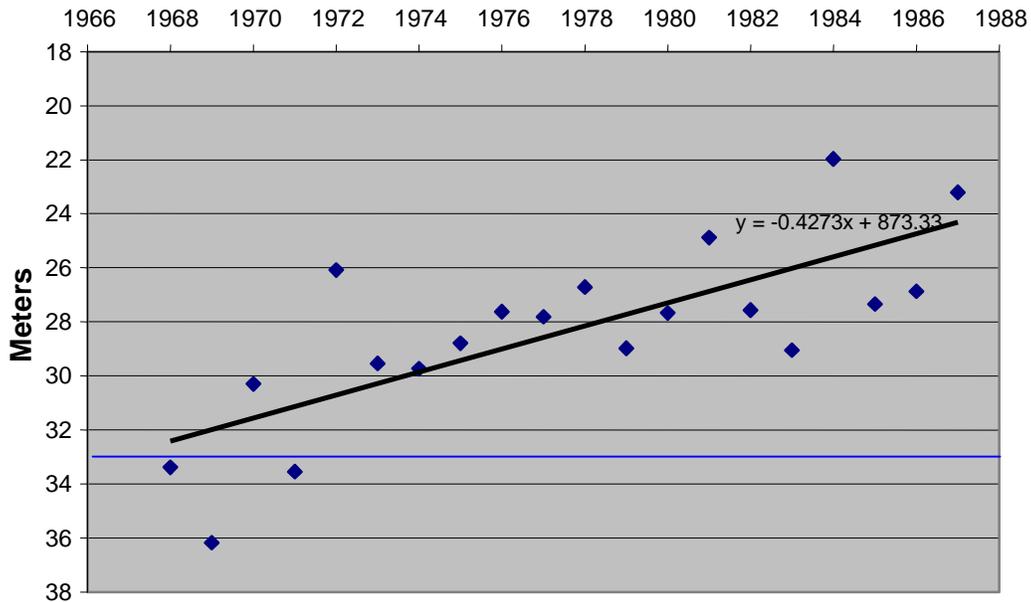
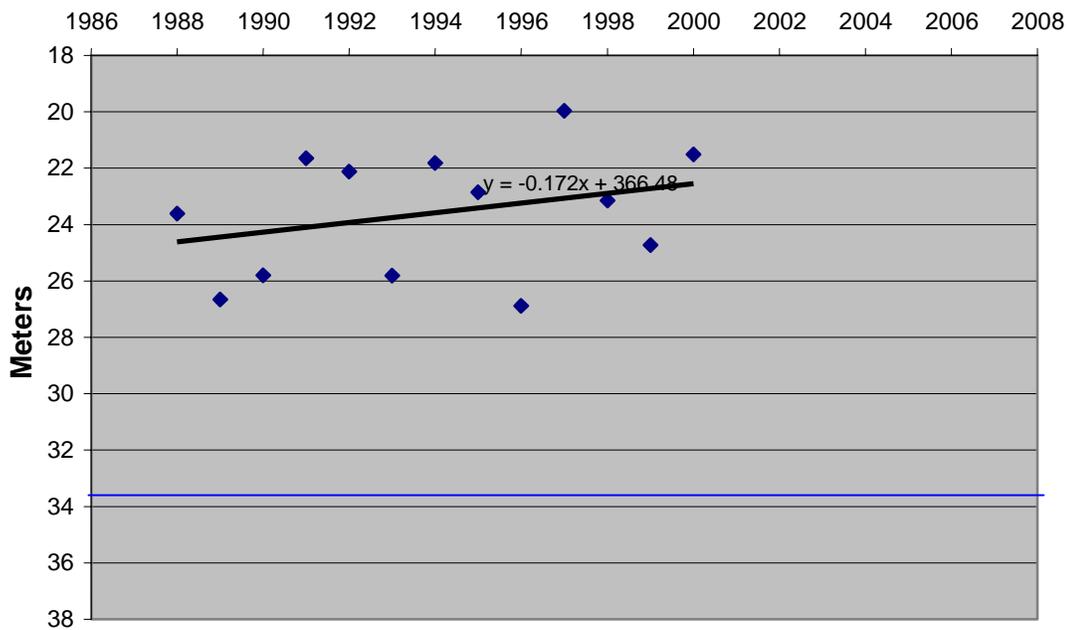


Figure 3- 6 Winter (Dec-Mar) Secchi Depth 1988-2000



Although there is considerable seasonal variability with measurements of Secchi depths, the long-term trend shows a continued decrease in clarity. The TRG has recent analysis from filtering the data to remove this seasonal effect and to accentuate variability at longer time scales (Jassby, *et al.* 1999). The results show a similar long-term decreasing trend, and point to significant changes before 1985, which was just prior to the time the Regional Plan was being developed. The slope of the overall annual average trend is -0.25 meters/year. This analysis did not

include 1998 and 1999, both of which are very low in comparison with other annual averages. These latest measurements correspond to high snowmelt and runoff years and indications of deep mixing in the lake, down to 450 meters. Many of the greater Secchi depths over the period of record have occurred in drought years and seasons where lake mixing is minimal. The January 2, 1997 flood was extremely significant in the Tahoe Basin, especially on the west and south shores. Other trends seen are in seasonal variation, where the strong annual minimum is around June, with a weaker low in December. The June decline can be attributed to cumulative discharge associated with snowmelt runoff and suspended sediment. While the December- March patterns tend to show the higher Secchi depths for the year, the December minimum was attributed to the deeper mixing accumulations from the fall. (Jassby *et al*, 1999).

5. Threshold Attainment Status

The attainment schedule for Secchi depth is not being met. The interim target of annual average Secchi depth of 22.7 meters in water year 2000 was not met at both the index and mid-lake stations. However, the index station winter averages have been greater than the interim targets for 1998, 1999, and 2001. It is important to remember, however, that the original attainment schedules for WQ-2 and WQ-3 may not be realistic in light of the Lake's 20-year response time discussed earlier in this evaluation. The Secchi depth continues to decrease as a trend over the last five years, with the largest drop in 1997 impacted by the New Year, 1997 rain-on-snow event and resulting flooding. Large bedload shifts occurred in west shore streams along with a rapid rise in mid-winter lake level. In the trend analysis by Jassby, the slope calculated of -0.25 m/yr may be a more realistic measure of attainment, as it removes the variability of seasonal effects and evaluates the long-term clarity record. The winter average rate of decrease before the 1987 Regional Plan, and the rate of decrease after that plan was in place may suggest that the situation is improving slowly. Annual Secchi depth for 1997-2000 (mean of 20.3 meters) has not recovered to pre-flood year readings of 1991-1996 (mean of 22.5 meters). The winter average data for the same periods may suggest more recovery, and would focus on the period of the actual 1997 flood event (mean of 22.3 meters since, and mean of 23.5 meters before the flood).

6. Effectiveness of Measures in Place

While the interim target from the 1996 Threshold Evaluation was not met, the winter average Secchi depth at the index station was greater than the interim target for 1998, 1999, and 2001. The compliance measures in place include the main water quality compliance measures at the end of this section. The trends since 1988, reflected in Figure 3-6, indicate that these compliance measures may be effective, but with a response lag time for Lake Tahoe of several decades, it cannot be stated with certainty at this time. The implementation of the EIP and the increased pace of water quality capital projects (see below) should accelerate the improvement in this threshold. Implementation of TMDLs and evaluation of EIP projects and other load reduction potential can provide greater confidence in the evaluation of this threshold using the water clarity model.

Category: water quality**Parameter: clarity, winter, pelagic Lake Tahoe**

1. STANDARD:

TRPA: average Secchi depth, December-March, shall not be less than 33.4 meters. California: Secchi disk transparency shall not be decreased below levels recorded in 1967-71 based on a comparison of seasonal and annual mean values.

2. INDICATOR (UNITS): Secchi depth, ~~annual~~ winter average; TRG index station (meters).3. MONITORING SUMMARY: The Tahoe Research group conducts regular monitoring of Secchi depth at the TRG index station, approximately once every ten days, and at the mid-lake station every 21 days.4. ATTAINMENT STATUS: Non-attainment. Secchi depths have shown a gradually decreasing trend over the period of record. However, the mid-winter average shows a distinct slowing in the decreasing trend since 1988, as compared with that for 1968 to 1987. Clarity was in attainment for the interim performance target of 20.7 meters for Water Year 1995.5. TARGET DATE: After 2020 (estimated)

6. EVALUATION INTERVAL: Annual

7. INTERIM TARGETS: ~~Pending completion of a water clarity model for Lake Tahoe, currently the subject of research and development, a realistic, measurable interim goal is a reduction in the rate of decline in pelagic zone clarity, based on diminishing nutrient loads from tributary streams, groundwater, and atmospheric sources.~~ Annual average Secchi depth at the TRG index station shall not be less than 22.7 meters in WY 2000. This interim target was not met by the winter average for 1998, 1999, and 2001. A target for the next evaluation period is 24.0 m, winter average, and 23.0m for the annual average (Also see WQ-2-A and WQ-2-B compliance forms for additional mitigation interim targets for this threshold indicator). ~~Lake Tahoe attains the interim target for WY 1995.~~ By December 31, 1996-1997, TRPA shall report on the development of a clarity model for Lake Tahoe.

~~By December 31, 1997, TRPA shall report on the feasibility of using depth-to-mixing of Lake Tahoe to establish new interim targets for Secchi depth.~~

8. COMPLIANCE MEASURES: Compliance Measures have been reworked for a complete listing see Table 3-6. (See Section II for inventory)

a. MEASURES IN PLACE:

~~Urban Runoff and Erosion: 01 through 16, inclusive
Airborne Nutrients: 12, 18, 19, and 20
Waste Management: 21, 22, 23, 24, 25, 26, and 28
Natural Area Management: 30, 31, 32, 34, 35, 36, 37, and 38
Lake Tahoe and the Shorezone: 42, 43, 44, and 45~~ 1-20, 26-30, 43-46, 56-59, 78-81, 93, 129, 214.

b. EFFECTIVENESS OF MEASURES IN PLACE: The compliance measures in place include the main water quality compliance measures of the Regional Plan. The implementation of the EIP and the increased pace of water quality projects should accelerate improvement in this threshold. See Table 3-6 for details. ~~Although the interim performance target was attained, the 1996-Evaluation recommends implementation of the Environmental Improvement Program (EIP), and continued implementation of the Stream Restoration Program (SEZRP) and the Capital Improvements Program, which includes fifty high-priority projects, which will include the results of the revegetation "head-start" program, and other changes to the compliance measures in place.~~

c. SUPPLEMENTAL MEASURES:

~~Urban Runoff and Erosion: 01, 02, 04, 05, 08, 09, 10, 11, and 12
Natural Area Management: 19, 20, and 21~~

~~Lake Tahoe and the Shorezone: 22~~

d. EFFECTIVENESS OF

~~SUPPLEMENTAL MEASURES: To strengthen efforts to attain this threshold, the 1996-Evaluation recommends implementation of supplemental measures 01 (restrictions on rate and/or amount of additional development), 02 (improved public education efforts as it relates to BMPs~~

~~and fertilizer use), and 07 (increased funding for CIP) as high priority action items.~~

9. ADEQUACY OF COMPLIANCE

MEASURES: Compliance measures in place contributed to a unknown degree to the attainment of the interim performance target. However, Lake Tahoe remains in non-attainment of the underlying threshold, and will not be in attainment for many years.

~~The 1996 Evaluation recommends implementation of supplemental measures as a high priority. Long term monitoring will be necessary to determine the adequacy of the combined compliance measures.~~

C. WQ-2A: CAPITAL IMPROVEMENT PROGRAM

1. Evaluation Criteria

As a related factor to the deep-water clarity of Lake Tahoe, progress on Capital Improvement Projects for erosion control and restoration is tracked. Each local government or jurisdiction (Caltrans, NDOT, USFS, and cities/counties), is compiled of the following:

- 1) total expenditures on projects, including operations and maintenance;
- 2) miles of road shoulder treated with erosion control and runoff practices;
- 3) area (in acres) of public right-of-way treated with erosion control and runoff practices.

2. Measurement and Monitoring

Completion of erosion control projects has been documented primarily through the adjustment of the Water Quality Scores in a project area and, more recently, in the update of the EIP. For completion of erosion control projects and relative projects costs since 1988, see Table 5 of the Appendix. The completion of a database linked to the EIP will now allow submitted projects to input threshold indicator and units of benefit achieved by the project completion relative to threshold attainment. See section VI on EIP integration for full discussion of units of benefit.

In addition, several new indicators have been identified to further quantify specific erosion control treatments and their impacts (see Table 3-4). The miles of road shoulder treated and acres of right-of-way treated have not been extracted from individual projects, although the California Tahoe Conservancy (CTC) has cumulative accounting for the years 1988–2000 for their funded projects in the two California counties, and the City of South Lake Tahoe. Data from the United States Forest Service – Lake Tahoe Basin Management Unit (USFS-LTBMU) projects is not available at this time, although erosion-control grant funding to counties and CSLT has been tracked since the inception of that program in the 1980's. A uniform data reporting and tracking system is needed, but is not in place at this time. A second generation of benefit units would involve loading reductions from specific BMPs and treatments within projects, relative to the required load reductions for lake clarity.

3. Results of Measurement and Monitoring Efforts

The cumulative table for expenditures on erosion projects shows that a total of approximately \$89,000,000 has been spent by local jurisdictions, not including any operations and maintenance (see Table 5 in the Technical Appendices). Not all constructed projects are reflected in this list as it is ~~compiled~~ compiled from those projects submitted each year by the implementing agency, and only those projects in residential zoning will reflect a change to the water quality score. However, Caltrans, NDOT, and USFS-LTBMU implemented water quality projects have not been part of that reporting process. The water quality elements of commercial and redevelopment types of projects would be large additions to the list, when those can be documented. The EIP Integration section of this chapter discusses water quality elements incorporated in other threshold projects and information needs for

project tracking. At this time there is no tracking/reporting system that provides information on project benefits, such as those listed for this threshold section. We anticipate that seven of eight local jurisdictions will meet the 1996 interim targets for expenditures (Table 3-4). Calculation of water quality project totals for the USFS is more complex, since there are expenditures in several budgetary programs that have water quality elements and support water quality projects. The USFS erosion control grant program totaled \$14,808,430 between 1988 and 2001 for project completion, \$2,448,425 since 1996; most of these projects are accounted for in the project list in Appendix Table 5. However, there are many instances of more than one name being used for the same project, which makes reporting difficult at this level.

Table 3-4. Summary of Water Quality Capital Project Expenditures Since 1996 Threshold Evaluation

Jurisdiction/Unit	1996 Expenditure Target	Expenditures through 2001 Construction
City of South Lake Tahoe	\$ 5.2 million	\$ 5,789,714
El Dorado County	\$ 3.0 million	\$ 7,093,350
Placer County	\$ 10.0 million	\$ 11,837,658*
Washoe County	\$ 4.0 million	\$ 6,107,022
Douglas County	\$ 4.0 million	\$ 5,169,360
Caltrans	\$ 5.5 million	\$ 4,567,000*
Nevada DOT	\$ 4.7 million	\$ 10,907,860
USFS-LTBMU	\$ 4.5 million	Unknown, EC grants since 1996 \$2,448,425
*2001 Project Cost, and other data expected to meet target by December 31,2001		

The CTC summary for erosion control projects did not track miles of roadway treated, but did provide totals for miles of drainage treated and area of source control or revegetation. The 1988–2000 totals for the three local California jurisdictions are as follows: 18.0 miles of rock-lined and vegetated channels; 106.0 miles of roadside drainage facilities (curb, gutter, and pipe); 127 acres of revegetation; and 3.0 miles of retaining walls. In addition 396 sediment traps and basins were installed over the same period. The 1995 Water Quality Report stated that a total of 36.2 public right-of-way miles had been treated. Since 1995, approximately 7.4 of additional highway right-of-way miles have been treated with up to 4.25 miles under construction during the 2001 season. Those highway projects included an additional 21.5 acres of source control since 1995. Local Nevada jurisdictions data is not available for local rights-of-way miles treated since 1995. Several local jurisdiction water quality projects are scheduled to be under construction during the 2001 season.

Table 3-5. Water Quality Thresholds CIP Mitigation Measures and Proposed Project Units of Benefit					
Threshold	Description	Parameter	Standard	Interim Targets	Units of Benefit
WQ-1	Shallow waters of Lake Tahoe	Turbidity, shallow waters of Lake Tahoe	Decreases sediment load as required to attain turbidity values not to exceed 3 NTU in littoral Lake Tahoe. In addition, turbidity shall not exceed 1 NTU in shallow waters of Lake Tahoe not directly influenced by stream discharges.	NA. Implementation of related research program on turbidity, direct runoff, and shorezone erosion and recommended load reductions.	Reductions in sediment/nutrient discharge to the lake.
WQ-2	Deep waters of Lake Tahoe	Clarity, winter, pelagic Lake Tahoe	Average secchi depth, December-March, shall not be less than 33.4 meters. (Secchi)	Annual average Secchi depth shall not be less than 22.7 meters in water year 2000.	Reductions in sediment/nutrient discharge. Watersheds where clarity model applied based on needed load reductions.
WQ-2A	Capital Improvement Program	Deep waters of Lake Tahoe	Clarity, winter, pelagic Lake Tahoe. (CIP; C. Road BMP; D. Trail BMP; E. Slope Stabilization/Revegetation; F. Runoff Treatment)	From January 1, 1997 to December 2001, total expenditures on Capital Improvement Projects. Total phosphorus concentrations shall not exceed established forecast lines. TRPA shall prepare a mitigation plan of urban runoff at the point of discharge.	Acres treated for source control. Miles of roads BMP. Miles of trail BMP. Acres of source control treated. Miles of drainage conveyance treated, should change to load reductions.
WQ-2B	Best Management Practices	Deep waters of Lake Tahoe	Clarity, winter, pelagic Lake Tahoe. (Res. BMP)	By December 31, 2001, 35 percent of the properties shall have BMPs in place, and 30 percent have revegetation of disturbed areas.	% of BMP's installed by jurisdiction
WQ-3	Water quality	Phytoplankton Primary Productivity	Annual mean phytoplankton primary productivity shall not exceed 52gC/m ² /yr. California: algal productivity shall not be increased beyond levels recorded in 1967-1971, based on a statistical comparison of seasonal and annual mean values.	Annual mean phytoplankton shall not exceed 140 gmC/m ² /yr. For water year 2000.	Load reductions for Nitrogen, Phosphorus, and Iron.

Table 3-5. Water Quality Thresholds CIP Mitigation Measures and Proposed Project Units of Benefit					
Threshold	Description	Parameter	Standard	Interim Targets	Units of Benefit
WQ-4	Tributaries	Tributary water quality	California: total nitrogen (0.19mg/l), total phosphorus (0.15mg/l) and total iron (0.03mg/l annual average). Nevada: soluble phosphorus not to exceed 0.007mg/l annual average, soluble inorganic nitrogen not to exceed 0.025mg/l annual average. TRPA: attain a 90th percentile value for suspended sediment of 60mg/l.	Total phosphorus concentrations shall not exceed established forecast lines.	% of watershed treated (BMPs, SEZ; water quality; slope stabilization)
WQ-4A	Tributaries	Tributary water quality	Reduce sedimentation	% of 1 inch / hr storm	Volume of runoff treated or reduced
WQ-5	Stormwater runoff quality	Surface discharge to surface water	TRPA threshold-dissolved inorganic nitrogen, 0.5mg/l; dissolved phosphorus, 0.1 mg/l; dissolved iron, 0.5mg/l; suspended sediment, 250mg/l; grease and oil, 2 mg/l.	TRPA shall prepare a mitigation plan of urban runoff at the point of discharge.	Miles of roadways treated; acres of intervening areas treated;
WQ-6	Stormwater runoff quality	Surface discharge to groundwater	Surface water infiltration into the groundwater shall comply with the Uniform Regional Runoff Guidelines. For total nitrogen, 5mg/l; total phosphorus, 1mg/l; total iron, 4mg/l; turbidity, 200 NTU; and grease and oil, 40 mg/l.	TRPA shall prepare a mitigation plan for urban runoff at the point of discharge.	Same as above and: volume of runoff infiltrated, add quality of pretreatment and water quality of infiltrated water (characterization of urban runoff).
WQ-7	Other Lakes	California-Nevada Other Lakes	For other lakes in Nevada, the standards are the same as the tributary standards.	TRPA shall determine the status of developing standards by September 2006.	No degradation from 1991 to 1995 other lake studies

4. Trends

There is a trend to increase the rate of project implementation, in particular through the Environmental Improvement Program and a funding focus through the state and federal governments. The local revenue generation component of the EIP is not yet in place, but will focus primarily on project maintenance. However, there is a need for more emphasis on the quality of treatment in water quality projects for removing fine particulates and phosphorus in relation to lake clarity and this threshold element.

5. Threshold Attainment Status

Non-Attainment for interim expenditure targets from 1996 Evaluation. The attainment schedule for Secchi depth is discussed under WQ-2 above. Once the Water Clarity Model and requirements for load reductions and Total Maximum Daily Loads are established, it will be possible to make better evaluations of the benefit of particular water quality capital projects towards improving lake clarity.

6. Effectiveness of Measures in Place

The main compliance measures for this sub threshold are 5, 7, 17, 20, and 21 in Table 3-6. Increased emphasis on the quality of runoff treatment in these capital projects to remove fine sediment and phosphorus should improve the effectiveness of these measures. Use and reporting of units of benefit and load reductions for water quality capital projects will provide a better measure of the effectiveness of measures in place for this threshold element.

Category: water quality

Parameter: clarity, winter, pelagic Lake Tahoe

1. STANDARD:

TRPA: average Secchi depth, December-March, shall not be less than 33.4 meters. California: Secchi disk transparency shall not be decreased below levels recorded in 1967-71 based on a comparison of seasonal and annual mean values.

2. INDICATOR (UNITS): As a related factor, progress on the Capital Improvements Program for Erosion and Runoff Control (now Water Quality EIP, WQEIP). For each local unit of government, Caltrans, NDOT, and the U.S. Forest Service: (1) total expenditures on WQEIP projects, including operations and maintenance; (2) miles of road shoulder treated with erosion and runoff control practices; and (3) area of public right-of-way treated with erosion and runoff control practices (acres).

3. MONITORING SUMMARY: TRPA monitors implementation of the CIP through project planning, funding, design, permitting, inspection, and coordination; and will now request units of benefit data on miles and acres of treatment applied to projects. The completion of the EIP update will allow this information to be linked to the GIS database to provide a tracking /reporting system for project benefits. ~~TRPA gathers data in the field on miles and acres of public right-of-way treated~~
~~TRPA participates in the regional technical advisory committee for erosion and runoff control, and is currently developing a needs assessment for public right-of-ways for the entire Tahoe Region. This information is stored on the GIS and will help prioritize future projects. Based on TRPA's current finance plan adjusted to 1996 dollars, and using a 10-year schedule (to coincide with the 208 Plan date) the local government needs are adjusted to 60% of the projected cost. This percentage reflects an assumption of state and local costs. The remaining 40% is a proposed federal contribution and is not yet secured.~~ The figures below will adjust with an update of the 208 plan and development of the Environmental Improvement Program finance plan.

4. ATTAINMENT STATUS: ~~* Non-attainment (tentative) for 1991. Currently six of the eight jurisdictions meet the target for expenditures on capital improvement projects.~~

~~* Since the target date is through December 31, 1996, final expenditures will not be available until early 1997.~~

Non-attainment, although five out of eight jurisdictions have met target expenditures, see Table 5 in the appendix for details. Caltrans has recently finished a master plan for project implementation. The USFS erosion controls grants are distributed through the counties, and it is difficult to extract only the water quality projects. The soil conservation threshold does not track project expenditures outside of SEZ, so the USFS projects related to water quality are included here.

The interim target should be revised to reflect the completion of the EIP update and associated database for tracking of benefit units. New interim target will focus on specific units for WQ-2A thru F, (see Section VI table of Benefit Units).

5. TARGET DATE: ~~For indicator (1), from January 1, 1997 to December 31, 2001:~~
~~City of South Lake Tahoe: \$5.2 million~~
~~El Dorado County: \$3.0 million~~
~~Placer County: \$10.0 million~~
~~Washoe County: \$4.0 million~~
~~Douglas County: \$4.0 million~~
~~Caltrans: \$5.5 million~~
~~NDOT: \$4.7 million~~
~~USFS-LTBMU: \$4.5 million~~

INTERIM TARGET DATE: For indicator (1), by December 31, 2006 is difficult to set due to other program elements incorporated into Water Quality Threshold EIP projects. Although EIP implementation is expected to accelerate project the pace of project completion, there are gaps in project funding and breakout of project elements for water quality benefit *per se*. Project applications will include the units of benefit identified for EIP, and will be evaluated on a yearly basis as part of the water quality scores update process. There will be no less than 50% WQ EIP implementation in each jurisdiction for the next evaluation period.

6. EVALUATION INTERVAL: Annual, in conjunction with IPES and water quality scores update. By 2002, additional tracking

will be formulated to address those projects not tied to IPES scoring, specifically, CALTRANS, NDOT, and the USFS.

7. EFFECTIVENESS OF MEASURES: The tracking of expenditures on projects does not provide sufficient information related to the units of water quality benefits per project completion. The addition and expansion of WQ-2 for such units, and the inclusion to the EIP database will provide a better measure of the effectiveness for this element to the threshold.

D. WQ-2-B: BEST MANAGEMENT PRACTICES

1. Evaluation Criteria

A key component of the TRPA Best Management Practice (BMP) Retrofit Program is controlling nonpoint source pollution through the application of BMPs on all developed properties in the Tahoe Basin, including residential, commercial, industrial, and public service properties. Retrofitting existing development with appropriate BMPs has been identified as a critical component for controlling and treating urban runoff. Implementation of permanent, developed parcel BMPs and revegetation of disturbed areas, particularly on residential properties, has shown a substantial increase since the 1996 TRPA Threshold Evaluation. For example, during the short five and one-half month field season in 2000, BMP prescriptions for 628 properties were performed, BMPs implemented on over 120 properties, and an estimated 4,600 stakeholders were contacted.

2. Measurement and Monitoring

To track the implementation of BMPs, TRPA previously employed the use of a stratified random survey on a selected number of parcels to ascertain BMP implementation throughout the Basin. The primary objective of the survey was to determine the percentage of developed properties that have installed permanent BMPs. The survey included evaluation of a combination of different land uses such as residential, commercial, public service, tourist and recreation properties. The survey was conducted in 1989, 1990, 1993, 1995, and 1999. Parcels were evaluated using specific criteria to assess the extent of water quality treatment present. Major BMP treatment categories included revegetation of disturbed areas, surface runoff treatment, paved driveways, and roof drip line infiltration trenches.

There aren't any statistically significant correlations that can be derived from the previously employed random survey method. The main problem with the previous surveys was that there was no quantitative comparison between the number of developed parcels and those with BMPs installed (and maintained).

3. Results of Measurement and Monitoring Efforts

Recognizing that the analysis for assessing BMP implementation was inadequate, the methodology for tracking implementation of permanent BMPs was completely redesigned. The BMP tracking system program was redesigned to incorporate actual field implementation and evaluation data as opposed to using a random survey. Currently, installations are tracked in near real-time monitoring (RTM) by continuously inputting them into a *Microsoft Excel* database. A preliminary review of the data for BMP installations shows:

- BMP implementation in Washoe County is estimated at 65 percent.
- There are 16,160 developed parcels in El Dorado County; of those, approximately 21 percent have been improved with BMPs since 1989.
- In Placer County there are 10,269 improved parcels; 27.5 percent have BMPs.
- Of the 4,002 developed parcels in Douglas County, 20 percent are anticipated to have BMPs in place by fall 2001.

In evaluating BMP implementation successes, emphasis has shifted from the use of a randomly generated “drive-by” survey to using actual statistical data on BMP implementation derived from a combination of sources including local jurisdictions (e.g., city and county MOU data) and TRPA’s in-house Tahoe Environmental Geographic Information System (TEGIS) database. This improved analysis of BMP implementation will ultimately give a more accurate picture of region-wide retrofit statistics.

Towards this end, data from the Excel database is linked with data from the TEGIS database; this data is then assimilated with information from 5,000+ site visits to create a seamless spatial geographic database. There are approximately 60,000 parcels in the Tahoe Basin, the TEGIS database contains approximately 28,000 permit records. The end product of this work is the creation of neighborhood-specific digital maps that can be spatially analyzed and queried for areas of BMP needs. The goal behind this exercise was to enable project managers to focus personnel resources to urban areas with runoff problems and neighborhoods in need of BMPs. These maps can be made available to the public through local building and planning departments. Maps also may be distributed to local real estate and appraisal firms so that BMPs will be assigned a value and thus be economically driven.

4. Trends

The trend towards increased BMP implementation and maintenance is assisted by the efforts described below.

Interagency Coordination: A multi-agency collaborative task force has been formed comprised of the Resource Conservation Districts (RCDs), Natural Resource Conservation Service (NRCS), the University of Nevada Cooperative Extension, and TRPA’s Erosion Control Team, to provide services that protect and enhance the water quality of Lake Tahoe through BMP assistance and education.

BMP Operations & Maintenance Program: TRPA’s Erosion Control Team has developed a long-term project maintenance program. The program consists of planning and implementation phases. The planning phase entails developing a framework to create, track, and implement maintenance programs for all types of activities and projects. This includes everything from street sweeping to sediment basin cleaning. The planning phase also involves identification of long-term funding sources to support the long-term maintenance program. Emphasis is on developing a program to monitor and maintain BMP effectiveness for all projects, with a focus on water quality. The planning phase will be coordinated with the BMP retrofit program to track and monitor the non-point discharges related to erosion control, land restoration, BMP retrofits, and other water quality-related projects and activities. The implementation phase will involve coordination, monitoring and tracking of the maintenance and functionality of the projects and activities.

In addition, TRPA staff will continue to coordinate efforts of sewer agencies in the Basin in evaluating their infrastructure and seeking financial assistance for a regional sewer line rehabilitation to prevent discharges.

5. Threshold Attainment Status

The previously established criteria for this threshold were based on the foundation of a randomly generated survey used to measure BMP implementation. With the development of the completed redesigned survey, which captures meaningful data on actual BMP implementation, there is a more accurate tool to assess Basin-wide implementation of BMPs.

The 1996 Threshold Evaluation established an interim target of 35 percent revegetation of disturbed areas and 40 percent implementation of BMPs for developed properties. A preliminary review of statistical permit and BMP retrofit data suggests that BMP installation in El Dorado and Placer Counties is closer to 25 percent. However, it is important to note that both of these counties have a small number of Priority One Watersheds. The majority of Priority One Watersheds are located in Washoe County. A review of data indicates that BMP implementation in Washoe County is estimated to be 65 percent. Douglas County is anticipated to have 20 percent BMP implementation at the end of the 2001 construction season. Overall, it is estimated that 30 percent of developed parcels (including revegetation on those parcels) in the Tahoe Basin will have BMPs in place by the end of the 2001 field season.

6. Effectiveness of Measures in Place

This program has achieved measurable results in many different nonpoint source pollution prevention management measures from increased community involvement and awareness of stormwater runoff to on-the-ground water quality improvements. Another key feature built into our nonpoint source program is that it is designed to be flexible and adaptable over time.

Since the success of the TRPA BMP Retrofit program is used to determine long-term water quality trends and minimize the impacts of nonpoint source pollution, consistent, secure funding is imperative to ensure that this program continues on a robust path of education and outreach. The program includes BMP implementation, near real-time tracking of installations, and monitoring for BMP effectiveness. This nonpoint source grant funding serves to augment our baseline funding to provide additional incentives to private property owners to install measures to control and treat stormwater runoff.

An improved and “upgraded program” will incorporate the mission of a unified, coordinated Basin-wide approach to dealing with the control and prevention of polluted runoff. Therefore, the BMP Retrofit Program will incorporate a broad-based nonpoint source pollution prevention approach utilizing the above-referenced management measures.

Specifically, future goals include:

- Update the TRPA Handbook of Best Management Practices, which is Volume II of the 208 Plan
- Target 80 percent BMP implementation in priority 1 and priority 2 watersheds by October 15, 2006
- Create a programmatic mechanism to provide data to Project Review to ensure the availability of data for permitting decisions and for future county/city/TRPA management measures
- Procure additional funding to meet federal requirements associated with the National Pollutant Discharge Elimination System (NPDES) Phase II guidelines, prior to March 10, 2003.
- Promote long-term interagency coordination
- Evaluate the effectiveness of individual Best Management Practices
- Investigate new technologies to treat stormwater runoff

Category: water quality

Parameter: clarity, winter, pelagic Lake Tahoe

1. STANDARD:
TRPA: average Secchi depth, December-March, shall not be less than 33.4 meters. California: Secchi disk transparency shall not be decreased below levels recorded in 1967-71 based on a comparison of seasonal and annual mean values.
2. INDICATOR (UNITS): As a related factor, progress on implementation of Best Management Practices (BMPs). Based on a stratified random survey of residential, commercial, public service, and recreation properties, the percentage of properties with: (1) BMPs in place in accordance with the Handbook of Best Management Practices, and (2) revegetation of areas disturbed (e.g., denuded or compacted without structures) as of July 1, 1989.
3. MONITORING SUMMARY: Previous surveys were conducted in 1989, 1990, 1993, ~~and 1995, and 1999.~~ TRPA has redesigned the tracking system for implementation of BMPs to using statistical data generated through the Erosion Control Team. Data in excel sheets are linked to the TEGIS system and parcel database for region wide retrofit status. ~~TRPA visited parcels from a random selection of one percent of the assessors' lists parcels in the Tahoe Region. TRPA evaluated parcels for compliance with BMP requirements in five categories: (1) paving, (2) drainage conveyance, (3) stabilization, (4) treatment of surface runoff, and (5) revegetation.~~
4. ATTAINMENT STATUS: ~~Attainment for 1994 interim target.~~ Non-Attainment using statistical data indicates 25% BMP Installation in El Dorado and Placer counties, 65% for Washoe, and 20% in Douglas county. Basin wide BMP implementation is 30%.
5. INTERIM TARGET DATE: The interim target from the 1996 Evaluation set a goal of 35% revegetation of disturbed areas and 40% for developed properties. Continued tracking should provide additional data to be reviewed yearly, and complied with water quality scores update in January. ~~For indicator (1), by December 31, 2001, 40~~

~~percent of properties in the survey. For indicator (2), 35 percent of properties in the survey.~~ By December 31, 2006 projected for 80% of developed parcels in priority 1 and priority 2 watersheds that need site evaluations and potentially BMP implementation (based on known developed parcels, security returns, and known BMP implementation): 1) BMP site evaluations / implementation targets are as follows: Douglas County 156 parcels; Washoe County 2694 parcels; Placer County 2796 parcels; City of South Lake Tahoe 7679 parcels; and El Dorado County 4291 parcels; 2) Revegetation of disturbed areas of disturbed areas has not been tracked, but is a component of each BMP retrofit assessment/implementation, erosion control CIP, and restoration project. Thus the target for revegetation will be set the same as for implementation of BMPs.

6. EVALUATION INTERVAL: Annual

7. EFFECTIVENESS OF MEASURES IN PLACE: The BMP Retrofit Program has greatly accelerated the pace of BMP installations and in non point source pollution prevention through increased community involvement and awareness of runoff to on the ground water quality improvements.

E. WQ-3: PELAGIC LAKE TAHOE, PHYTOPLANKTON PRIMARY PRODUCTIVITY

1. Evaluation Criteria

NUMERICAL STANDARD: Reduce dissolved inorganic nitrogen (N) loading from all sources by 25 percent of the 1973-81 annual average. Achieve the following long-term water quality standards:

Annual mean phytoplankton primary productivity (PPr) : 52gmC/m²/yr.

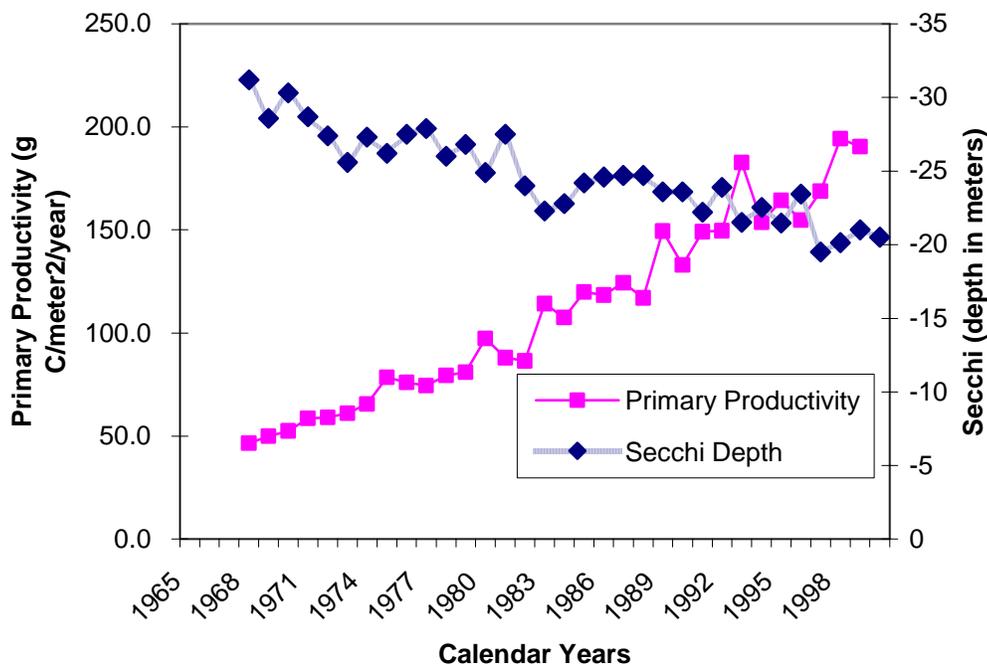
MANAGEMENT STANDARD: Reduce the loading of dissolved phosphorus, iron, and other algal nutrients from all sources as required to achieve ambient standards for primary productivity and transparency.

Load reductions as described under management standard for WQ-1.

2. Measurement and Monitoring

The Tahoe Research Group has collected phytoplankton primary productivity in conjunction with Secchi Measurements at the Index Station since 1968.

Figure 3-7. Primary Productivity and Secchi Depth



3. Results of Measurement and Monitoring Efforts

The annual total PPr is plotted against Average Annual Secchi in Figure 3.7. The measurement for 1968 was 46.5 grams of carbon per meter squared per year (g C/meter²/yr), and has steadily increased, with a high of 196.2 in 1998. A large increase from 1997 to 1998 corresponds to the return of deep mixing in the lake, greater than 400 meters. The flood event of January 2, 1997 is also assumed to have significantly contributed to sediment and nutrient loads, although not all tributaries experienced the same level of loading. These are only a few of many

important variables involved in phytoplankton growth response. Other physical factors such as temperature variations and weather and wind patterns also have dramatic influence on this threshold.

4. Trends

The continued upward trend of PPr matches inversely with the decrease of Secchi depth, indicating there is still work to be done for improvement of lake clarity. Goldman, et al. (1989) shows that the result of a model of depth of mixing versus primary productivity accounts for 54 percent of the inter-annual variability. A median peak marks the seasonal pattern in July and a minimum in January (*Watershed Assessment*, 2000) The complexity of a lake of this size and depth is evidenced by the number and scope of projects under way by several universities and research facilities. The year 2000 Annual Progress Report from the University of California, Davis outlines current investigations in the components of the Clarity Model they are working on. The Particle Size Characterization and the Optical Model are integral to the larger model and both relate to primary productivity.

5. Threshold Attainment Status

The algal productivity (PPr) of the pelagic zone of Lake Tahoe does not meet the TRPA threshold of 52 grams C/m²/year (annual average). In addition, PPr did not meet the interim performance target stated in the 1996 evaluation of 140 gm C/m²/yr. The interim target for the development of a clarity model is underway and is nearing completion. This research will also be tied to an Airshed Model and newly identified projects funded through the State of California. The depth to mixing against PPr values was published in the *Watershed Assessment* (see Figure 3-7); however, the mixing depth inter-annual variability only and cannot be used to establish interim targets. The PPr trends along with clarity trends may help to predict reasonable interim targets.

6. Effectiveness of Measures in Place

Although inorganic nitrogen loading is specifically referred to in the numerical and management standards for this threshold, PPr has been shown to be phosphorus-limited in the last several years. While most of the main water quality compliance measures technically apply to this threshold, those that have the greatest potential to reduce phosphorus loading could be most effective (such as those for water quality capital projects, especially for roadways and developed intervening areas). It is difficult for both Secchi Depth and PPr to link the effectiveness of measures in place due to the long residence time and complexity of lake chemistry. The scale of specific on the ground erosion control projects and other efforts do not lead to direct indications of clarity improvement. The update of the EIP and the addition of mitigation measures C - F and proposed benefit units to the WQ-2 threshold. Benefit Units (refer to Table 3-5) and potential load reductions based on TMDLs should greatly improve the link of projects and BMP implementation to lake clarity.

Category: water quality
Parameter: phytoplankton primary productivity (PPR), pelagic Lake Tahoe.

~~By December 31, 1997, TRPA shall report on the feasibility of using depth-to-mixing and primary productivity values of Lake Tahoe to establish new interim targets for Primary productivity.~~

1. STANDARD: TRPA: annual mean phytoplankton primary productivity shall not exceed 52 gC/m²/yr.
California: algal productivity shall not be increased beyond levels recorded in 1967-1971, based on a statistical comparison of seasonal and annual mean values.
2. INDICATOR (UNITS): Phytoplankton primary productivity, annual average, measured at the TRG index station (gC/m²/yr).
3. MONITORING SUMMARY: The Tahoe Research Group conducts regular monitoring of PPR at the index station approximately every ten days.
4. ATTAINMENT STATUS: Non-attainment. PPR at the index station has been steadily increasing over the period of record. Attainment will be difficult due to the complexity of lake chemistry, and the slow response time of the Lake. ~~For details, see the 1996 Evaluation. Lake Tahoe does not attain the long-term standard or the interim target.~~
5. TARGET DATE: After 2021 (estimated) ~~(estimated)~~
6. EVALUATION INTERVAL: Annual
7. INTERIM TARGETS: Pending completion of a water clarity model for Lake Tahoe, currently the subject of research and development, a realistic, measurable interim goal is a reduction in the rate of increase in pelagic zone primary productivity, based on diminishing nutrient loads from tributary streams, groundwater, and atmospheric sources.
The proposed interim target is 170 gm C/m²/yr. This is a more realistic and achievable target until the completion of the clarity model. This target was met in 1994-1997. For Water Year 2000, annual average PPr at the TRG index all not exceed 140 gmC/m²/yr.
~~By December 31, 1996-1997, TRPA shall report on the development of a clarity model for Lake Tahoe.~~

8. COMPLIANCE MEASURES: The compliance measures have been reworked, for a complete listing see Table 3-6. in 2001 Threshold Evaluation (See Section II for inventory)
 - a. MEASURES IN PLACE: ~~Urban Runoff and Erosion: 01 through 16, inclusive Airborne Nutrients: 17, 18, 19, and 20 Waste Management: 21, 22, 23, 24, 25, 26, and 28 Natural Area Management: 30, 31, 32, 34, 35, 36, 37, and 38 Lake Tahoe and the Shorezone: 42, 43, 44, and 46 Same as WQ-2 with: 48 and 49.~~
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The compliance measures in place include the main water quality compliance measures of the Regional Plan. Algal productivity exceeded the short-term forecast line every year since 1984. ~~The 1996 Evaluation recommends strengthened public awareness and involvement, especially in the area of BMPs and fertilizer use, implementation of the Capital Improvements Program's top fifty projects, including information from the revegetation "head start" program, and other changes to the compliance measures in place.~~
 - ~~c. SUPPLEMENTAL MEASURES: Urban Runoff and Erosion: 01 through 12, inclusive Airborne Nutrients: 13, 14, and 15 Waste Management: 16, 17, and 18 Natural Area Management: 19, 20, and 21 Lake Tahoe and the Shorezone: 22~~
 - ~~d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: To strengthen efforts to attain this threshold, the 1996 Evaluation recommends implementation of supplemental measures 01 (restrictions on rate and/or amount of additional development), 02 (improved BMP implementation/enforcement program), 03 (additional restrictions on fertilizer use), and 07 (increased funding for CIP) as high priority action items.~~

9. ADEQUACY OF COMPLIANCE

MEASURES: Compliance measures in-place did not attain the interim performance target. Lake Tahoe remains in non-attainment of the underlying threshold, and will not be in attainment for many years. The 1996 Evaluation recommends [sed](#) implementation of supplemental measures as a high priority. Long-term monitoring will be necessary to determine the adequacy of the combined compliance measures.

F. WQ-4: TRIBUTARIES

1. Evaluation Criteria

NUMERICAL STANDARD: Attain applicable state standards for concentrations as follows:

California: total nitrogen (0.19 mg/l), total phosphorus (0.15 mg/l), and total iron (0.03 mg/l) (all based on annual average);

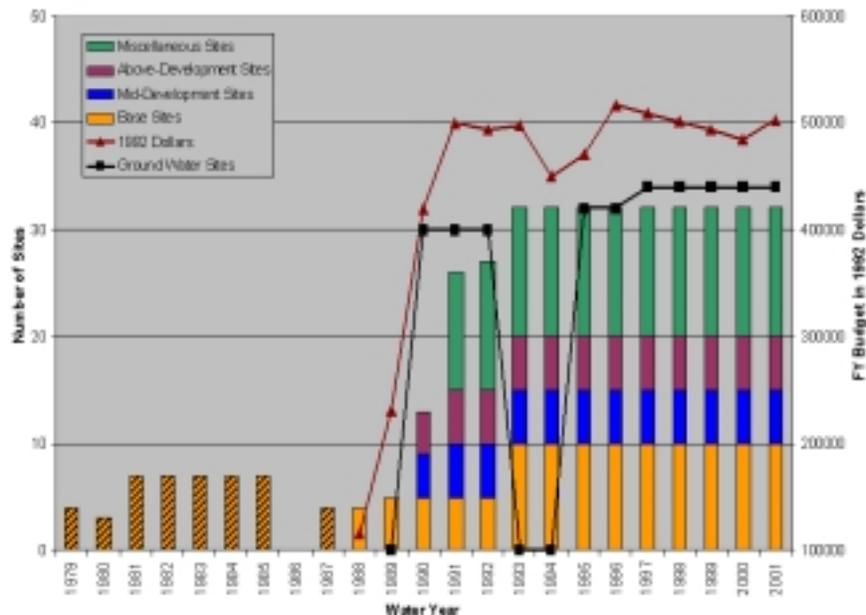
Nevada: soluble phosphorus not to exceed 0.007 mg/l (annual average); soluble inorganic nitrogen not to exceed 0.025 mg/l (annual average); attain a 90th percentile value for suspended sediment of 60 mg/l.

MANAGEMENT STANDARD: Reduce total annual nutrient and suspended sediment load to achieve loading thresholds for littoral and pelagic Lake Tahoe.

2. Measurement and Monitoring

The monitoring of water quality on selected tributaries is one of the longest and largest data sets available, with some records going back to the early 1960's. Most of the monitoring since 1980 has been accomplished through a joint effort, which established the Lake Tahoe Interagency Monitoring Program (LTIMP). The original members of LTIMP included TRPA, USGS, TRG, USFS, NDEP and Lahontan RWQCB. The program has experienced substantial growth especially in 1991, through joint funding from the USGS and TRPA (Figure 3.8). Currently, the program includes collection of streamflow, physical, sediment and nutrient data. There have been annual data reports published for most years, initially by the TRG and more recently by the TRPA. These reports summarize the data collected and calculate loading for the ten primary sites in California and Nevada. The chemical constituent data is also published by California and Nevada districts in Annual Data Reports. For a more complete description of the monitoring network, see the USGS Fact Sheet located in the Supplemental Section.

Figure 3-8. History of LTIMP Stream and Ground Water Monitoring Program



3. Results of Measurement and Monitoring Efforts

Tributary water quality varies greatly, depending on a number of factors such as slope, soil type, weather, and drainage area. The chemical constituent data for all sites has been published by the USGS in their annual data report. Annual average concentrations are routinely run for the ten main tributaries (the table and graphs can be found in the technical appendices). Low water years generally have lower annual concentrations than years with higher snowmelt and runoff. The impact from the 1997 flood is somewhat masked in the annual average, as the event was so large statistically manipulation was necessary for the regression analysis. The tributary network has been funded at the current level since 1991, with a good spread of high, low, and average water years.

4. Trends

The tributary monitoring network was the focus of a recent comprehensive project to assemble all the streamflow, water quality, and GIS data collected from the program to a central location for an in-depth trend analysis. The project goals included load calculations of all existing data, comparison of new loading models (LOADEST2 and FLUX) to old regression methods, comparison among the watersheds monitored for changes in the long-term network, and publishing the data in a final report. Some tasks of the original proposal that were not feasible due to data constraints and funding issues included relating the water quality within the watershed to land use and land coverage; defining the relationship of streamflow and various precipitation events; and updating the flood statistics for the base gages. The land coverage task is now the focus of additional data collection by DRI and the USGS. The streamflow analysis is complete and a report is expected by October, 2001. The trend analysis for the miscellaneous ungaged sites was not possible due to infrequent sample collection relative to that for the primary tributary sites. Trends for the larger tributaries are as follows:

- Total Phosphorus trends are represented in Figure 3-9. It appears the long-term trend is decreasing on loading for total phosphorus for nine of the ten main stations, with Incline Creek showing a trend undetected.
- Total Nitrogen is decreasing for six of the ten gages, with undetected trends on four sites, mostly on the west shore (Figure 3-10).
- Suspended sediment trends are mixed, decreasing for Upper Truckee, Logan House, and Trout Creek, increasing for Blackwood, Ward and General Creek, and undetected on the others (Figure 3-11).

The tributary trend analysis will be the subject of discussion and possible prioritizations of watershed restoration in the next few years. It is an important part of an overall sediment/nutrient model for the Lake Tahoe Basin, which includes the Water Clarity Model for Lake Tahoe; this will be used to determine needed reductions in the nutrient/sediment discharge to the lake. Total Maximum Daily Loads (TMDLs) will be based on watershed and intervening area contributions to the lake. Various models and assessments estimate tributary annual load contributions to the lake. Tributaries are estimated to contribute 20 percent of the total nitrogen, 28 percent of the total phosphorus, and 16 percent of the dissolved phosphorus load to Lake Tahoe. The total sediment loading to the lake from tributaries is estimated at between 7,000–11,000 MT/year for the ten LTIMP

watersheds; models may be used to estimate total sediment contributions from all tributaries based on the LTIMP data analysis.

If needed reductions in loading from sources such as atmospheric deposition cannot be attained, TMDLs for tributary sources would need to be reduced further to compensate. In order to meet TMDLs for the lake, all sources and needed reductions need to be balanced. At this point no effort should be spared to reduce loads from tributaries.

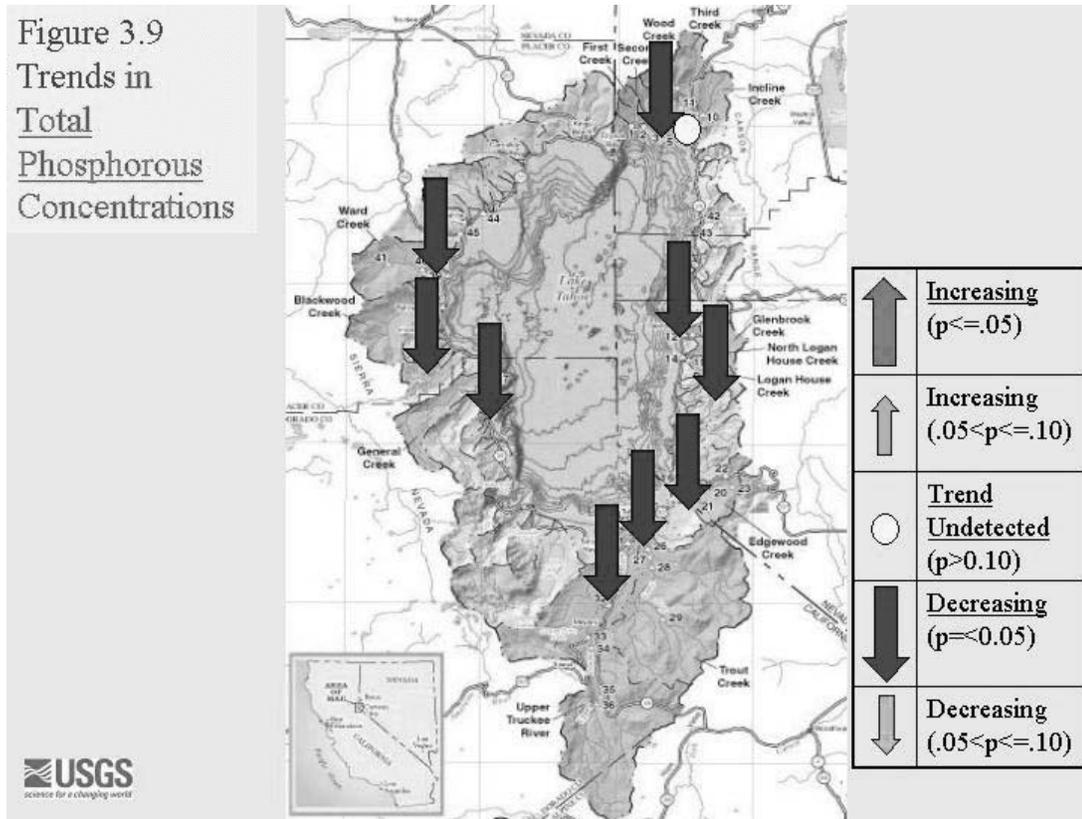


Figure 3.10
Trends in
Total Nitrogen
Concentrations

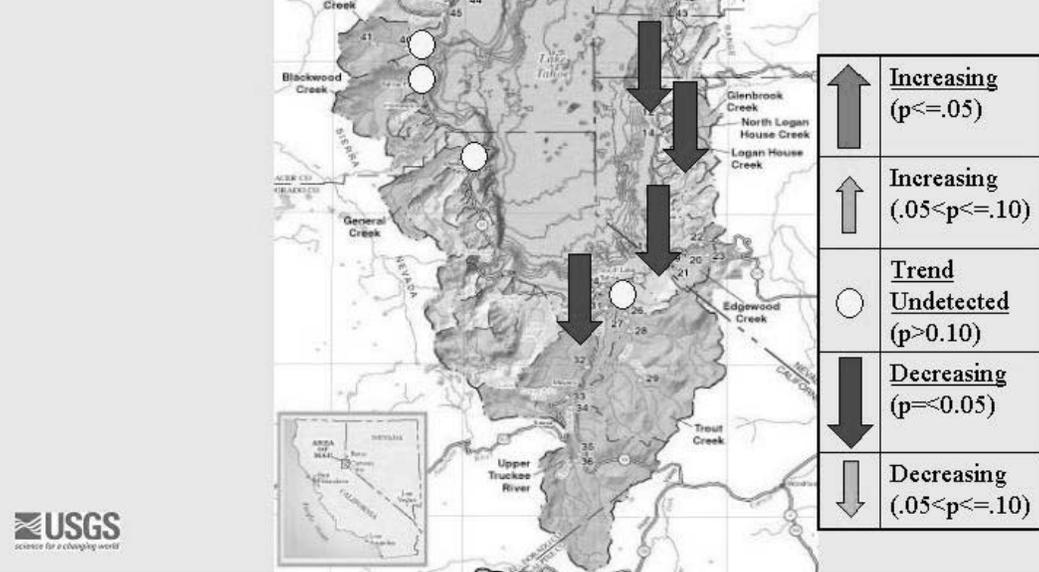
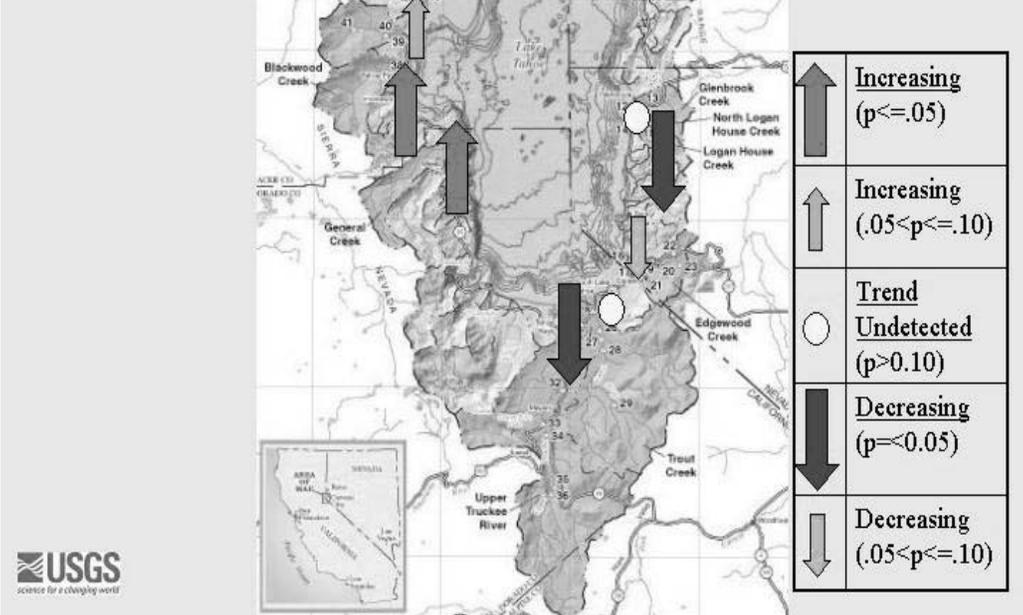


Figure 3.11
Trends in
Suspended
Sediment
Concentrations



5. Threshold Attainment Status

Water quality varies depending on the tributary; in addition, state standards are total concentrations for California and dissolved concentrations for Nevada. Attainment of the standards for individual tributaries in California is more difficult, and most exceeded the standards for the water years 1996-2000. Attainment of the tributary standards occurs most often in the watersheds with little or no development and/or disturbance, such as General and Logan House Creeks. Although Ward and Blackwood Creeks have little commercial development, the history of land disturbance from roads, logging and gravel operations continue to cause serious erosion in these areas. As shown in the graphs above, the long-term trends do show decreasing concentrations for many of the tributaries in Total Phosphorous, Nitrogen and Sediment. Additional trends graphs can be seen in the technical appendices. The establishment of TMDLs for tributaries, based on the Lake Tahoe Water Clarity Model, can be used to further evaluate these loading trends and implement management strategies.

6. Effectiveness of Measures in Place

The most obvious measure in place for tributaries is the active participation by local jurisdictions in implementation of erosion control projects and the construction of BMPs at all new developments. Most of the water quality compliance measures are related to this threshold. The downward trends for total phosphorus, total nitrogen, and total suspended sediment suggest that at least some of these compliance measures may be effective in reducing discharges of nutrients and sediment from tributaries. Other measures such as watershed restoration and stream bank stabilization can greatly reduce these loads from tributary watersheds. See Table 3-6, and the Effectiveness of Compliance Measures in Place, at the end of this section for additional measures.

Category: water quality
Parameter: tributary water quality

- STANDARD: California: total nitrogen (0.15-0.22 mg/l), total phosphorus (0.010-0.030 mg/l), and total iron (0.015-0.03 mg/l), (annual average.). Nevada: [Lake Tahoe standards for](#) soluble phosphorus not to exceed 0.007 mg/l (annual average.); soluble inorganic nitrogen not to exceed 0.025 mg/l (annual average.). TRPA: attain a 90th percentile value for suspended sediment of 60 mg/l.
- INDICATOR (UNITS): Annual average concentrations of appropriate constituents in any tributary stream for which states have established standards (mg/l); 90th percentile value for suspended sediment of 60 mg/l.
- MONITORING SUMMARY: The USGS and the Tahoe Research Group currently monitor tributary water quality at 31 stations on 14 tributary streams. For details, see [Chapter 4 of the 1996 Evaluation USGS Fact Sheet 138-00, October 2000](#). The period of record varies from stream to stream, but generally ranges from seven to 16 years of data.
- ATTAINMENT STATUS: Non-attainment. Depending on the water year, some tributaries are in attainment of the constituents listed above. [The recent trend analysis for the long-term tributary data shows some improvement in loading for many of the larger tributaries. Load reductions \(available for the ten at lake tributaries\) for total nitrogen and phosphorus clearly show improvement in the long-term trend, sediment reductions were mixed. See the figures in section 3.9, 3.10, 3.11. in section III.F of this 2001 Threshold Evaluation and the appendix for details.](#)

- California Tributary Standards:
Total Nitrogen: ~~During Water Years 1989 through 1995, California streams exceeded state standards 24 of 35 times, or 69 percent of the time. Non-attainment, total load reductions were seen in the Upper Truckee River.~~ **Total Phosphorus:** ~~During Water Years (WYs) 1981 through 1995, California streams were in non-attainment 64 of 72 times. Each of the four monitored tributary streams in the Tahoe Region for which TRPA established interim 1994 performance targets for total phosphorus, attained the performance target in either WY 1989 or WY 1990, except General Creek.~~

~~None attained the performance target in both WY 1989 and WY 1990. For details, see the 1996 Evaluation. Non attainment, although load reductions were observed in 100% of the California monitored tributaries. Total Iron: All of the annual average values for monitored streams in California from WY 1989 through WY 1995-2000 exceeded the applicable California standard. The background levels in the Tahoe region far exceed the standard of 0.03 mg/l. There is sufficient data to revise to a more realistic value, which should coincide with establishment of TMDL's for major basin tributaries.~~

Nitrogen, Phosphorus, and Iron Water Quality Objectives for Waters in California^{a,b}, mg/1

	Total		
	Total Nitrogen	Phosphorus	Total Iron
	Annual - 90 th	Annual - 90 th	Annual - 90 th
Lake Tahoe	0.15	0.008	
Heavenly Valley Creek			
Cold Creek			
Trout Creek	0.19	0.015	0.03
Saxon Creek			
Upper Truckee River	0.19	0.015	0.03
Echo Lakes			
Fallen Leaf Lake	0.20	0.005	0.010
Eagle Creek	0.20	0.010	0.03
Taylor Creek	0.17	0.010	0.02
Cascade Creek	0.21	0.005	0.01
Tallac Creek	0.19	0.015	0.03
Cascade Lake			
Lonely Gulch Creek	0.19	0.015	0.03
Meeks Creek	0.23	0.010	0.07
General Creek	0.15	0.015	0.03
McKinney Creek	0.19	0.015	0.03
Madden Creek	0.18	0.015	0.015
Blackwood Crk.	0.19	0.015	0.03
Ward Creek	0.15	0.015	0.03
Burton Creek	0.16	0.015	0.03
Griff Creek	0.19	0.010	0.03
Dollar Creek	0.16	0.030	0.03
Watson Creek	0.22	0.015	0.04
Camelion Crk.	0.19	0.015	0.03

^a Nevada has established uniform criteria for all waters in terms of soluble phosphorus and total soluble inorganic nitrogen, not to exceed an annual average mean of 0.007 and 0.025 mg/l, respectively.

^b These objectives have been extracted from Table II-9 of the Lake Tahoe Basin Water Quality Plan, State Water Resources Control Board, October 1980. This footnote is a part of that table and is presented here for completeness. "The water quality objectives presented here are derived from those contained in the Water Quality Control Plan for the North Lahontan Basin (State Water Resources Control Board and Lahontan Regional Water Quality Control Board, 1975) with the following modifications. Several of the narrative objectives applying to waters of Lake Tahoe, are clarified.

- b. Nevada Lake Tahoe standards used for tributary Standards:
Soluble Phosphorus: Nevada tributaries typically do not attain state standards. ~~However, in certain water years, streams are in attainment.~~ Only one of the Nevada streams was in attainment for soluble Phosphorous. Logan House Creek, being the background and 'undeveloped' watershed has historically met the standard.
Total Soluble Inorganic Nitrogen: Nevada tributaries typically do not attain state standards. ~~However, in certain water years, streams are in attainment.~~ Three of the five Nevada monitored streams are in attainment for soluble nitrogen.
- c. TRPA Suspended Sediment Threshold:
~~Using discrete daily sediment concentrations reported by the USGS 90th percentile concentrations typically exceed the 60 mg/l threshold at monitoring stations on Third Creek, Incline Creek, and Edgewood Creek, and attained the threshold at all other locations.~~ Trends are evident for decreasing sediment loading in 60% of Nevada monitored streams, in particular Logan House Creek, Edgewood, and Third Creek.
5. TARGET DATE:
 a. Total Nitrogen: 2006
 b. Total Phosphorus: 2006
 c. Total Iron: 202406 (pending review of California iron standards)
6. EVALUATION INTERVAL: annual
7. INTERIM TARGETS: ~~For the California total phosphorus standard, annual average concentrations shall not exceed the forecast lines.~~ Meet tributary average standards for N, P, and set uniform standards for these and suspended sediment with the Lahontan RWQCB and Nevada Division of Environment Protection.
~~By December 31, 1996-1997 the update of the Regional Plan, 2007, TRPA should prepare a report and a recommendation to include any TMDL's established for the Tahoe Region, regarding possible replacement of the 90th percentile suspended sediment threshold with an equally stringent annual average threshold.~~
~~By December 31, 1997, TRPA shall complete the stormwater runoff model which targets certain watersheds for water quality improvements.~~
 By December 31, 1998, September, 2002,
- TRPA shall ~~develop a~~ implement the BMP maintenance program for large projects as part of the Capital Improvements Program.
8. COMPLIANCE MEASURES: The compliance measures have been reworked, for a complete listing see Table 3-6. of the 2001 Threshold Evaluation (See section II for inventory)
- a. MEASURES IN PLACE: ~~Urban Runoff and Erosion: 01 through 16, inclusive~~
~~Waste Management: 21, 22, 23, 24, 25, 26, 28, and 29~~
~~Natural Area Management: 30, 31, 32, 34, 35, 36, 37, and 38. 1-20, 26-41, 54, 127, 139, 150-152, 178.~~
- b. EFFECTIVENESS OF MEASURES IN PLACE: Some measures are more effective than others, supplemental measures may have to be put in place. The 1994 Evaluation recommends strengthened BMP requirements, expanded monitoring of BMPs, implementation of the Capital Improvements Program, including the revegetation "head start" program, and other changes to the compliance measures in place. For a complete list of 2001 recommendations see Table 3.7.
- c. SUPPLEMENTAL MEASURES: ~~Urban Runoff and Erosion: 01 through 12, inclusive~~
~~Waste Management: 16, 17, and 18~~
~~Natural Area Management: 19, 20, and 21~~
- d. ~~EFFECTIVENESS OF SUPPLEMENTAL MEASURES: To strengthen efforts to attain this threshold, the 1994 Evaluation recommends implementation of supplemental measures 01 (restrictions on rate and/or amount of additional development), 02 (improved BMP implementation/enforcement program), 03 (additional restrictions on fertilizer use), and 07 (increased funding for CIP) as high priority action items.~~
9. ADEQUACY OF COMPLIANCE MEASURES: Compliance measures in-place contributed to an unknown degree to the partial attainment of the interim performance target. ~~However, tributaries to Lake Tahoe remains out of attainment of the underlying threshold standards. The 1996 Evaluation recommends implementation of supplemental measures as a high priority. Long-term monitoring will be necessary to determine the adequacy of the combined compliance measures.~~

G. WQ-5: STORMWATER RUNOFF QUALITY – SURFACE WATER DISCHARGE

1. Evaluation Criteria

NUMERICAL STANDARD: Surface water discharge limits per Chapter 81, TRPA Code of Ordinances:

Constituent	Maximum Concentration
<i>Dissolved Inorganic Nitrogen as N</i>	<i>0.5 mg/l</i>
<i>Dissolved Phosphorus as P</i>	<i>0.1 mg/l</i>
<i>Dissolved Iron as Fe</i>	<i>0.5 mg/l</i>
<i>Grease and Oil</i>	<i>2.0 mg/l</i>
<i>Suspended Sediment</i>	<i>250 mg/l</i>

1981 208 Plan/SWRCB Water Quality Control Plan--discharges to surface water:

<i>Total nitrogen as N</i>	<i>0.5 mg/l</i>
<i>Total phosphate as P</i>	<i>0.1 mg/l</i>
<i>Total iron</i>	<i>0.5 mg/l</i>
<i>Turbidity</i>	<i>20 NTU</i>
<i>Grease and oil</i>	<i>2.0 mg/l</i>

NOTE: for discharges to groundwater, see WQ-6

Achieve a 90-percentile concentration value for dissolved inorganic nitrogen of 0.5 mg/l, for dissolved phosphorus of 0.1 mg/l, and for dissolved iron of 0.5 mg/l in surface runoff directly discharged to a surface water body in the Basin.

Achieve a 90-percentile concentration value for suspended sediment of 250 mg/l.

MANAGEMENT STANDARD: Reduce total annual nutrient and suspended sediment loads as necessary to achieve loading thresholds for tributaries and littoral and pelagic Lake Tahoe.

2. Measurement and Monitoring

The Lahontan Regional Water Quality Control Board (LRWQCB) sampled urban runoff in several locations in the Lake Tahoe Basin. During the time period of 1986 to 1989, LRWQCB focused on six sites in South Lake Tahoe to collect data for total phosphorus, total nitrogen, total iron, and turbidity. The collected data exhibited several violations of state standards for total nitrogen, total phosphorus, total iron, and turbidity, with the highest concentrations generally occurring in late spring through late summer, presumably the result of intense summer thunderstorms. This data can be found in TRPA's Annual Water Quality Reports.

Runoff discharge to surface waters was also monitored by TRPA at selected culvert outlets to the lake from 1991-1995. These samples were not flow weighted and rarely met TRPA and state standards. (Of the ten sites monitored for surface discharge to surface and groundwater, approximately 80 percent violate TRPA and state standards.) Graphs of this data are located as Appendix B of the 1999 *Annual Water Quality Report*. [Since 1995](#), more recent and relevant monitoring data are from the TRG intervening area study and automated samplers tied to specific projects. Much of this data is preliminary, and has not been incorporated into a single report. There are several efforts underway to monitor both pre- and post-project water quality to determine effectiveness of the project design and runoff treatment, as well as database coordination for information exchange. The

Tahoe Integrated Information Management System (TIIMS) will be instrumental in the collection, consolidation, and access of historical and current data, for all thresholds.

3. Results of Measurement and Monitoring Efforts

As mentioned above, most of the earlier sampling did not meet state standards. Earlier results reported for the TRG intervening area study show discharges from urban areas generally exceed discharge standards, while those from non-urban intervening areas meet discharge standards (*Watershed Assessment*, 2000).

The available data for stormwater discharge sites is variable in terms of constituents reported, and consist of either single grab samples or average of multiple samples taken from within several runoff events at particular sites. The number of sites varies from as few as four for soluble iron to seventeen sites for soluble nitrogen and phosphorus constituents. If a single soluble constituent (e.g. soluble nitrate-nitrite) is reported, but exceeds the discharge standard, that site is counted as non-attainment. On this basis 70 percent of the sites meet soluble N discharge standards. Soluble P discharge standards are met by 60 percent of the sites, and 73 percent of the sites meet the TSS discharge standard. Only 25 percent of the few sites reporting soluble iron meet that surface discharge standard.

Some of the current projects that have monitored water quality related to runoff are the Ski Run and Wildwood Basins, and the Beecher-Lodi Project by the City of South Lake Tahoe and the Angora Creek and Pioneer III Restoration Projects by El Dorado County. The Beecher Lodi project monitors the treatment using a Vortecnic's vault system, which discharges to a grassy swale. There is no flow data for some of these samples; a graph of TSS and Total P is shown in Figure 3-12. As projects have begun to collect the nutrient data, the need for flow-weighted samples is even more critical in runoff sampling. The Pioneer III sampler has now been upgraded to include flow volumes per sample bottle and sample time. This will distinguish the 'first flush' and subsequent dilution effects of individual storms. As seen in Figure 3-13, the initial concentration of total phosphorus dropped significantly from Bottle # 1 to Bottle # 3.

Figure 3-12. Beecher Lodi Project

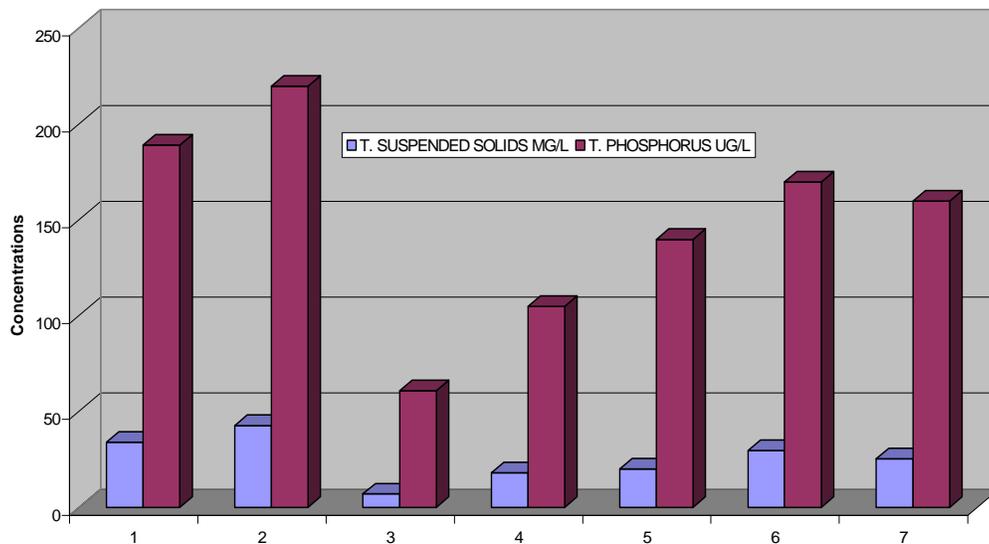
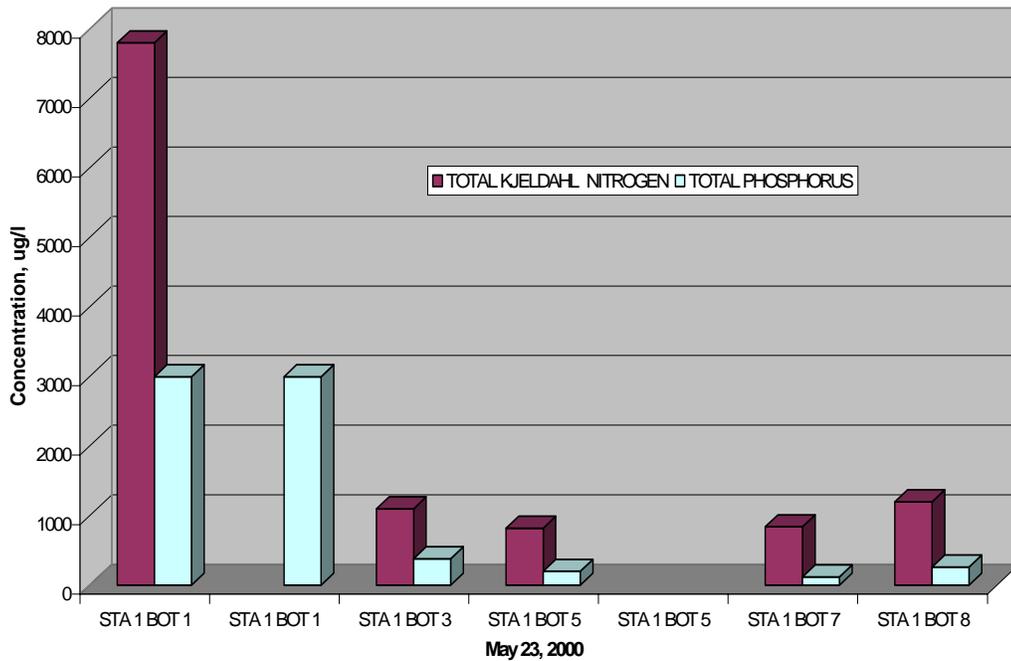


Figure 3-13. Pioneer Trail III



4. Trends

The data sets for runoff to surface water have neither been extensive enough nor consistent to attempt any meaningful trend analysis. As more data is collected, related to specific projects or land uses or to answer a specific question, there will be opportunities to evaluate the numeric standards now in place. The issue of consistent state standards for California and Nevada must be resolved; for example, there is no state standard in Nevada for iron, and the standard in California of .5 mg/l is far below most background levels. TMDLs should be applied to this threshold as well in order to consider needed load reductions from runoff treatment and the potential load reduction benefit of specific treatments.

5. Threshold Attainment Status

Available data demonstrate that this threshold is not in attainment. The data from TRPA sampling of direct runoff in the intervening areas to surface waters shows there is much work to be done in the treatment of these flows. More recent monitoring, directed to sample the inputs and outputs on erosion control projects, shows there is improvement in water quality constituents through treatment in artificial or constructed wetlands. (Angora, 1999). Threshold attainment should be directed toward the improvement of those areas in watersheds with the highest load accumulations based on the LTIMP Analysis, and needed load reductions. Currently, there are several large scale monitoring projects underway focused on various aspects of the surface flow to surface water threshold; more data will be published in TRPA's 2002 *Annual Water Quality Report*.

An attainment schedule will likely be applied on a watershed basis or smaller, as results of recent research will be applied to evaluate the reduction of runoff to surface waters. A current study, funded by CTC, to evaluate selected projects will

focus on the Tahoe City and Kings Beach areas; another study, funded by the USFS and Nevada State Lands, will focus on infiltration effectiveness at the Round Hill Project; and EPA/Nevada License Plant grants to TRPA will focus on runoff treatment in constructed wetlands relative to certain land uses. These monitoring studies will be important in helping determine load reductions from various runoff treatment BMPs.

6. Effectiveness of Measures in Place

Most of the water quality compliance measures shown in Table 3-6 apply to this threshold. In particular, those for BMPs and water quality capital projects could be most effective with increased emphasis on fine sediment and nutrient treatment for runoff in order to meet discharge standards.

Category: water quality**Parameter: runoff water quality**

1. STANDARD: TRPA threshold--discharges to surface water (90th percentile):
 Dissolved inorganic nitrogen: 0.5 mg/l
 Dissolved phosphorus: 0.1 mg/l
 Dissolved iron: 0.5 mg/l
Grease and oil: 2.0 mg/l
 Suspended sediment: 250 mg/l
 1981 208 Plan/SWRCB Water Quality Control Plan--discharges to surface water:
 Total nitrogen as N: 0.5 mg/l
 Total phosphate as P: 0.1 mg/4
 Total iron: 0.5 mg/l
 Turbidity: 20 JTU
 Grease and oil: 2.0 mg/l
 NOTE: for discharges to groundwater, see WQ-6
2. INDICATOR (UNITS): Concentration of applicable constituent in samples of surface runoff (localized surface flow from rainfall and snowmelt draining small sub-watersheds) at point of discharge to surface waters (mg/l for chemical constituents), as related factors, progress on implementation of implementation of BMPs, as set forth in the 208 Plan, Volume I (November 1988), pp. 183, 184. (See SQ-2-A and B). Also, note that TRPA interprets the "Total phosphate" guideline in the 1981 208 Plan to mean "Total phosphorus."
3. MONITORING SUMMARY: ~~Monitoring of surface runoff was conducted in four studies from 1969 to 1982. The results were summarized in TRPA's Threshold Study Report in 1982. Since 1982, the Lahontan Regional Water Quality Control Board and TRPA have conducted additional monitoring. The Lahontan Board monitored four sites on the South Shore from 1986 to 1989. TRPA has monitored ten sites periodically throughout the Region from since 1991. TRPA has mapped the significant points of discharge to the surface waters of the Lake Tahoe shoreline area. A discussion of the early monitoring conducted by the Lahontan WQCB and TRPA can be found in the annual data reports. TRPA mapped the significant points of discharge to the surface waters of the Lake Tahoe shoreline area as culvert points and monitored ten of these sites periodically throughout the Region 1991-1995, this is currently being updated and expanded. There are also about 10 projects in the process of monitoring for pre-~~
project data related to stormwater runoff. For details, see the 1996 Evaluation.
4. ATTAINMENT STATUS: Non-attainment. In the TRPA and Lahontan Board monitoring programs, 81 to 95 percent of samples did not attain the guidelines for discharges to surface water. The more recent data on selected erosion control projects show 70% of the sites meet soluble N, 60% meet soluble P and 73% meet the TSS discharge standard. Only 25% of the few sites reporting meet the soluble iron standard.
5. TARGET DATE: ~~2006~~After 2010
6. EVALUATION INTERVAL: Annual
7. INTERIM TARGETS: By December ~~30, 1997, 2006~~ TRPA shall ~~prepare a complete plan for mitigation of the water quality impacts of urban runoff at points of discharge to the surface waters of the Region, for inclusion in the integrated Environmental Improvement Program target source control and runoff treatment at limiting Phosphorus and fine sediment sources to meet discharge standards. The monitoring focus will be on flow weighted samples and event loading from runoff, and correlate samples based on land use.~~
8. COMPLIANCE MEASURES: ~~(See Section II for inventory) The compliance measures have been reworked, see Table 3-6.~~
 - a. MEASURES IN PLACE: ~~Urban Runoff and Erosion: 01, 02, 03, 04, 05, 06, 07, 11, and 16
 Waste Management: 26, 28, and 29
 Natural Area Management: 30, 31, 32, and 38
 Lake Tahoe and the Shorezone: 40, 41, and 45. 1-20, 21, 22, 33, 34, 52-54, 127, 215.~~
 - b. EFFECTIVENESS OF MEASURES IN PLACE: Many measures have not been monitored to determine their effectiveness as related to the threshold, see table 3.6 for details. The 1996 Evaluation recommends strengthened BMP requirements, expanded monitoring of BMPs, implementation of the Capital Improvements Program, including the revegetation "head start" program, increased public involvement

- ~~and education, and other changes to the compliance measures in place.~~
- c. SUPPLEMENTAL MEASURES: Some supplemental measures may need to be moved to measures in place. ~~Urban runoff and Erosion: 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, and 12
Natural Area Management: 20
Lake Tahoe and the Shorezone: 22~~
- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~To strengthen efforts to attain this threshold, the 1996 Evaluation recommends implementation of supplemental measures 01 (restrictions on rate and/or amount of additional development), 02 (improved BMP implementation/enforcement program), 03 (additional restrictions on fertilizer use), and 07 (increased funding for CIP) as high priority action items.~~
9. ADEQUACY OF COMPLIANCE MEASURES: Untreated surface runoff will generally not meet the TRPA and state guidelines for discharges to surface waters. Discharges to surface waters should either be eliminated or treated prior to discharge. Specific compliances measures for this threshold need to be developed relative to TMDLs.

H. WQ-6: STORMWATER RUNOFF QUALITY – GROUNDWATER DISCHARGE

1. Evaluation Criteria

MANAGEMENT STANDARD: Surface runoff infiltration into the groundwater shall comply with the uniform Regional Runoff Quality Guidelines as set forth in Table 4-12 of the Draft Environmental Threshold Carrying Capacity Study Report, May 1982.

Where there is a direct and immediate hydraulic connection between ground and surface waters, discharges to groundwater shall meet the guidelines for surface discharges, and the Uniform Regional Runoff Quality Guide lines shall be amended accordingly.

Constituent	Maximum Concentration
Total Nitrogen as N	5 mg/l
Total Phosphate as P	1 mg/l
Iron as Fe	4 mg/l
Turbidity	200 NTU
Grease and Oil	40 mg/l

2. Measurement and Monitoring

This threshold assumes a treatment path for infiltration or other runoff treatment prior to intercepting groundwater. It is not a groundwater standard *per se*. There has been some monitoring of various aspects of ground water in the last five years, with two distinct subjects of focus:

1. Ground water character in the Tahoe Basin was the subject of a 1997 report by Carl Thodal of the Nevada USGS. The report summarized data collected by the USGS from 1990-1992; many of these wells have been part of the current LTIMP network since 1995 (see Figure 3-8). Thodal's report and the network include 32 public, private, and observation wells around the basin, ranging in depth from 10 ft. to over 300 ft. This effort is a surrogate for potential impacts to ground water, but does not isolate infiltration impacts. One of the most extensive pre-project ground water monitoring systems was installed in October 2000 at the Cattleman's basin site of the Pioneer Trail III Water Quality Project. The network of 30 monitoring wells will characterize current groundwater quality, and the effectiveness of the treatment facilities to be constructed in 2001.
2. The sampling of runoff discharge water directly related to the threshold of surface runoff infiltration to groundwater is more limited. There is some monitoring of golf course facilities, mostly on the California side. A few erosion control projects have some data that should be considered as part of this threshold, namely the inlets (or discharge points) of urban runoff to treatment basins. As for surface discharge, sites vary from single non-flow weighted grab samples to averages of multiple flow weighted samples from within several storm events at several sites. Characterization of urban runoff from various types of land use and density in project monitoring will contribute greatly to the knowledge of infiltration water quality and future evaluation of this threshold and management standards.

3. Results of Measurement and Monitoring Efforts

The number of sites vary from a low of four reporting soluble iron to fourteen sites reporting total P constituents of stormwater discharge to treatment sites. On this basis, total N discharge to treatment areas is met by 62.5 percent of these sites. Total P discharge standards are met at 78.6 percent of these treatment discharge sites, and total iron discharge standards are met at 75 percent of these sites. No turbidity data was available from these sites, and there is not a good conversion or correlation between TSS and turbidity.

The water quality of the 32 USGS network wells can be found in Thodal's report and the Annual Data Reports by the USGS, 1995-2001. A random selection of some of these wells is found in Figures 3-14a, b, and c. These wells are more representative of baseline groundwater quality and potential general impacts, as opposed to the standard of infiltration to groundwater. These data show the potential influence of infiltration for nitrates based on well depth, the deeper wells (e.g., Tahoe Tree) having lowest concentrations. It also shows some locations where the shallow groundwater does exceed the infiltration standard (i.e., Edgewood and Zephyr), but with unknown source.

Figure 3-14a. Selected USGS Wells

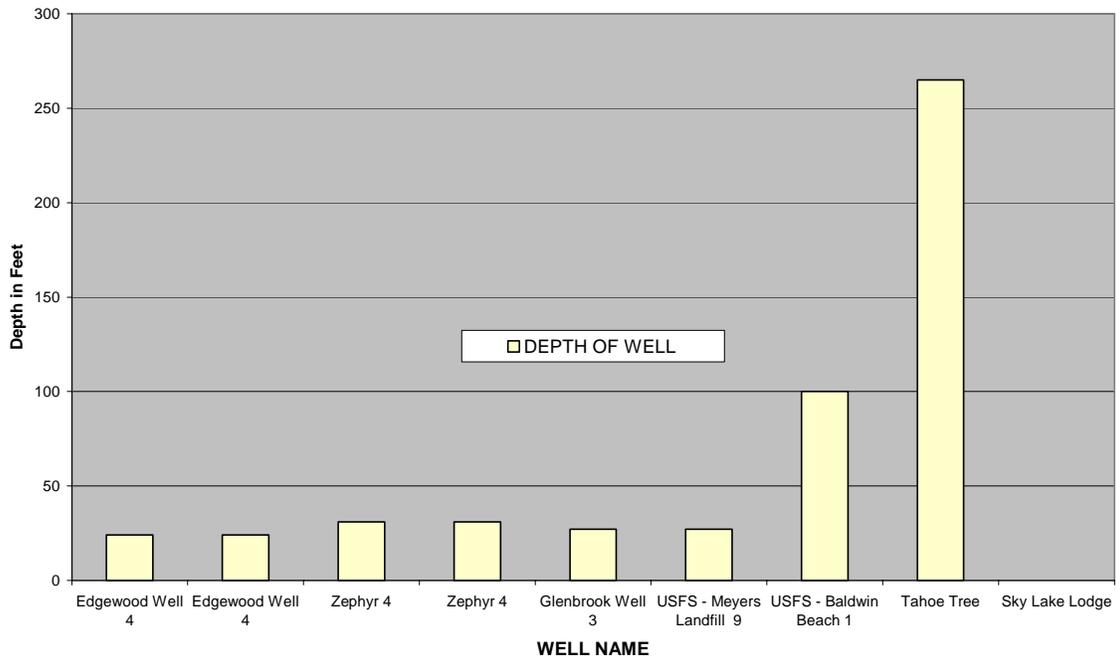


Figure 3-14b. Selected Wells vs. Nitrates

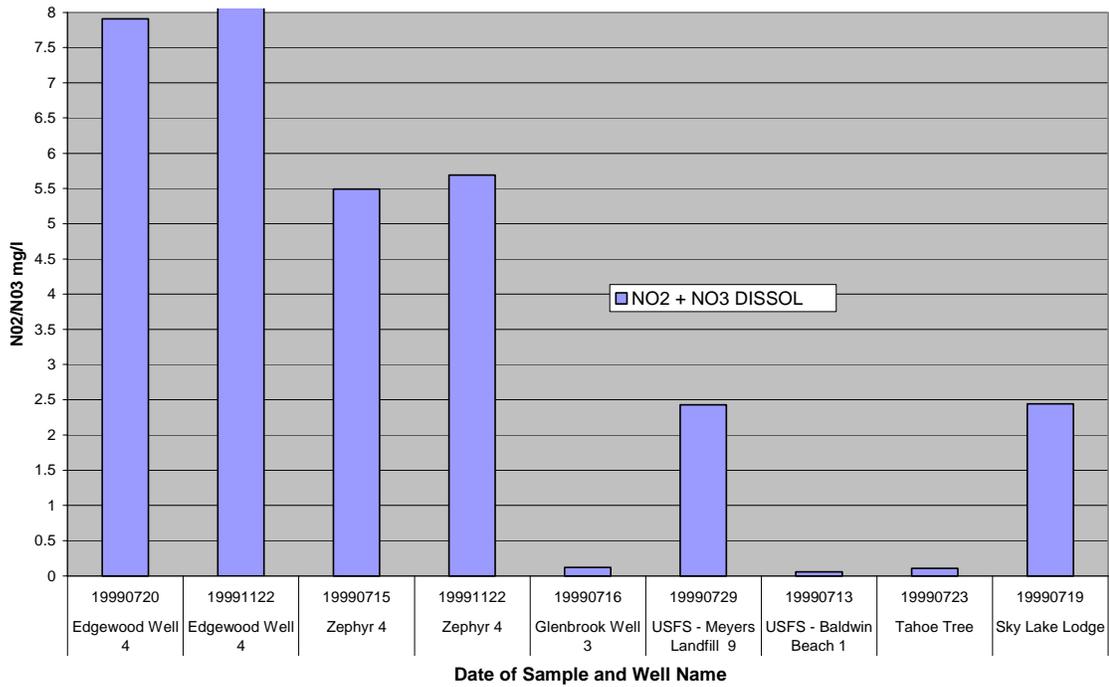


Figure 3-14c. Selected Wells vs. Phosphorus

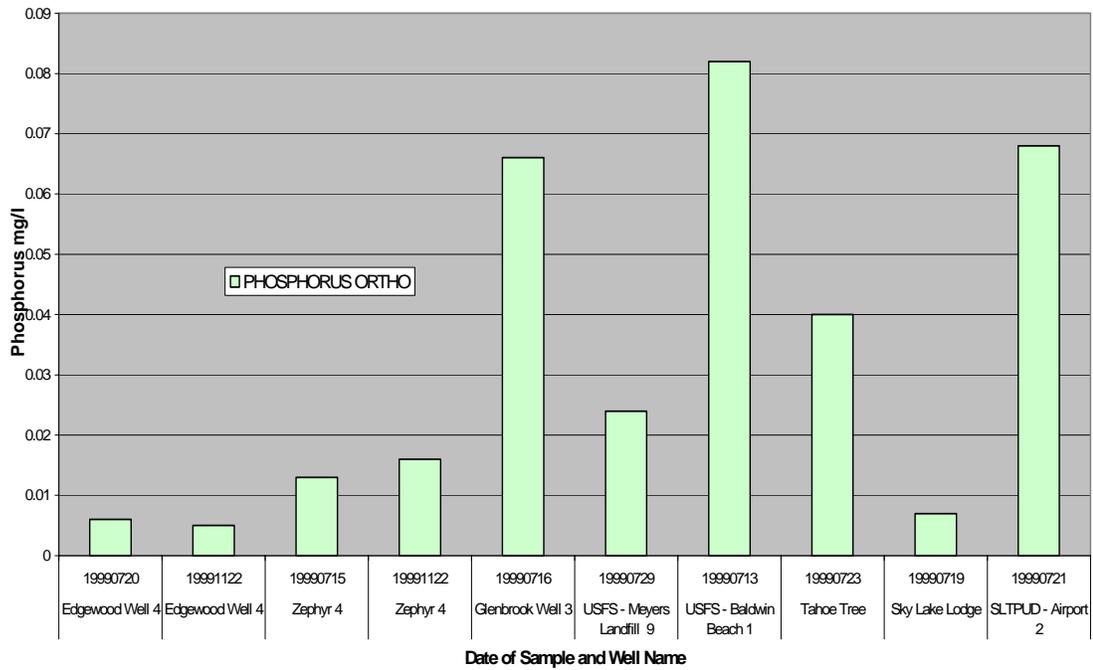


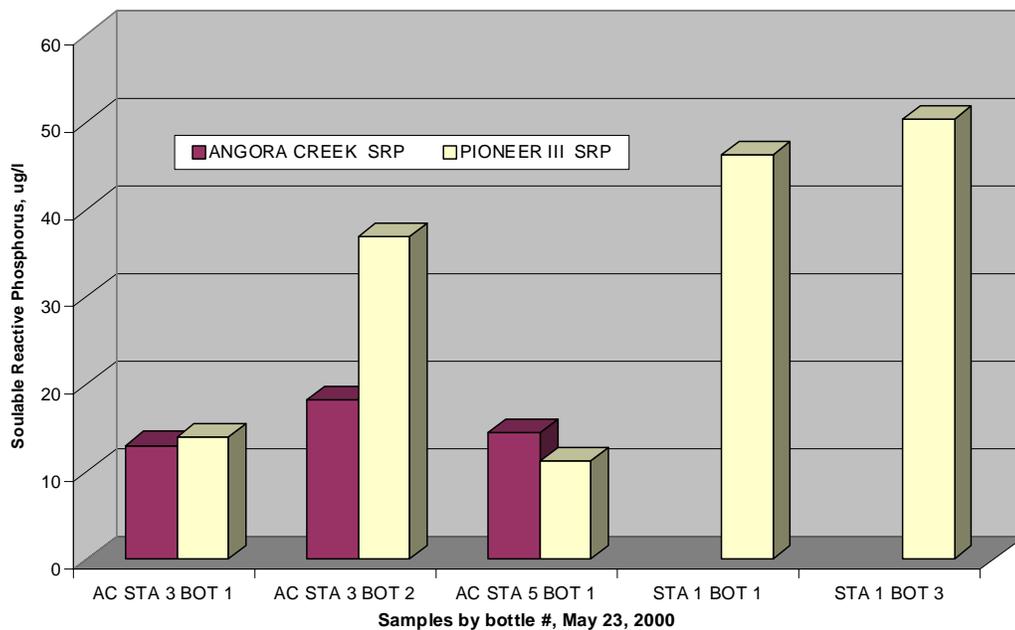
Figure 3-15 (below) shows a comparison of the soluble reactive phosphorus from the Angora Creek Project and Pioneer Trail III for the end of snowmelt, May 2001. The samples at Angora have some pre-treatment whereas Pioneer III is direct residential runoff.

Although flow-weighted samples are not as important for direct groundwater measurements, in terms of runoff volumes infiltrating to groundwater, the data is needed to estimate the total loads. It is also useful for event duration and intensity calculations.

4. Trends

As with Surface Runoff data, there is insufficient data to run a trend analysis for any infiltration to groundwater at present. The coordination of several large monitoring projects by various agencies in the next few years (through grants and USFS funding) will greatly increase the state of knowledge in the impacts of urban runoff to both surface and groundwater. The Lake Tahoe Interagency Monitoring Program (LTIMP) group has been well represented by most agencies involved with this monitoring and will likely provide the forum for these efforts.

Figure 3-15. Angora Creek vs. Pioneer III



5. Threshold Attainment Status

Available data demonstrate non-attainment for the runoff discharge standard to infiltration or other treatment areas. There are currently no baseline ground water standards *per se* other than drinking water standards. Attainment of the runoff infiltration standard to ground water can be difficult to achieve, but can be done, as seen in the Angora and Pioneer snowmelt samples. Storm related runoff in highly urbanized settings are the most likely to exceed the standards, but there is little direct flow-weighted data to support conclusions one way or another. Source

control and pretreatment of stormwater runoff prior to infiltration or discharge to treatment areas are very important components of the efforts to meet this threshold and reduce loads to ground water, tributaries, and Lake Tahoe.

6. Effectiveness of Measures in Place

Most of the main water quality compliance measures apply to this threshold, but especially those involving infiltration of stormwater runoff in particular (e.g. for BMPs and water quality capital improvement projects). There is evidence from the limited monitoring reported above that appropriately pretreated runoff can meet the ground water infiltration standards. However, some ground water well data suggest a possible need for better controls on fertilizer use and other sources of nitrogen in particular.

Category: water quality
Parameter: groundwater

1. STANDARD: TRPA: Surface water infiltration into the groundwater shall comply with the Uniform Regional Runoff Guidelines, below. Where there is a direct and immediate hydraulic connection between ground and surface waters, discharges to groundwater shall meet the guidelines for surface discharges--see WQ-5. Uniform Regional Guidelines for discharges to groundwater:
 Total nitrogen as N: 5 mg/l
 Total phosphate as P: 1 mg/l
 Total iron: 4 mg/l
 Turbidity: 200 ~~JTU~~ NTU
 Grease/Oil: 40 mg/l
2. INDICATOR (UNITS): Concentration of applicable constituent in samples of surface runoff (localized surface flow from rainfall and snowmelt draining small sub-watersheds) at point of discharge to groundwaters (mg/l for chemical constituents, NTU, ~~rather than JTU for turbidity, consistent with discussion under WQ-1~~); as related factors, progress on implementation of the Capital Improvements Program for erosion and runoff control and implementation of BMPs, as set forth in the 208 Plan, Volume I (November 1988), pp. 183 and 184. (See WQ-2-A and B). Also, note that TRPA interprets the "Total phosphate" guidelines to mean "Total phosphorus."
3. MONITORING SUMMARY: ~~Monitoring of surface runoff was conducted in four studies from 1969 to 1982. The results were summarized in TRPA's Threshold Study Report in 1982. Since 1982, the Lahontan Regional Water Quality Control Board and TRPA have conducted additional monitoring. The Lahontan Board monitored four sites on the South Shore from 1986 to 1989. TRPA monitored ten sites periodically throughout the Region since 1991. This threshold assumes a treatment path for infiltration, it is not a ground water standard per se. For prior monitoring studies see the 1999 Annual Water Quality Report. There have been some reports on general groundwater character, but limited information exists on the threshold as it relates to infiltration of runoff.~~ TRPA has mapped the significant

points of discharge to the ground waters of the Region. ~~For details, see the 1996 Evaluation.~~

4. ATTAINMENT STATUS: Non-attainment. In the TRPA and Lahontan Board monitoring programs, 29 to 34 percent of samples did not attain the guidelines for discharges to ground water. The more recent data on selected erosion control projects show 62.5% of the sites meet total N, 78.6% meet total P and 75% reporting meet the total iron standard. There is limited amount of data on TSS but no data on turbidity, and there is not an established correlation between TSS and turbidity.
5. TARGET DATE: ~~After 2006~~ 10
6. EVALUATION INTERVAL: Annual
7. INTERIM TARGETS: By December ~~30, 1997~~ 2004 TRPA shall target source control and runoff treatment at limiting Phosphorus and Nitrogen loading reductions to groundwater and Lake Tahoe in order to meet discharge standards. The current monitoring for project effectiveness shall be evaluated to include in the design of new projects.
8. COMPLIANCE MEASURES: The compliance measures have been reworked, for a complete description, see Table 3-6. (See Section II for inventory)
 - a. MEASURES IN PLACE: ~~Urban Runoff and Erosion: 01, 02, 03, 04, 05, 06, 07, 11, and 16
 Waste Management: 26, 28, and 29
 Natural Area Management: 30, 31, 32, and 38
 Lake Tahoe and the Shorezone: 40, 41, and 45. Same as WQ-5 with 19-22, 42-50, 60, 135, 140.~~
 - b. EFFECTIVENESS OF MEASURES IN PLACE: ~~The 1996 Evaluation Report recommends strengthened BMP requirements, expanded monitoring of BMPs, implementation of the Capital Improvements Program, including the revegetation "head start" program, and other changes to the compliance measures in place. There has been little monitoring of this threshold as it relates to infiltration, some inferences can be~~

made of SEZ treatment to runoff. New measures related to the near shore have been added to the current measures in place.

- c. SUPPLEMENTAL MEASURES: Specific study of current measures in place are required before supplemental measures are enacted. ~~Urban Runoff and Erosion: 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, and 12
Natural Area Management: 20
Lake Tahoe and the Shorezone: 22~~
- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~To strengthen efforts to attain this threshold, the 1996 Evaluation recommends implementation of supplemental measures 01 (restrictions on rate and/or amount of additional development), 02 (improved BMP implementation/enforcement program), 03 (additional restrictions on fertilizer use), and 07 (increased funding for CIP) as high priority action items.~~

9. ADEQUACY OF COMPLIANCE MEASURES: Discharges of surface runoff to groundwater, with application of BMPs and limits on impervious coverage, will generally meet the TRPA and state guidelines for discharges to groundwater, although runoff from heavily urbanized areas of the Region should be pretreated prior to infiltration. More study is needed for the influence of ground water infiltration at the lake interface.

I. WQ-7: OTHER LAKES

1. Evaluation Criteria

NUMERICAL STANDARD: TRPA and Nevada for other lakes in Nevada, the standards are as for the tributary streams, (see WQ-4). TRPA and California: TRPA has not officially adopted specific standards for California or Nevada others lakes, and it has been suggested to adopt the tributary standards for the discharge streams of these lakes. The assumption being that meeting tributary discharge standards will not impact Lake Tahoe at least. However feasibility studies have not been completed to confirm if such standards are appropriate and will protect water quality in these other lakes.

2. Measurement and Monitoring

There are more than 170 ponds or small lakes within the Tahoe Basin (TRPA, 1982). The total area of these small lakes and ponds comprise approximately 3 percent of Lake Tahoe's surface area.

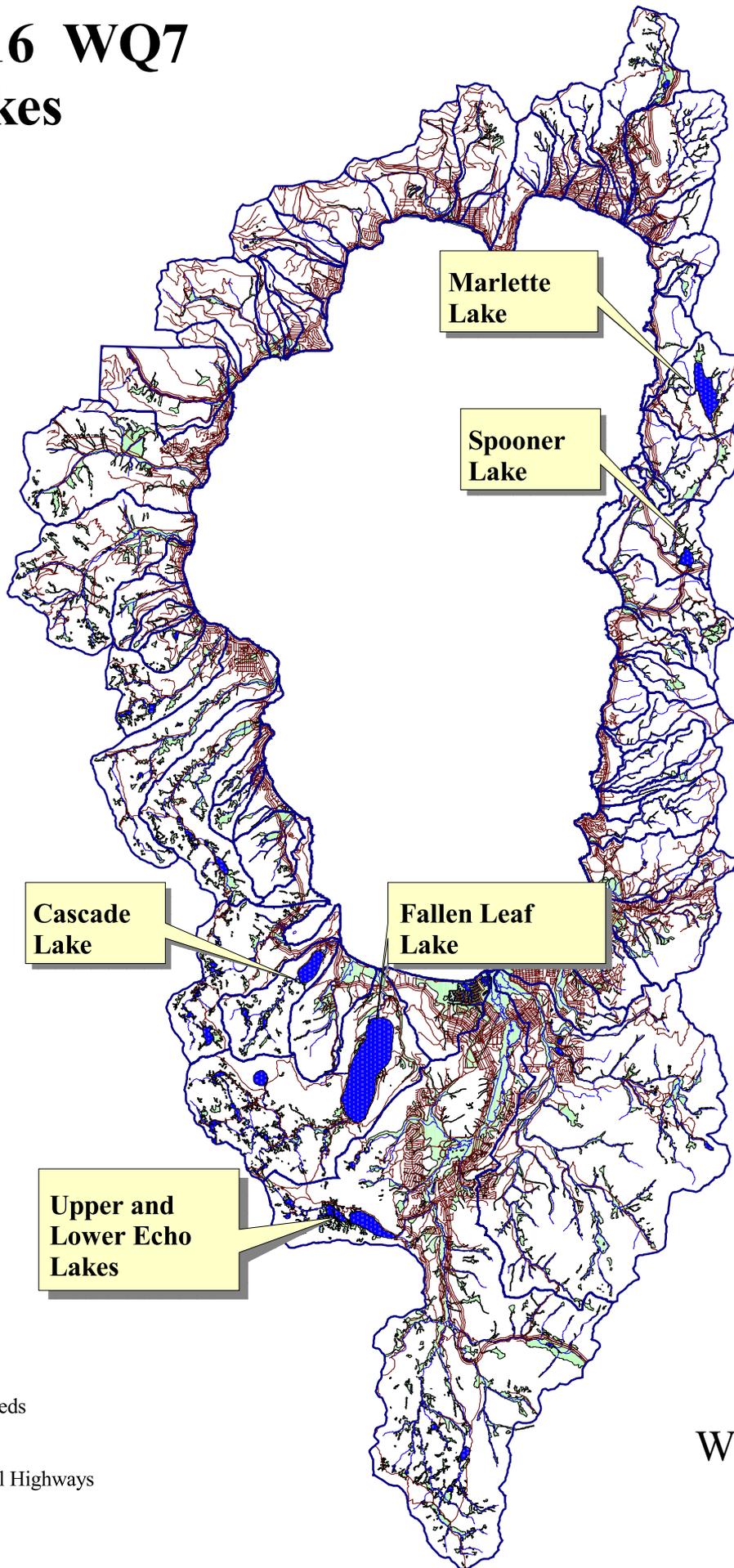
Historically, very limited data exists on these other lakes. In 1975, the USGS and EPA collected water quality data on Fallen Leaf, Lilly and Gilmore Lakes. Concentrations were typically well within state standards, with the exception of total iron.

In 1991, in cooperation with the USGS, NDEP and TRG, TRPA initiated Other Lake Monitoring as part of its water-quality monitoring program. That same year, NDEP, in cooperation with TRPA, received a Clean Lakes Water Quality Assessment Grant (LWQA) from the U.S. Environmental Protection Agency to monitor two lakes in Nevada, Spooner Lake and Marlette Lake. In 1992, TRPA received a Federal 314 LWQA grant from the California State Water Resources Control Board to monitor three California Lakes, Fallen Leaf, Upper Echo and Lower Echo Lakes. The purpose of these grants was to collect water quality data in order to characterize water quality conditions, and to develop standards for each lake. California and Nevada Lake locations can be seen in Figure 3-16. A more complete description of the results from this monitoring can be found in the technical appendices.

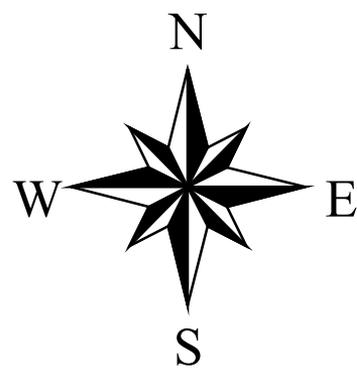
Since 1996, the main monitoring of other lakes has been in conjunction with monitoring for fuel oxygenates associated with motorized watercraft discharges. In August of 1998, Lower Echo, Upper Angora, and Fallen Leaf Lakes were monitored for nitrogen, bio-reactive iron, and dissolved oxygen in addition to other non-threshold parameters.

Figure 3.16 WQ7

Other Lakes



- Priority Watersheds
- Other Lakes
- All Other Roads
- State and Federal Highways
- Streams
- SEZ



3. Results of Measurement and Monitoring Efforts

In the pre-1996 sampling reported above, concentrations for total Kjeldahl nitrogen, soluble reactive phosphorus, total phosphorus, and biologically available iron are typically well below California and Nevada state standards. The study for Echo and Fallen Leaf Lakes concentrated on the trophic status and algae production, and concluded that Upper Echo Lake was the most productive and Fallen Leaf the most oligotrophic. Nevada lakes also show thermal stratification, seasonally and with depth; Marlette and Spooner Lakes seem to be phosphorus limiting in the fall. More recently (1997-2000), sampling was done by the USGS at Fallen Leaf and Echo Lakes for MTBE and other organic compounds related to motorized watercraft, and the 1999 TRPA ban on most two-cycle carbureted engines in the Lake Tahoe Region. The results were published in a Fact Sheet, reproduced in the Technical Appendices. The reductions in MTBE and related organics were quite dramatic, as seen in Figure 3-17, presented at the December 2000 TRPA Governing Board meeting.

In the August 1998 sampling, Lower Echo, Upper Angora, and Fallen Leaf Lakes met Nitrogen standards (specific N standards for Fallen Leaf Lake). All three lakes met soluble iron standards, and the specific dissolved oxygen standard.

4. Trends

The lack of a long term monitoring program for other lakes limits any trend analysis to observations of what is considered baseline data. The specific studies cited above have discussions on trends for motorized watercraft related compounds only.

5. Threshold Attainment Status

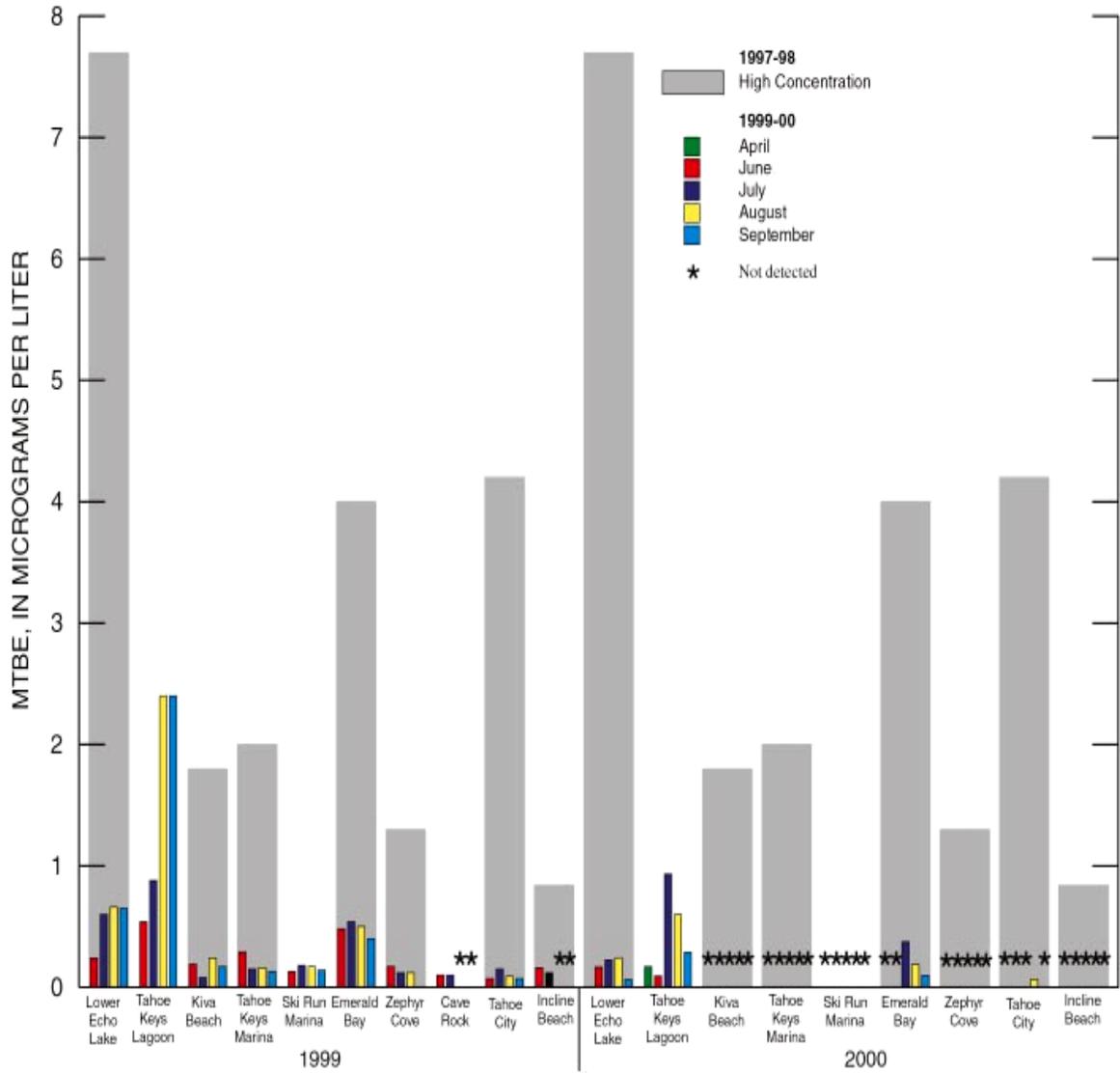
Unknown, since the states have not established numerical standards other than for Fallen Leaf Lake, and monitoring has not continued on a regular basis other than MTBE sampling, it is difficult to determine how things may have changed. However, prior monitoring indicated threshold attainment relative to existing standards for tributaries or Fallen Leaf Lake.

there is no set standard, the attainment schedule should begin with the adoption of this Threshold Evaluation and hold to the ONRW standard of no further degradation to these other lakes. TRPA shall determine the status of establishing water quality standards for the other lakes by the 2006 Threshold Evaluation.

6. Effectiveness of Measures in Place

The effectiveness of compliance measures is not known in the absence of a comprehensive monitoring program. While other lakes, aside from Fallen Leaf and Echo, don't have much development around their shores and in their sub-watersheds, compliance measures for BMPs, water quality capital projects and other limitations on disturbance or development have the best opportunity to positively effect this threshold. See measures 1–5, 8, 11, 13, 20–22, 26–35, 37, 38, 40, 41, 52, 57, and 60 in Table 3-6.

Figure 3-17. MTBE Sampling in Lake Tahoe and Other Lakes 1999 - 2000



Category: water quality
Parameter: other lakes

1. STANDARD: Numerical standards are set for Fallen Leaf Lake, including total nitrogen (0.20 mg/l ann. avg.) and total phosphorus (0.005 mg/l ann. avg./ 0.010 mg/l 90th percentile). No other lake in California, other than Lake Tahoe, is assigned numerical standards. The tributary standards for tributaries draining those lakes therefore apply. ~~Studies completed in 1992 should provide baseline data for the lakes included, namely Fallen Leaf, Spooner, Marlette, and both Echo's. TRPA and Nevada: for other lakes in Nevada, the standards are as for tributary streams (see WQ-4). TRPA and California: The Water quality Control Plan Report for the North Lahontan Basin (SWRCB/LRWQCB, 1975) and the Water Quality Control Plan for the Lake Tahoe Basin (SRWCB, 1980) set general objectives for all surface waters for color, taste and odor, floating material, suspended material, settleable materials, oil and grease, biostimulatory substances, sediment, turbidity, pH, dissolved oxygen, bacteria, temperature, toxicity, pesticides, chemical constituents, and radioactivity. They also set numerical standards for certain water bodies for total filterable residue (total dissolved solids), chloride, sulfates, sodium, boron, total nitrogen, total phosphorus, and fecal coliform.~~
 2. INDICATOR (UNITS): Annual average or 90th percentile concentrations of applicable constituents (WQ-4 Tributary Standards California: Ann. Avg. Total nitrogen, phosphorus, iron, Secchi depth or turbidity specific to each lake. Nevada: Ann. Avg. soluble inorganic nitrogen, soluble phosphorus, Secchi depth or turbidity specific to each lake, or Fallen Leaf Lake) from samples of the other lakes in the Tahoe Region for which the states have established numerical standards (normally mg/l); as related factors, progress on implementation of the capital improvements program for erosion and runoff control and implementation of BMPs, as set forth in the 208 Plan, Volume I (Nov. 1988), pp. 183 and 184. (See WQ-2-A and B).
 3. MONITORING SUMMARY: From 1974 to 1976, EPA and USGS conducted limited monitoring of Fallen Leaf, Lilly, and Gilmore Lakes. Fallen Leaf Lake easily met the total nitrogen standard. The Forest Service has monitored Lake LeConte, in the Desolation Wilderness, since 1983. Since 1991, TRPA has collected data on total nitrogen, total phosphorus, total iron, and turbidity at Cascade, Upper and Lower Echo, Marlette, Spooner, and Fallen Leaf Lakes. ~~For details, see the 1996 Evaluation.~~ In 1992, TRPA and NDEP initiated additional monitoring of other lakes in Nevada, and in 1993, federal grant assistance was obtained to evaluate California These studies should provide some baseline data for the lakes included, namely Fallen Leaf, Spooner, Marlette, and both Echos. In August 1998 Lower Echo, Upper Angora, and Fallen Leaf lakes were in attainment for N and Iron standards (tributary or specific respectively). Fallen Leaf was also in attainment for dissolved oxygen and iron specific standards.
 4. ATTAINMENT STATUS: ~~Unknown-Not known, pending final report due in June, 1996.~~ Generally in attainment for nitrogen and phosphorus. TRPA shall determine the status of establishing water quality standards by the 2006 Threshold Evaluation. September 30, 1997.
 5. TARGET DATE: ~~To be determined, pending feasibility study, 2003.~~ There are no specific indicator standards for other than Fallen Leaf Lake. By December 2004 TRPA shall complete the other lakes feasibility study, in order to set appropriate indicator standards for other lakes.
 6. EVALUATION INTERVAL: ~~Annual~~ Every 2-3 years.
 7. INTERIM TARGETS: ~~Due to the lack of recent monitoring data on other lakes, no numerical targets are set. By September 1996-1997, TRPA shall determine the status of this indicator with respect to attaining and maintaining the state standards, particularly for Cascade, Upper and Lower Echo, Marlette, Spooner, and Fallen Leaf Lakes, Under direction of Lake Tahoe as a Outstanding Natural Resource Waters, other lakes should allow no further degradation of water quality. By December 2004, TRPA shall apply tributary standards to other lakes if appropriate (based on the other lakes monitoring study) and study feasibility of establishing other water quality standards.~~ TRPA shall establish interim targets, and shall identify compliance measures necessary and sufficient to attain and

maintain the [appropriate](#) standards [for other lakes](#).

8. COMPLIANCE MEASURES: [The Compliance Measures have been reworked, see Table 3-6 for details.](#) (~~See Section II for inventory~~)
 - a. MEASURES IN PLACE: ~~Urban Runoff and Erosion: 01, 02, 03, 04, 05, 08, 11, and 13~~
~~Waste Management: 21, 22, 24, 28, and 29~~
~~Natural Area Management: 30, 31, 32, 34, 35, 36, 37, and 38~~
~~Lake Tahoe and the Shorezone: 40, 41, 43, 44, 45, and 47.~~ [1-5, 8, 11, 13, 14, 21, 22, 26-31, 35-42, 55-59, 102, 129, 140, 152, 155, 178, 194.](#)
 - b. EFFECTIVENESS OF MEASURES IN PLACE: Pending further data collection and analysis, the effectiveness of measures in place is not known.
 - c. ~~SUPPLEMENTAL MEASURES: Urban Runoff and Erosion: 02, 08, and 11~~
~~Waste Management: 16 and 17~~
~~Natural Area Management: 19 and 20~~
~~Lake Tahoe and the Shorezone: 22~~
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Pending further data and analysis, the need for and effectiveness of supplemental measures is not known.
9. ADEQUACY OF COMPLIANCE MEASURES: ~~Without additional data interpretation, the adequacy of in-place and supplemental measures is not known.~~ [The limited data set indicates restriction of development and BMP implementation has been effective for this threshold. Many of the new measures in place are related to other thresholds such as fisheries, and effectiveness is not easily determined.](#)

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(1) BMP requirements, new development: For all additional development in the Tahoe Region, application of temporary and permanent BMPs are required as a condition of approval. Requirements are set forth in Chapter 25 of the TRPA Code. BMPs are described in the Handbook of Best Management Practices.	Yes, but there are elements that need to be improved.	Site-specific BMP prescriptions are based on soil, slope and topography appropriate to the project site.	Currently working on updates to the BMP Handbook in conjunction with NDEP to incorporate new technologies and information, continued enforcement of temporary and construction BMPs.
(2) BMP implementation program -- existing streets and highways: Under Chapter 25 of the TRPA Code, the implementation program includes voluntary, regulatory, and remedial aspects. BMPs are described in the Handbook of Best Management Practices.	No	Existing roads are large contributors of sediment and various pollutants. Improved implementation of BMPs.	Enhance the existing coordination and communication with NDOT and Caltrans to incorporate new technologies to capture sediment.
(3) BMP implementation program -- existing urban development: Under Chapter 25 of the TRPA Code, the implementation program includes voluntary, regulatory, and remedial aspects. BMPs are described in the Handbook of Best Management Practices.	Yes, but there are elements that need to be improved.	Actually called the BMP retrofit program. Soil conservation will continue to support the BMP retrofit program in an effort to enhance and develop the program. Priority watersheds are assigned by date. Projects within priority watersheds are put on a BMP retrofit program when remodels or additions are approved on the property. Priority One watershed properties were required to come up to BMP standards by October 15, 2000.	Continue outreach to educate about the effectiveness of BMPs, using contractor and real estate workshops. It is the intent of the program to provide incentives for BMP retrofit for properties not coming in for project approval. Continue working on developing a program to require BMP compliance upon sale of the property,
(4) BMP implementation program -- existing urban drainage systems: Under Chapter 25 of the TRPA Code, the implementation program includes voluntary, regulatory, and remedial aspects. BMPs are described in the Handbook of Best Management Practices.	Yes, but not entirely.	TRPA is in the process of monitoring specific BMP effectiveness. It is the intent to monitor the effectiveness of BMPs on urban properties in the near future.	Develop short-term watershed indicators in addition to Bio-Assessment Monitoring in an effort to respond or adjust to impacts/improvements faster than water quality indicators reveal. There is a need to develop demonstration projects to illustrate the accuracy of these short-term indicators. Evaluation of indicators should lead to the identification of problem areas in ways to adjust BMP effectiveness. Indicators will also provide quantifiable benefits at the neighborhood scale. These short-term indicators should compliment the existing long-term tributary and Lake monitoring.
(5) Capital Improvements Program for Erosion and Runoff Control: The CIP for erosion and runoff control is set forth in Volume IV of the 208 Plan. It is a critical part of the TRPA Regional Plan. The CIP applies primarily to erosion and runoff problems from public rights-of-way. It is implemented by the local jurisdictions, Caltrans, and NDOT with oversight and assistance from TRPA and other agencies.	Yes, but not entirely.	Capital Improvement Program will be part of the EIP. Its implementation has and will continue to be one of TRPA's most effective actions to pursue attainment of the threshold.	Continue to support Capital Improvement Programs represented through EIP.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
<p>(6) Excess coverage mitigation program: Where projects are approved for modification or rehabilitation of facilities on parcels with existing coverage in excess of the Bailey coefficients. This mitigation program provides for a reduction of coverage in an amount proportional to the cost of the project and the extent of excess coverage that is onsite. The program is set forth in Chapter 20 of the TRPA Code of Ordinances.</p>	<p>Yes, but not entirely.</p>	<p>Temporary adjustments are proposed for this program and are intended to be adopted in June 2001. This threshold evaluation may suggest other revisions such as the type of coverage that can be transferred, adjustments in hydrologic boundaries, and the restrictive use of subsidies to support specific types of projects. However, the most critical revision that needs to be assured is that a one-to-one mitigation will be attained when this program option is exercised. Modification of the reduction formula and adjustment to the square foot coverage cost will be a part of the solution.</p>	<p>The excess coverage mitigation fee is currently being reviewed basin wide by a licensed appraiser. This is happening simultaneously in conjunction with the local land acquisition agencies (USFS, CTC, NVSL) and will be achieved by 2001. Transfer of coverage and hydrologic boundaries are related issues to be identified as an A, B, or C list recommendation.</p>
<p>(7) Effluent limitations: California (SWRCB, Lahontan Board) and Nevada (NDEP) issue effluent standards under their statewide authorities to help control water quality problems resulting from discharges of urban drainage. TRPA may also set effluent standards for control of nonpoint sources under the provisions of Chapter 9 of the TRPA Code of Ordinances.</p>	<p>Yes, but not entirely.</p>	<p>Currently no enforcement on the Nevada side for the type of projects that Lahontan monitors on the California side. TRPA defaults as the enforcer on the Nevada side.</p>	<p>Improve partnership with NDEP on the Nevada side to coordinate with Lahontan on effluent standards with similar guidelines basin wide.</p>
<p>(8) Limitations on new subdivisions: No new divisions of land are permitted within the Tahoe Region which would create development potential inconsistent with the Goals and Policies (See the Goals and Policies, p. 113.). TRPA's intent is to avoid the impacts of new lot and block subdivisions while allowing mechanisms such as re-subdivision to lessen the potential impacts of existing approved but unbuilt subdivisions.</p>	<p>Yes.</p>	<p>This measure is working because new subdivisions are not creating development potential as defined by the Code. All new subdivisions approved are approved consistent with the Bailey coefficients as the existed on the effective date of the Regional Plan. Concern has been expressed regarding the configuration of coverage approved as a part of multi-family projects that are subsequently subdivided.</p>	<p>TRPA should continue to require water quality monitoring studies for these types of two-step subdivisions to determine if impacts are similar to traditional lot and block subdivisions.</p>
<p>(9) Land use planning and controls: TRPA's land use plan, set forth in the Goals and Policies and the Plan Area Statements and maps, directs development to already urbanized areas of consistent land use. Specific land use policies are implemented through the use of Plan Area Statements, specific community plans, and in some instances master plans. See the Goals and Policies (pp. II-2 through 5), and Chapters 13, 14, 15, 16, and 18 of the Code of Ordinances.</p>	<p>Yes.</p>	<p>Control measure introduction adequately explains the critical portions of this issue. That it is prudent planning to concentrate development in the Basin within the urban boundaries and Plan Areas</p>	<p>Continue the commitment to the strict interpretation of those chapters to honor the commitment to concentrate those activities within the urban boundaries and Plan Area Statements. This will reflect TRPA's continued commitment to reducing disturbance on raw lands.</p>

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(10) Residential development priorities (IPES): The Individual Parcel Evaluation System (IPES) evaluates parcels eligible for single-family development contingent upon their relative suitability for development. This program directs additional development first to the most suitable parcels. IPES is set forth in Goals & Policies (pp. VII-3 through 7) and Chapter 37 of the Code.	Yes.	DRI analysis suggests that there has been a decrease in sediment loads in most of the tributaries since implementation of IPES. The increase in sediment loads in other creeks may not be directly attributable to the IPES program. However, their needs to be more refined research to determine whether IPES is definitively effective as designed and intended.	A reevaluation of the environmental management strategies within those watersheds or tributaries where sediments are not going down should be undertaken. To help determine what factors may be contributing to the increase. However, their needs to be more refined research to determine whether IPES is definitively effective as designed and intended.
(11) Limits on land coverage for new development: All new development must conform to the coefficients of allowable land coverage set forth in the Bailey Report. In some instances, provisions are made to allow additional coverage on a given parcel by transfer programs. See the Goals and Policies (pp. II-12 through 15) and Chapter 20 of the Code.	Yes.	New coverage approved conforms as stipulated by permit. However, existing excess coverage is not being fully mitigated.	Continue to vigorously pursue the necessary adjustment required so that the excess coverage mitigation program can function as intended. This implies a one-to-one sq. ft. mitigation.
(12) Transfer of development: To provide more flexibility for planning new development and mitigating existing problems, four types of transfer programs are provided in the Regional Plan: 1) transfers of residential development rights, 2) transfers of existing development, 3) transfers of land coverage, and 4) transfer of residential allocations. See the Goals and Policies, pp. II-14 and VII-14.	Yes.	Land coverage has become short in supply and high in cost, particularly in Nevada watersheds. New multi-family residential projects must acquire development rights to facilitate increased density. Rights are typically transferred from environmentally sensitive parcels, which are permanently retired as a consequence of the transfer. A new program allows for the assignment of residential allocations to buildable parcels in-lieu of retiring a sensitive parcel, an alternative to obtaining allocations through local jurisdictions. Limited availability of new commercial floor area (CFA) and tourist accommodation units (TAUs) requires project proponents to acquire and transfer existing development to facilitate new construction.	Continue to support residential development rights as well as the allocation and transfer of existing development rights program. Continue to support Nevada Division of State Lands in the establishment of a land bank program. This can be accomplished and refined through the MOU process.
(13) Restrictions on SEZ encroachment and vegetation alteration: No new land coverage or other permanent disturbance is permitted in SEZs. There are exceptions for certain public outdoor recreation facilities, public service facilities, projects which require access across SEZs, new development in man-modified SEZs, and SEZ restoration and erosion control projects. This will continue provided that the TRPA makes the required findings and that offsetting restoration is secured. See Chapter 20 of the Code.	Yes, but with additional with future refinements	SEZ encroachment and disturbance, no new disturbance is happening as a consequence of the improved mapping and identification of SEZ in the basin. There are historical disturbances of SEZs that have not been fully restored. This suggests that there is a need for further programmatic resources.	Whether through resource/ cost sharing with partner agencies, or through BCP requests or grant funding, the SEZ management will benefit from increased funding and attention. There is a particular need to reclarify what activities are appropriate within SEZ's to enhance their maintenance and functions, some MOUs may need to be modified.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(14) SEZ restoration program: The SEZ restoration program is set forth in Volume III of the 208 Plan and Volume's I-IV of the updated Environmental Improvement Program.	Yes, but not entirely.	Explanation adequately addressed in the recommendation section.	300 acres of SEZ should be restored over the next five years. 200 may come from subdivided lands acquired by US Forest Service, California Tahoe Conservancy, and Nevada Division of State Lands. An inventory of these lands is needed to determine the restoration potential and feasibility of the 200-acre target. The balance of the 300 acres needs to come from projects outside of these lands. Artificial wetlands should be evaluated for their water quality treatment effectiveness and applicability for SEZ restoration threshold credit; project-need descriptions and locations for the SEZ portion of the EIP should be updated based on evaluation criteria derived from the classification system; TRPA will continue to advocate implementation and financing of the SEZ portion of the EIP.
(15) SEZ setbacks: All new development must be setback from the defined extent of the SEZs to preserve their integrity. There are important values of the edge zone created by the SEZ and surrounding vegetation types. Required setbacks are identified in Chapter 37 of the Code.	Yes.	No new disturbance of SEZs are happening as a consequence of the continuing effort to improve the mapping and identification of SEZ in the Basin. A redefinition of SEZ has incorporated all the soil and hydrologic qualities, not just vegetative indicators that define their existence.	A more rigorous application and updated scientific definition of the SEZ is needed. A Continued commitment to enforce SEZ setbacks will be vigilantly enforced.
(16) Fertilizer reporting requirements: TRPA may request practices that require regular fertilizer maintenance (e.g., golf courses, parks, cemeteries, ball fields, and residential yards) need to submit fertilizer management plans for review and approval. Large users of fertilizer shall initiate a tracking program for lands under their control and present annual reports to TRPA. See Chapter 81 of the Code. Additional restrictions on fertilizer use could include bans on fertilizer applications in some situations, such as golf courses in SEZs, or lake front properties, or requirements to use only slow-release fertilizers.	Yes, but not entirely	Explanation adequately addressed in Control measure narrative.	TRPA should develop a mechanism where reports are routed to the appropriate staff person for interpretation and possible action. An effort needs to be made to encourage other large turf areas users to develop plans for review. This will need to happen in cooperation with Lahontan and NDEP, perhaps on an NPDES permit or a TRPA BMP Plan.
(17) Water quality mitigation: All projects and activities which result in the creation of additional land coverage must offset their potential water quality impacts through one, or a combination of the following methods: 1) implementation of offsite water quality control projects as a condition of project approval or 2) contribution to a water quality mitigation fund. See Chapter 82 of the Code.	Yes	Should be contingent upon demonstrated effectiveness of the BMPs that are part of the erosion control projects.	Continue to be vigilant about updating our methods. Monitor to quantify as well as qualify the effectiveness of the BMPs we use. Re-evaluate the mitigation fund so allocation may more specifically benefit the project area.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(18) Restrictions on rate and/or amount of additional development: Such restrictions could include restrictions on additional development in all categories or certain categories, including residential, commercial, recreational, and public service. Restrictions could be applied Region-wide, by jurisdiction, by watershed, or by some other appropriate sub-unit. Restrictions could be placed on public service uses not currently covered by allocations by establishing allocation limits, setting priorities, or prohibiting certain uses in the Region.	Yes.	Continuing to see a mix of new and redeveloped properties. This measure is closely tied to attainment and maintenance of all thresholds. If measure were not working there would be only projects proposed on raw land. New public service facilities continue to be approved on an “as needed” basis as the finding that there is a need for the project needs to be made. New public service projects are prohibited from providing additional service capacity /infrastructure for unplanned development.	Continue to enforce the applicable Code provisions.
(19) Improved BMP implementation/enforcement program: An improved program could include subsidized BMP applications from grants, annual budgets, or fees; or mandatory compliance with BMPs upon sale of property.	Yes, but some elements need to be improved.	Mandatory BMP compliance upon sale of property is currently being worked on in cooperation with Basin –wide realtors.	Continue to develop a public outreach and education program related to BMPs and watershed improvements as part of the Environmental Improvement Program (EIP). Compliance with residential BMPs is based on watershed priority are as follows: Priority 1=2001; Priority 2=2006, Priority 3=2011. TRPA should continue (and expand) BMP workshops with the local Resource Conservation District for contractors, homeowners, and landscape architects.
(20) Increased funding for CIP for erosion and runoff control: Increased funding could come from grants, annual budgets, bonding, or fees. This measure is consistent with the CIP Volume IV of the 208 Plan.	Yes, but not entirely.	Funding sources are emerging and are expected to be in place. This will be captured under EIP’s future funding	Continue to participate and identify priority projects that deserve the funding sources available through EIP, including options for private homeowners and small business. This should be targeted toward projects that will result in the greatest benefit to source control as well as treatment and interdiction of known sediment producing areas.
(21) Artificial wetlands/runoff treatment program: This compliance measure would include a more active program to identify major discharge points of surface runoff and provide treatment through the installation and maintenance of artificial wetlands. The program should involve pilot projects prior to full-scale implementation. This program is consistent with the spirit and intent of the 208 plan.	Not at present	Funding sources are emerging to include monitoring for projects related to urban runoff. Efforts are underway to coordinate the ongoing monitoring efforts to maximize the exchange of information and provide feedback for project design.	Utilize the results of current EPA grant for wetlands efficiency in runoff to evaluate the use of these wetlands Consider use of artificial wetlands for water quality treatment and SEZ restoration credit.
(22) Transfer of development from SEZs: Removal of existing structures from SEZs could be accomplished by establishment of a specific transfer program, with appropriate incentives.	Yes.	Bonus units can be given to projects that transfer development out of a SEZ. This is the only incentive specific to SEZs. There are prohibitions against additional land coverage and development within SEZs. This encourages development outside SEZs and promotes removing existing development from SEZs.	Continue to promote program as it functions presently.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(23) Combustion heater rules, stationary source controls, and related rules: Rules regarding emissions from comb. heaters and stationary sources set forth in Chapter 91 of the TRPA Code.	Yes		See Chapter 1
(24) Redevelopment and redirection of land use: Certain plan area statements are designated for redirection of development to improve environmental quality, community character, and efficiency of transportation systems. See the Goals and Policies, pp. II-2, II-4, and II-12, and Chapter 15 of the Code of Ordinances.	Yes.	Explanation adequately addressed in Control measure narrative.	Continue to concentrate development within urban areas.
(26) Elimination of accidental sewage releases: The discharge of wastewater to the surface or groundwaters of the Tahoe Region is prohibited, except for existing development operating under approved plans for wastewater disposal. Sewage collections, conveyance, the treatment districts shall have approved spill contingency, prevention, and detection plans. (See the Goals and Policies, pp. II-41 and 43).	Yes, but needs further development.	On the ground evaluation of sewage disposal sites is evaluated by the geologists of the BMP retrofit program. Contingency plans for overflow emergencies are prescribed through this program. This may include interception basins to capture run-off in times of facility failure.	Continued effort of vigilant re-evaluation of these facilities and the interception measures that have been installed will be updated as new methods and technology allow. Implement the EIP project to inspect and replace export lines away from SEZ's.
(27) Reduction of sewer line exfiltration: All agencies which collect or transport sewage should have plans for detecting and correcting exfiltration problems, and shall be required to implement such plans as a condition of TRPA project approvals. (See Goals & Policies,p.II-45).	No	Only certain ground water well monitoring stations can detect these subterranean sewage pipe exfiltration failures. Plans submitted to identify exfiltration problems are limited in there ability to detect these system failures.	The ability to monitor and detect sewage exfiltration failures is limited by funding, technology and human resources. The ability to address these problems will need to be developed in coordination with TRPA compliance division.
(28) Effluent limitations: State agencies issue limitations under their existing authorities to entities collecting and treating wastewaters. All existing sewage collection and treatment entities in the Tahoe Region are covered by NPDES permits or California Waste Discharge Requirements (WDRs).	Yes	The explanation is adequately captured in the control measure narrative.	To continue to support and work in partnership with the authorities who monitor and regulate the collection and treatment of sewage waste waters.
(29) Regulation of wastewater disposal at sites not connected to sewers: Wastewater discharge prohibitions apply equally to discharges in rural or remote areas. TRPA may approve holding tanks or other no-discharge systems in some situations where they would not create adverse impacts. See Chapter 81 of the Code.	Yes	The explanation is adequately captured in the control measure narrative.	Continue to enforce.
(30) Prohibition on solid waste disposal: Disposal of solid wastes in or on land within the Tahoe Region is prohibited. See p.II-45 of Goals & Policies.	Yes	The explanation is adequately captured in the control measure narrative.	Continue to enforce.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(31) Mandatory garbage pick-up: Garbage pick-up is mandatory in the Tahoe Region and should be structured to encourage clean-ups and recycling. See p. VI-3 of the Goals and Policies.	Yes		See Chapter 7
(32) Hazardous material/wastes programs: Underground storage tanks for sewage, fuel, or other potentially harmful substances shall meet TRPA standards and shall be installed, maintained, and monitored in accordance with the BMP Handbook. TRPA will cooperate with other agencies on preparation, evaluation, and implementation of toxic and hazardous spill control plans. All persons handling, transporting, using, or storing toxic or hazardous substances shall comply with applicable state and federal laws. See pp. II-44 and 45 of the Goals and Policies and Chapter 81 of the Code.	Yes	The explanation is adequately captured in the control measure narrative.	Continue to enforce and continue to pursue new technology that will allow for the rapid detection of these system failures when they occur. Encourage construction of above ground fuel tanks, especially in sensitive areas, (marinas and SEZ's)
(33) BMP implementation program: Snow and ice control practices: Chapter 81 regulates snow removal and snow disposal locations for all public and private snow removal operations. The BMP Handbook addresses snow disposal practices. The implementation program is set forth in Chapter 25 of the Code and involves voluntary, regulatory, and remedial aspects. Snow removal is limited to structures, paved areas, and areas necessary for parking or safe pedestrian access. Snow removal from dirt roads is subject to TRPA regulation.	No	Enforcement issue that is not being addressed. New projects are required to show snow storage areas, however it is existing commercial properties that are the problem. Active BMP retrofit of paved driveways will aid in residential properties.	Incorporate snow and ice reports to identify specific areas of high deicer use as potential pilot projects for BMP effectiveness relative to snow removal practices. Public education program (perhaps through LTEEC) for landowners. Require snow removal plans that include barriers, snow disposal sites in appropriate locations and other BMPs for commercial properties and large developments such as condominium complexes.
(34) Reporting requirements, highway abrasives and deicers: Institutional users of road salt shall keep records on salt application. Major users of salt and abrasives shall initiate a tracking program and present annual reports to TRPA. (See Goals and Policies, p.II-44 and Chapter 81 of the Code).	Yes, but not entirely.	Currently TRPA is receiving reports from some of the large users (Caltrans and NDOT). There is no staff time devoted to interpretation of these reports and follow up monitoring	Prioritize projects and/or additional urban runoff treatment in areas of high use. Continue with interagency working groups related to maintenance and development of basin-wide standards.
(35) BMP implementation program--roads, trails, skidding, logging practices: The BMP Handbook and Chapter 71 of the TRPA Code identify the required BMPs for roads, trails, skidding, and logging. The program of implementation is set forth in Chapter 25 of the Code	Yes	TRPA's Registered Professional Forester will vigilantly monitor activities associated with logging activities and recommend appropriate adjustment of permits and prescriptions to enforce the most current and appropriate BMPs.	Continue to enforce and expand knowledge base to incorporate and minimize the deleterious consequences associated with logging activities.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(36) BMP implementation program--outdoor recreation: Outdoors recreation uses are subject to the BMP requirements of Chapter 25 of the TRPA Code of Ordinances. The required practices are described in the BMP Handbook.	Yes, but not entirely	Bike trails, ski areas, shore zone use, and I use requires a specific suite of on-the-ground mitigation to minimize the aggravation to the landscape that is offend associated we these types of concentrated activities.	The appropriate installation of BMPs that are tailored to minimize the accelerated erosion often associated with concentrated recreational use needs further development.
(37) BMP implementation program--livestock confinement and grazing: Farm and ranch structures, grazing, range pasture management, and range improvement are primary resource management uses and are permissible as set forth in the Plan Area Statements (Code, Chapter 18). TRPA approval is required for a new grazing or confinement project. (See Code, Chapter 73). Application of BMPs is required of owners and operators of livestock confinement (corrals) and grazing. The implementation program is set forth in Chapter 25 of the Code. The required practices are described in the BMP Handbook and the Landscape Guide.	Yes, but not entirely	The explanation is adequately captured in the control measure narrative.	TRPA is in the process of bringing livestock containment facilities into compliance with the established and new technologies that will help mitigate the consequences of concentrated livestock containment. TRPA should evaluate the effectiveness of grazing BMPs on protection of stream channels and water quality.
(38) BMP implementation program--pesticides: The use and storage of insecticides, fungicides, and herbicides must be consistent with the BMP Handbook. See also in-place water quality compliance measure (47).	Yes but could use further development.	The States regulates the handling and storage of these types of chemicals through licensed applicators because there misuse is difficult if not impossible to mitigate.	TRPA should amend the Regional Plan to incorporate specific guidelines related to pesticide use. Currently very little information exists in the BMP Handbook. TRPA should develop BMPs related to the use and disposal of pesticide products and provide outreach and education through landscape companies and nurseries. These products should only be allowed if other methods are ineffective, TPRA encourage integrated pest management as an alternative
(39) Land use planning and controls -- timber harvesting: Reforestation, regeneration harvest, sanitation salvage cut, selection cut, special cut, thinning, timber stand improvement, tree farms, early successional stage management, fire detection and suppression, fuels treatment and management, insect and disease suppression, and prescribed fire management are primary resource management uses and are permissible as set forth in the TRPA Plan Area Statements (Code of Ordinances, Chapter 18).	Yes	The explanation is adequately captured in the control measure narrative.	Continue to enforce the provisions of the TRPA Code. Increase programmatic participation and support for compliance in the accurate interpretation and application of the Code.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(40) Land use planning and controls - outdoor recreation: Beach recreation, boat launching facilities, cross-country skiing courses, developed campgrounds, golf courses, group facilities, off-road vehicle courses, outdoor recreation concessions, marinas, RV parks, riding and hiking trails, rural sports, skiing facilities, snow mobile courses, undeveloped campgrounds, and visitor information centers are primary recreational uses and are permissible uses as set forth in the Plan Area Statements (Code, Chapter 18). Expansion of existing ski facilities must be based on approved master plan.	Yes, but not entirely	The explanation is adequately captured in the control measure narrative.	TRPA will continue to commitment to those Code chapters that address those activities within the urban boundaries and Plan Area Statements which reflects our commitment to reducing disturbance on raw ?lands.
(41) Land use planning and controls--OHV use: Off Highway Vehicle use is prohibited in the Region except on specified trails, roads, or designated areas where impacts can be mitigated. (See Goals and Policies, p. V-3).	Yes, but not entirely.	The explanation is adequately captured in the control measure narrative.	This control measure warrants additional review to evaluate these types of recreational activities within the Lake Tahoe Basin. The intent is to assure that these types of activities are appropriately matched to the types of soils that are most resilient to these impacts.
(42) Control of encroachment and coverage in sensitive areas: Public outdoor recreation facilities may encroach into sensitive lands provided TRPA makes required findings designed to protect water quality and ensure mitigation of impacts. Projects that, by their nature, need not be located in sensitive lands are identified in the 208 plans, Table 16.	Yes, but not entirely.	The explanation is adequately captured in the control measure narrative.	Increase vigilant enforcement and a re-affirmation of TRPA's historical interpretation of Table 16 in the 208 Water Quality Management Plan.
(43) Control of shorezone encroachment and vegetation alteration: All vegetation at the interface between the backshore and foreshore shall be undisturbed. The use of lawns or ornamental vegetation in the shorezone is discouraged in the Goals and Policies. There are eight shorezone tolerance districts along the shoreline of Lake Tahoe, Fallen Leaf Lake, and Cascade Lake. Specific rules apply to each district. (See Chapter 53 of the Code of Ordinances).	Yes.	The installation lawns and/or ornamental vegetation should be discouraged and in most cases prohibited.	Continue to enforce the conditions outlined in Section 55.6 of the TRPA Code that sets forth standards for vegetation alteration in the backshore area. This requires that plants used for revegetation within the backshore be from the TRPA-approved list of backshore plants.
(44) BMP implementation program--shorezone areas: The BMP handbook includes special BMPs for the shorezone. The program of implementation is set forth in Chapter 25 of the Code. The Shorezone EIS was completed in 1999 and will have potential impact to this measure.	Yes, but not entirely.	TRPA Compliance Division will be hiring staff in the near future to address these issues.	Develop action plans for implementation of dynamic shoreline BMPs and protective structures (i.e. appropriately designed revetments). Utilize DRI's Shorezone Erosion Study to help focus TRPA's activities to the types of shorezone revetments and methods of shoreline stabilization that are most effective.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(45) BMP implementation program--dredging and construction in Lake Tahoe: The BMP Handbook includes BMPs for construction and dredging in Lake Tahoe. The program implementation is set forth in Chapter 25 of the Code.	Yes, but with the need to incorporate new technologies	This is a compliance measure not a BMP measure. Dredging is a permitted activity and is subject to fairly strict control, illegal activities may have a larger impact.	TRPA will continue to monitor this activity. This agency will also concurrently seek out new technologies that may allow for this activity while minimizing the associated impacts.
(46) Restrictions and conditions on filling and dredging: Filling and dredging are subject to TRPA ordinance provisions to protect water quality and the natural function and dynamics of the shorelines and lakebeds. See Chapter 54 of the Code.	Yes, , but with the need to incorporate new technologies	This is a compliance measure not a BMP measure. Same as above.	TRPA will continue to monitor and enforce the applicable provisions in the TRPA Code. This agency will also concurrently seek out new technologies that may allow for this activity while minimizing the associated impacts.
(47) Protection of stream deltas: Stream deltas shall be protected from encroachment and disturbance as described under SEZ protection provisions, in-place water quality compliance measure (13).	Yes, but not entirely	Protection of 100 year floodplain, although not a threshold is a primary responsibility of the Soil Conservation/SEZ program. Restricted activities as a consequence of floodplain management and SEZ protection provisions that are already in place will continue to allow TRPA to manage stream deltas in a effort to encourage proper ecological function.	TRPA is in the process of reviewing and updating both the demarcation of the 100 year floodplain and the most current comprehensive definitions of wetland delineation.
(48) Marina master plans: Expansion of marinas is limited until TRPA adopts a master plan for the marina (see Chapter 16 of the Code of Ordinances).	Yes.	Marina Master Plans are an effective means for consistent and regulated expansion of such facilities.	Strict enforcement and monitoring of permit requirements.+
(49) Additional pump-out facilities: Liquid and solid wastes from boats shall be discharged at approved pump-out facilities. Pump-out facilities shall be provided by marinas and launching facilities as required by Chapter 25 of the Code and the BMP Handbook.	Yes, but not entirely	Existing pump out facilities at marinas require maintenance and are not subject to regular inspections. Not all launching facilities have provisions. The explanation is adequately captured in the control measure narrative.	TRPA will continue to review improved compliance procedures as well as advanced technologies to deal with marine generated wastes.
(50) Controls on anti-fouling coatings: The BMP Handbook incorporates California and federal restrictions on the use of paints containing tributyltin (TBT). The program of implementation is set forth in Chapter 25 of the Code. The Lahontan Board also enforces the California restrictions.	Yes, but not entirely.	The explanation is adequately captured in the control measure narrative.	Continue to enforce the applicable measures outlined in the BMP Handbook.
(51) Modifications to list of exempt activities: This is a contingency measure not presently enacted by TRPA. Activities presently exempt from requirements for TRPA permits, but which are found to have adverse impacts, may be removed from the list of exempt or qualified exempt activities.	Yes, but not entirely.	These types of activities are covered under existing MOUs with the local jurisdictions.	Suggest that this be converted to supplemental measure in place. Review current MOUs with local jurisdictions for completeness and updates relative to recent compliance violations.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(Supplemental Measure 52) More stringent SEZ encroachment rules: More stringent SEZ encroachment rules could include reducing or eliminating the exceptions to the prohibitions on SEZ encroachment.	Not in place	There is a need to review the activities that are presently allowed within SEZ's.	TRPA feels there is a need to review the SEZ rules. There is also a need to reevaluate the qualified exempt activities that are currently allow under the existing code of ordinances.
(Supplemental Measure 53) More stringent coverage transfer requirements: This is a contingency measure not presently enacted by TRPA. More stringent requirements could include: elimination of transfers of potential coverage; elimination of transfers of soft coverage; increased coverage transfer ratios; or restriction on TRPA's ability to substitute transfers of soft or potential coverage for hard coverage in commercial transfers.	Not in place	The explanation is adequately captured in the control measure narrative.	TRPA has recently reaffirmed the interpretation of the language of chapters 20 and 38. This recent review has clarified that hard, soft and potential coverage can be used to mitigate excess coverage for residential, recreation, and public service projects however, only hard coverage can be used to mitigate excess coverage for commercial and tourist projects.
(Supplemental Measure 54) Modifications to IPES: This is a contingency measure not presently enacted by TRPA. The Goals and Policies contemplate adjustments in IPES based on results of a special component of the TRPA monitoring program to evaluate IPES. Modifications to IPES could include further restrictions or safeguards on movement of the IPES line.	Not in place	Recommend as a measure in place. Confirmation of certain limitations on how extensively the K-factor of the REH portion of IPES can be manipulated.	A performance audit of the IPES program was completed in July, 2000 with limited conclusions. Data sets could be used to further investigate the relationships and performance of IPES in sediment reduction to lake tributaries.
(Supplemental Measure 56) Control of upwind pollutants: Future compliance measures implemented by upwind jurisdictions will have a beneficial effect on transport of nitrogen compounds to the Tahoe Region. The 208 plan contains a strategy for encouraging controls to upwind NOx emissions.	Not in place		
(Supplemental Measure 57) Additional controls on combustion heaters. This compliance measure could include requirements to install certified combustion heaters upon sale of a home, or sooner.	Not in place		
(Supplemental Measure 58) Improved exfiltration control program. An improved program could include monitoring and reporting requirements and compliance schedules for correction of problems.	Not in place		Continue to leave as supplemental and provide for research direction to demonstrate need and effectiveness.
(Supplemental Measure 59) Improved infiltration control program: An improved program could include monitoring and reporting requirements and compliance schedules for correction of problems.	Not in place		Continue to leave as supplemental and provide for research direction to demonstrate need and effectiveness.

Table 3-6. Effectiveness of Measures in Place for the Water Quality Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(Supplemental Measure 60) Water conservation/flow reduction program: Such a program could include problem identification, strategy development, improvement recommendations, and implementation effectiveness.	Not in place	Periodic drought invariably leads to reduced water table levels and aquifer storage. As a consequence there is generally an increase in Total Dissolved Solids (TDS) as well as an increase in the concentration of undesirable pollutants.	Encourage and promote an educational outreach program that provides incentives for water conservation at both the residential and commercial level.
(Supplemental Measure 61) Additional land use controls: It could include amendments to the Plan Area Statements to restrict areas in which certain or special uses are allowed.	Not in place		

IV. STATUS OF 1996 RECOMMENDATIONS

The development and update of the Environmental Improvement Program (EIP) has been the most significant and time-consuming of the 1996 Threshold Evaluation recommendations. The Presidential Forum in 1997 provided impetus and funding interest for the EIP and many of the ongoing studies that were recommended by the 1996 Evaluation (See Matrix, Section II). Some aspects of 1996 recommendations, such as the Water Clarity Model and the prioritization of water quality EIP projects won't be completed until Fall 2001. The LTIMP analysis is under review by Lahontan staff, and is expected by Fall 2001. It is expected that the TRG Intervening area runoff study will be completed in Fall 2001. Several flow-weighted monitoring programs for urban runoff and treatment in focus watersheds are just getting underway, or have been in progress for a couple years (e.g. El Dorado DOT Angora Creek Erosion Control Project Monitoring). In addition, the Lahontan Budget Change Proposal for water quality research is scheduled to begin this year pending California budget approval. Monitoring (other than MTBE / BTEX) or tributary-based water quality standards have not been established for other lakes. However, the potential to establish TMDLs for those tributaries may mean a move away from concentration-based standards; tributary standards for TMDLs may be based on their load contributions to Lake Tahoe and, therefore, not be uniform.

V. 2001 RECOMMENDATIONS

In addition to the existing Compliance Measures and Supplementary Measures recommended to be put in place, the following recommendations are proposed for the maintenance and/or attainment of the existing water quality thresholds. Proposed recommendations that are not specific to a single water quality threshold are listed under "Additional Recommendations" (Section I).

This evaluation concentrates its analysis on impacts recently identified, or previously identified impacts determined to have greater significance at this time.

Where costs to implement the recommendations are known or can be estimated, they are given. If no costs are given, costs are either unknown or the recommendation may be completed by existing staff resources. If in, or associated with, an EIP program, project, or study, EIP project numbers and descriptions are provided.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~A. 1. NTU threshold and code amendments, and continue monitoring program~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: Staff Time (0.05 P/Y), Boat/support at current levels, \$10,000~~

~~Completion Date: February 2002~~

~~Threshold Indicator: WQ-1~~

~~**Recommendation:** Amend the threshold section of Goals and Policies and Code Chapter 81 to reflect the use of NTUs as the unit of measure for all turbidity monitoring (indicator was changed to NTU in 1992). For at least three years, TRPA should continue the existing TRPA monitoring protocol to maintain the historical record while utilizing purveyor or other continuous monitoring data to augment TRPA's data set.~~

~~**Product:** Larger turbidity dataset from historic sampling, plus continuous water purveyor data to supplement historic sample site data, and use for trend analysis.~~

~~A.2. Implementation of continuous turbidity monitoring~~

~~Responsible Entity: TRPA, Local Utility District Water Purveyors~~

~~Funding/Cost: Staff Time (0.05 P/Y)~~

~~Completion Date: July 2002~~

~~Threshold Indicator: WQ-1~~

~~**Recommendation:** Pending the results of the Phase II Turbidity Study, TRPA should approach water purveyors and determine the feasibility of entering into an agreement that would allow for the coordination, collection, and sharing of purveyor turbidity data. TRPA should consider installation of continuous turbidity monitors at other locations in the littoral zone.~~

~~**Product:** Continuous turbidity data from water purveyor's intake line locations.~~

~~A.3. Phase III spatial turbidity analysis~~

~~Responsible Entity: TRPA and DRI~~

~~Funding/Cost: \$150,000~~

~~Completion Date: December 2003~~

~~Threshold Indicator: WQ-1, WQ-2, WQ-3~~

~~**Recommendation:** TRPA should pursue funding for continued spatial analysis of turbidity including sampling and analysis, and use this data, in part, to prioritize restoration projects. Annual contract cost is estimated at \$30,000, if leverage funds are available or up to \$150,000 if not. Studies need to be coordinated with those funded through the Lahontan RWQCB, TMDL program.~~

~~**Product:** Larger turbidity dataset and localization of littoral nutrient and fine sediment loading relative to development and other sources.~~

~~A.4. Turbidity trend analysis and evaluation of monitoring protocols~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: \$5,000~~

~~Completion Date: December 2004~~

~~Threshold Indicator: WQ-1~~

~~**Recommendation:** After spatial analysis and three years of purveyor data collection and trend analysis, TRPA should consider modifying or discontinuing the existing protocol to improve data utility. One time contract cost to complete a data trend analysis is estimated at \$5000. See EIP WQ Project Number 429, which includes turbidity data analysis.~~

~~**Product:** Improvement of the monitoring protocol should result in the ability to conduct trend analyses. Analysis for specific constituents may identify the sources of turbidity, and possibly link pollutant discharges and loading to specific land uses. This data will assist TRPA staff in determining the value of continued turbidity monitoring, as well as provide additional information on relative loading by watershed.~~

~~B.1. Intensified sweeping and right-of-way water quality maintenance in order to reduce fine sediment loading~~

~~Responsible Entity: TRPA, State and local transportation/public works departments~~

~~Funding/Cost: Staff time, increased state and local revenues for maintenance~~

~~Completion Date: December 2003~~

~~Threshold Indicator: WQ-2, WQ-5~~

~~**Recommendation:** To reduce loading on water quality treatment facilities, road-sweeping operations by local and state transportation departments should be intensified, and utilize modern sweepers that capture higher proportions of fine sediments. Funding for intensified maintenance and modern equipment should be identified, and allocated to transportation departments pursuant to an Operations and Maintenance Improvement Program developed by TRPA in cooperation with the appropriate local and state stakeholders. See EIP WQ Project Number 430 for BMP/WQ large project maintenance.~~

~~Implementation Example: Washoe County currently operates new generation street sweepers that prevent significant quantities of fine sediments from entering drop inlets; the theory is that once these sediments reach drop inlets, they can be transported to the Lake. Operation costs for intensive use of modern sweepers (Washoe road network in the Region swept 11 times per year) are approximately \$40 per mile of sweeper use. Approximately 3-18 yards of sediment per day is removed under this program. This does not include disposal of spoils out of the Region (Dick Minto, Personal Communication.)~~

Product: Reducing discharges of fine sediment particles directly to the Lake should have a positive effect on clarity by reducing light scatter and absorption by these sediments.

B.2. Project/BMP targeting of bioavailable/soluble phosphorus and fine sediment

Responsible Entity: ~~TRPA, LRWQCB~~

Funding/Cost: ~~Staff time (0.20 P/Y), BCP project funding, Total \$1,500,000~~

Completion Date: ~~December 2004~~

Threshold Indicator: ~~WQ-2, WQ-2-A, WQ-3, WQ-5, WQ-6~~

Recommendation: ~~EIP water quality project source control and treatment BMPs should be designed to target bioavailable or soluble phosphorus and fine sediments when feasible. However, particulate phosphorus cannot be ignored due to conversions to bioavailable forms in Lake Tahoe. See EIP WQ Project Numbers 10107 and 10108, expected to be funded through LRWQCB for bioavailable phosphorus research and fine-grained sediment / nutrient research, as part of the TMDL development program.~~

Product: ~~Source control and runoff treatment targeted at limiting Phosphorus and fine sediment sources. TMDL load reduction allocations.~~

C.1. EIP project implementation and units of benefit development

Responsible Entity: ~~TRPA, Water Quality Working Group, State and local transportation/public works departments~~

Funding/Cost: ~~Project Funding, Staff time (0.05 P/Y)~~

Completion Date: ~~December 2004~~

Threshold Indicator: ~~WQ-2-A, WQ-2, WQ-3, WQ-5, WQ-6~~

Recommendation: ~~EIP funding should be appropriated as soon as possible, and projects implemented as soon as possible. For project descriptions, see Volume II of the EIP Water Quality Threshold Program. For funding/cost information, see Volume III of the EIP. TRPA should further develop Phase I Units of Benefit (UBs) with input from the Water Quality Working Group for both projects and operations & maintenance. TRPA should integrate UBs into project approvals and all required reporting to insure they are measured and tracked, and couple UBs to specific water quality threshold indicators for evaluation purposes. Implementation of TMDLs and evaluations of load reductions from specific treatments and projects are necessary relative to needed load reductions to the lake for Phase II UBs. Chapter 38, Tracking, Accounting and Banking, should be amended.~~

Implementation Example: ~~By tracking and measuring Units of Benefit and load reductions, the evaluation of threshold status should be simplified. More important, the relative benefit of projects can be more easily evaluated, and the characteristics of the superior projects applied to future projects based on actual treatment benefits and contribution in load reductions to the lake.~~

Product: ~~Units of Benefit and tracking for EIP Projects.~~

D.1. Realtor disclosure and BMP installation as property sale requirement

Responsible Entity: ~~TRPA~~

Funding/Cost: ~~Staff time including monitoring/enforcement (1.70 P/Y)~~

Completion Date: ~~December 2002~~

Threshold Indicator: ~~WQ-2-B~~

~~**Recommendation:** Require realtor disclosure and properties due for BMPs to have them installed as a requirement of sale. Hire 4 person field implementation crew (seasonally).~~

~~**Product:** Code amendment (Chapter 25), and accelerated implementation/funding of BMPs at time of sale. Field implementation crew.~~

~~**D.2. BMP retrofit enforcement**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: Staff time (1.0 P/Y), \$65,000/yr~~

~~Completion Date: December 2002~~

~~Threshold Indicator: WQ-2-B~~

~~**Recommendation:** Pursue enforcement of non-compliant properties in priority 1 areas in following order: commercial and public property, homeowner associations, residential. Hire dedicated BMP enforcement officer.~~

~~**Product:** Program to enhanced BMP establishment, and a cost for non-compliance.~~

~~**D.3. Amended Project Review process for BMPs**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: Staff time (0.20 P/Y)~~

~~Completion Date: December 2002~~

~~Threshold Indicator: WQ-2-B~~

~~**Recommendation:** TRPA project review process should be amended to address more site-specific analysis of projects, BMP design and effectiveness in reducing nutrient and sediment loads from developed properties.~~

~~**Product:** Increased project and site-specific bmp effectiveness.~~

~~**D.4. Implement large project maintenance program**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: EPA Erosion Control grant \$100,000, California Prop. 13, Staff time (1.5 P/Y)~~

~~Completion Date: December 2002~~

~~Threshold Indicator: WQ-2-B~~

~~**Recommendation:** Implement the Large Project Water Quality BMP Maintenance Action Plan developed by the TRPA Water Quality Unit and the Erosion Control Team. Develop a regional strategy for creating, implementing, and tracking maintenance for all water quality treatment and BMPs in the Basin. See EIP WQ Project Number 430. Annual maintenance staff coordinator needed.~~

~~Implementation Example: The Large Project Water Quality BMP Maintenance Program is a subelement of the Operations & Maintenance Program. Target large projects first for a sequential, stepwise approach to implementation of the O&M Program.~~

~~**Product:** Maintenance of large projects. Chapter 25 Code amendment, to improve BMP maintenance and tracking database.~~

D.5. Implement new BMP evaluation protocol for Basin-wide database tracking

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~Staff time (0.20 P/Y)~~
Completion Date: ~~December 2002~~
Threshold Indicator: ~~WQ-2-B~~

Recommendation: ~~The new BMP implementation evaluation protocol shall be implemented by TRPA staff. See EIP WQ Project Number 16, for residential parcel BMP retrofit.~~

Product: ~~Accurate tracking of BMP implementation basin wide.~~

D.6. Develop and implement EIP operations & maintenance program

Responsible Entity: ~~TRPA, local jurisdictions~~
Funding/Cost: ~~Staff time (0.30 P/Y), local revenue~~
Completion Date: ~~December 2003~~
Threshold Indicator: ~~WQ-2, WQ-2-A, WQ-2-B, WQ5, WQ6~~

Recommendation: ~~Develop the Operations & Maintenance Program element of EIP. The bulk of the local revenue generation program proposed for the Tahoe Region would support local jurisdiction operation and maintenance of EIP projects.~~

~~Implement the Operations & Maintenance Program of EIP. Total costs over time are estimated at \$84 million including shorezone sewer replacement.~~

Product: ~~Operations and Replacement Maintenance of EIP projects to attain and maintain thresholds.~~

D.7. BMP effectiveness and units of benefit

Responsible Entity: ~~TRPA, LRWQCB, Water Quality Working Group~~
Funding/Cost: ~~Staff time (0.20 P/Y), \$425,000~~
Completion Date: ~~December 2004~~
Threshold Indicator: ~~WQ-2-B, WQ-2-A, WQ-2, WQ-3, WQ-5, WQ-6~~

Recommendation: ~~Real Time Management (or Adaptive Management) implementation needs to address BMP effectiveness. See EIP WQ Project Number 10109 funded partly through LRWQCB (in the TMDL program) on sediment and nutrient reduction effectiveness. The utility of Units of Benefit for individual BMP treatments should be explored by TRPA staff with assistance from the Water Quality Working Group.~~

Product: ~~Utilization of the most effective BMPs, and application of Units of Benefit to individual BMPs if practical.~~

E.1. Evaluate LTIMP watersheds for needed load reductions and restoration projects

Responsible Entity: ~~TRPA, LRWQCB, LTIMP, USGS~~
Funding/Cost: ~~Environmental Monitoring, Lahontan BCP, USGS Matching Funds \$425,000, Staff time (0.20 P/Y)~~
Completion Date: ~~December 2003~~
Threshold Indicator: ~~WQ-4, WQ-2, WQ-3~~

~~**Recommendation:** Using information obtained through the LTIMP Data Analysis Project, all watershed discharges in the Region should be evaluated by LTIMP with respect to needed reductions loading and restoration or project needs to gain those reductions. This may be accomplished by using modeling techniques or more comprehensive monitoring to ascertain specific locations of sources within watersheds. See EIP WQ Project Number 429, which supports the LTIMP data analysis for watershed contributions to loading.~~

~~**Product:** Estimates of needed load reductions for LTIMP watersheds, and projects needed to reduce those nutrient and sediment loads.~~

~~**E.2. Water quality EIP prioritization for watershed urban and intervening areas**~~

~~Responsible Entity: TRPA, Water Quality Working Group~~

~~Funding/Cost: Staff time (0.10 P/Y)~~

~~Completion Date: December 2002~~

~~Threshold Indicator: WQ-4, WQ-2, WQ-2-A~~

~~**Recommendation:** Urban areas *within watersheds or intervening areas* should be prioritized with respect to reductions in loading and project/restoration needs where data is available.~~

~~**Product:** Priority application to Water Quality EIP projects, giving higher priority to urban areas and urbanized intervening areas in particular.~~

~~**E.3. LTIMP monitoring protocols and tributary TMDLs**~~

~~Responsible Entity: TRPA, LRWQCB, LTIMP, USGS~~

~~Funding/Cost: Environmental Monitoring, Lahontan BCP, USGS Matching Funds, Staff time (0.10 P/Y)~~

~~Completion Date: December 2004~~

~~Threshold Indicator: WQ-4, WQ-2, WQ-2-A~~

~~**Recommendation:** Using information obtained through the LTIMP Data Analysis Project, LTIMP's tributary monitoring protocol should be evaluated and potentially reprogrammed by LTIMP towards collection of data that is more critical to evaluation of tributary and watershed health and related impacts, and needed reductions in those watershed discharges in the establishment of TMDLs.~~

~~**Product:** Tributary TMDLs, Chapter 38 Amendments, effective tributary monitoring.~~

~~**E.4. Establishment of common tributary discharge standards**~~

~~Responsible Entity: TRPA, Lahontan, Nevada Division of Environmental Protection~~

~~Funding/Cost: Staff time (0.20 P/Y), Environmental Monitoring, 106 Grants~~

~~Completion Date: December 2004~~

~~Threshold Indicator: WQ-4, WQ-2, WQ-3~~

~~**Recommendation:** The ability to establish common tributary and discharge standards between TRPA, Lahontan, and NDEP should be explored, and if feasible relative to establishment of TMDLs for the different watersheds, common standards or approaches to nutrient and sediment load reduction should be adopted by all three agencies. TRPA's Water Quality Management Plan and Lahontan's Basin Plan should be updated accordingly. This process may be complicated by the implementation of TMDLs, which~~

~~should be correlated with the LTIMP analysis and watershed discharge ranking in relation to the Water Clarity Model for Lake Tahoe and needed reductions in the nutrient and sediment budgets from specific watersheds. TMDLs would likely vary based on each watershed's relative contribution of loads to the lake, and thus not all tributaries may have the same standard. In the process, water quality standards should not be made less stringent. See EIP WQ Project Number 629, which involves 208 update processes.~~

~~**Product:** Uniform tributary discharge standards, Chapter 81 code and Threshold Amendments.~~

~~**F.1. Promote use of filter media and developing technologies to reduce stormwater loads**~~

~~Responsible Entity: TRPA, USFS, Caltrans~~

~~Funding/Cost: USFS, Caltrans, Staff time (0.05 P/Y)~~

~~Completion Date: May 2003~~

~~Threshold Indicator: WQ-5, WQ-2, WQ-2-A, WQ-3~~

~~**Recommendation:** TRPA should promote pilot projects that utilize filter media (and other appropriate technologies that may exist or be developed) and other best management practices technology to reduce loads fine sediments and soluble nutrients carried by urban runoff.~~

~~Implementation Example: Several Caltrans and NDOT water quality projects are located in intervening areas, or contain road segments that discharge runoff directly to the Lake. Use of filter media may be the only means of runoff treatment beyond pumping runoff to a regional treatment facility.~~

~~**Product:** Plan for removal of soluble nutrients and fine sediments from stormwater runoff. If maintained properly, filter media treatment may improve the quality of discharges to the Lake.~~

~~**F.2. Support of urban runoff characterization and coordinated monitoring studies for TMDL development and 2004 threshold studies**~~

~~Responsible Entity: TRPA, CTC, Lahontan, Nevada Tahoe Resource Team~~

~~Funding/Cost: BCPs, Grants, Total cost \$2,755,000, Staff time (0.10 P/Y)~~

~~Completion Date: December 2004~~

~~Threshold Indicator: WQ-5, WQ-2, WQ-2-A, WQ-3, WQ-6~~

~~**Recommendation:** TRPA shall support studies that further characterize urban runoff to determine what types of development are contributing specific loads to urban runoff, and target mitigation measures appropriately. See EIP WQ Project Numbers 628 (characterization of urban runoff under Wetland and Nevada License plant grants), 10110, and 10111 (characterization of loading rates for urban and non-urban intervening areas, and stormwater runoff in general). These projects contribute to the Tahoe TMDL development program, and 2004 threshold update research.~~

~~**Product:** Superior evaluation of potential to meet surface water stormwater discharge standards through project treatments. TMDL load reduction allocations.~~

G.1. Program for reduction in fertilizer use and elimination of fertilizer use in SEZs

Responsible Entity: ~~TRPA, Lahontan, NDEP~~
Funding/Cost: ~~Environmental Monitoring, Staff time (0.10 P/Y), grants~~
Completion Date: ~~December 2002~~
Threshold Indicator: ~~WQ-6, WQ-2, WQ-3, WQ-5~~

~~**Recommendation:** As a subelement of the Operations and Maintenance Improvement Program, fertilizer use and management programs should move from project-driven reporting to a Region-wide regulatory program requiring reductions in fertilizer use, and elimination of fertilizer use on low capability land (e.g. Stream Environment Zones) and in the shorezone. TRPA shall amend Goals and Policies – Water Quality Goal #1, Policy 6, and Code Chapter 25 and 81 accordingly.~~

~~**Product:** Chapter 25, and 81 code amendments, and regulatory program.~~

G.2. Native landscapes and low maintenance incentives program

Responsible Entity: ~~TRPA, Vegetation Working Group~~
Funding/Cost: ~~Staff time (0.10 P/Y)~~
Completion Date: ~~July 2003~~
Threshold Indicator: ~~WQ-6, WQ-2, WQ-3, WQ-5~~

~~**Recommendation:** The Vegetation Working Group (As yet to be formed) should develop incentives to convert non-native landscapes to native species to reduce dependency on irrigation and fertilizers.~~

~~**Product:** Low Maintenance / Native Vegetation Incentive Program~~

G.3. Sewer exfiltration reduction, infrastructure operation & maintenance feasibility study and program

Responsible Entity: ~~Utility Districts, USACE, TRPA~~
Funding/Cost: ~~possible USACE Feasibility Study \$300,000, Operations & Maintenance Grants, User fees \$65,000, Staff time (1.0 P/Y)~~
Completion Date: ~~December 2003~~
Threshold Indicator: ~~WQ-6, WQ-1, WQ-2, WQ-3~~

~~**Recommendation:** To address discharges due to sewer exfiltration, sewer infrastructure should be assessed, and failing infrastructures targeted for replacement and/or relocation. See EIP WQ Project Number 638, for shorezone sewer line replacement/relocation. Spatial turbidity / chlorophyll studies may be used to localize potential exfiltration from sewers to lake or groundwater. Will likely require TRPA staff coordinator.~~

~~**Product:** Process for evaluation and replacement of failing sewer infrastructure. Reduced Nitrogen and Phosphorus loading to groundwater.~~

G.4. Evaluation of impact of directing urban runoff to groundwater

Responsible Entity: ~~TRPA, Lahontan, NDEP~~
Funding/Cost: ~~Environmental Monitoring \$50,000, Staff time (0.05 P/Y)~~
Completion Date: ~~December 2004~~
Threshold Indicator: ~~WQ-6, WQ-1, WQ2, WQ-2-A, WQ-3~~

~~**Recommendation:** TRPA should study the impact of directing urban runoff to groundwater via infiltration facilities, in cooperation with NDEP and Lahontan; if negative impacts are found, infiltration requirements should be reexamined and revised to reduce the impacts. Infiltration of an inch/hour storm is used as a design standard, but source control and pretreatment need to be considered, as well as alternative runoff treatment.~~

~~Implementation Example: Restrictions on fertilizer use may be the best opportunity to reduce discharges of N and P to surface and groundwater while avoiding large capital improvement costs.~~

~~**Product:** N and P loading reductions to ground water, and Lake Tahoe.~~

~~**H.1. Application of tributary standards to other lakes if appropriate and study feasibility of establishing other water quality standards**~~

~~Responsible Entity: TRPA, NDEP, Lahontan~~

~~Funding/Costs: Environmental Monitoring \$50,000, Staff time (0.05 P/Y)~~

~~Completion Date: December 2003~~

~~Threshold Indicator: WQ-7, WQ-4~~

~~**Recommendation:** TRPA should investigate the application of Tributary Standards to Other Lakes, or set non-degradation standards specific to the lakes, and at the next evaluation, amend WQ-7 accordingly. See EIP WQ Project Number 10117, feasibility study on establishment of other lakes water quality standards.~~

~~**Product:** Temporary other lakes indicators based on tributary standards, evaluation of need for other lakes water quality standards. Improved understanding of other lakes water quality, and relationship to tributary water quality.~~

~~**H.2. Improved dam operations for water quality and fisheries**~~

~~Responsible Entity: TRPA, Nevada Division of Wildlife~~

~~Funding/Cost: Staff time (0.10 P/Y), Nevada Bonds, Bureau of Reclamation~~

~~Completion Date: July 2003~~

~~Threshold Indicator: WQ-7, WQ-4, F-3~~

~~**Recommendation:** TRPA should engage dam operators, learn dam operating procedures, and determine if release timing and volumes can be improved without violating water laws to minimize downstream impacts while maintaining minimum Instream flows for identified fisheries. Follows establishment of Instream flows from 1996 evaluation (model expected Dec. 31, 2001).~~

~~Implementation Example: It has been speculated that many poorer water quality monitoring results, and unexplained poor results in Third Creek are the result of untimely releases of water from Incline Lake. Timing and volume of these releases is unknown to TRPA staff. Knowing dam operations may allow staff to identify improved dam operations that would result in lower impacts to water quality while maintaining Instream flows necessary for fisheries.~~

~~**Product:** Improved water quality on outflow streams, maintenance of minimum flows for fisheries.~~

I. ADDITIONAL WATER QUALITY RECOMMENDATIONS:

These additional recommendations are likely to change the water quality program as a whole, and effect all water quality thresholds.

I.1. Cooperation in research on impacts of firework displays on Lake Tahoe

Responsible Entity: TRPA, Lahontan, NDEP
Funding/Cost: Staff time (0.10 P/Y), Environmental Monitoring, \$20,000
Completion Date: October 2003
Threshold Indicator: WQ-1, WQ-2, WQ-3

Recommendation: TRPA, in cooperation with NDEP and Lahontan, should research the potential impacts of pyrotechnic displays on water quality. The various types of pyrotechnic materials should be investigated, such as ignition, propulsion, explosion, coloration, and combustion sustaining chemicals/materials. The products of combustion, and the transport and fate of these materials should be monitored or researched. Indirect impacts should also be investigated, including discharge of pyrotechnic bedding material (sand on barges), and products of combustion from staging areas. Impacts to water clarity, water quality, and biological processes should be researched. Secondly, the significance of deposition of pyrotechnic debris (Rocket fall-out) and of increased trash and debris at public viewing sites should be determined.

Product: Depending on monitoring results, regulate fireworks displays as necessary.

2004 Threshold Update Research Milestones

These are general milestones for research that is described in the recommendations above for several threshold areas as part of the Lahontan BCP-TMDL program, and specific threshold research for the 2004 update.

<u>Milestone</u>	<u>Completion Date</u>
1) TMDL Program – Threshold Research Coordination	December 2001
2) Data Collection / Model Analysis	October 2003
3) Data Analysis, Working Group Review, Public Workshops	December 2003
4) Threshold Refinement - Working Group, Public Workshops	May 2005

Data Needs and Recommendations for the 2006 Regional Plan Revision

Clarity Model Use, Completion of the Intervening area runoff study, TMDLs established for the lake and source allocation – project load reduction estimates

Spatial Turbidity, and Constituent Sampling in the Littoral Zone

Tributary Loading Model – All Watersheds

Threshold Sampling and Models for Stormwater Runoff and Other Lakes

PAH Assessment

Motorized Watercraft Inventory

VI. EIP INTEGRATION

The Presidential Forum in 1997 and the adoption of the EIP did speed the development and completion of programs and construction of projects. In some cases more than one EIP Threshold project was identified in an implementer's project area (e.g. Air Quality/Transportation and Water Quality projects in the same general area). Although projects may be integrated when constructed, the water quality benefits of project may be difficult to separate when included under thresholds other than water quality. For example project costs need to be assigned to the appropriate threshold area on a line item or funding source basis, to the extent possible. In some cases separation of costs between EIP projects and thresholds may not be entirely possible based on the available data, and the project costs are counted under mainly one of two EIP projects.

Another area of need is for benefit unit tracking within EIP Projects. Units of benefit are intended to be quantifiable measures of project value in relation to particular TRPA Environmental Threshold indicators. The benefit units are derived from or contribute to the indicator, which is measurable in relation to the threshold in question. Indicators have a direct quantifiable relationship to attainment or maintenance of that threshold or local, state, or federal air or water quality standards. Thus the units of benefit are intended to evaluate how the EIP is performing in terms of contributions toward attaining or maintaining thresholds and applicable standards. The units of benefit for projects and programs are based on the specific threshold standards under each environmental threshold program. Some benefit units have existed under the historic Capital Improvement Program (CIP) for water quality projects such as pounds per dollar for sediment source control within projects, or miles of roadway treated, and miles of fish habitat improved in stream ratings for fisheries projects. Not all CIP benefit units have been converted to threshold benefit units. Refer to the list of the existing and potential EIP benefit units by program at the end of this section. It should be noted that these units are new to some threshold programs, and in most cases the non-lake benefit units have no known directly quantifiable relationship to lake clarity. Several studies such as the Lake Clarity Model (EIP #627, scheduled completion by February 2002) are intended to model in lake sediment and nutrient budgets, needed watershed improvements required for sediment and nutrient reductions, and provide linkage of project benefits to lake clarity. The required load reductions in fine sediment and nutrients per watershed will then need to be related to projects that can provide the largest benefit/cost for such reductions in discharge to Lake Tahoe. The second generation of project benefit units would be load reduction estimates based on TMDLs for source control (sediment and nutrients) and specific BMP or treatment effectiveness for load reduction.

Water Quality EIP Project Progress Through Fall 2000. There is redundancy between the CIP/ Erosion Control Project List (Water Quality Appendix table 5) and Completed Water Quality EIP projects covered in Volume IV of the EIP, May 2001 Update. Over \$32 million in Water Quality EIP projects were completed between 1997 and fall 2000 (Water Quality Appendix, Table 6). See Volume IV on the TRPA web site [<http://www.trpa.org/eipdocument/pdf/volume4.pdf>] for featured water quality projects. Nevada Department of Transportation's U.S. 50 & S.R. 760 (Elks Point Road) Master Plan for Erosion Control and Stormwater Management was completed in Fall 2001 at a cost of \$1 million. Caltrans initiated an EIP Master Plan Process for highways on the California side of the basin in November 1999 in order to program projects for that effort. Water Quality EIP programs completed as of fall 2000 totaled \$813 thousand for combined motorized watercraft studies (Table 2, Volume IV, Appendix A).

Critical Water Quality EIP Projects for 2006 Threshold Evaluation Benefit. Those research and monitoring projects revolving around the application of the Lake Clarity Model, and development of Total Maximum Daily (Annual) Loads for Lake Tahoe are some of the most critical for the 2006 Threshold Evaluation *per se*. These are largely funded through the 2002-2003 Lahontan Regional Water Quality Control Board Budget Change Proposal. Those water quality projects for urban runoff treatment and highway runoff with discharge to surface waters, or relatively direct discharge to Lake Tahoe would be most critical for demonstrating threshold standard improvement for the 2006 evaluation. Critical Water Quality EIP projects are listed below by threshold indicator. See Volume II of the 2001 EIP Update for descriptions.
[<http://www.trpa.org/eipdocument/pdf/volume2.pdf>]

WQ-1. Any project that reduce sediment and nutrient discharge directly to the lake or via groundwater would be critical to this threshold indicator. Only one specific EIP research project targets turbidity, WQ EIP #429 – Amend WQ-1 and WQ-4 Indicator Units. Related research EIP projects are: WQ #627 - Clarity Model Research, #629 - 208 Plan Update, #630 – Upper Truckee Focused Watershed Group. WQ #638 – Shorezone Sewer Line Replacement/Relocation would be critical to this threshold indicator, as well as water quality projects in intervening areas highlighted under WQ-2-A below.

WQ-2, and WQ-3. Any project resulting in significant load reductions to Lake Tahoe would be critical to demonstrating improvement for this threshold indicator. The most obvious project would be research under WQ #627 - Clarity Model Research, #10707 – Biologically Available Phosphorus Research, #10108 – Fine Grained Sediment and Nutrient Reach, #10110 – Direct Loading from Urbanized and Non-Urbanized Areas, #430 – BMP / WQ Maintenance Program for Large Projects, #431 – Dissolved Oxygen as a WQ Threshold Indicator.

WQ-2-A. The Water Quality Working Group is in the process of applying Water Quality EIP priority criteria based on assessment of water quality risk of project areas if left untreated. This process is expected to be complete by December 2002, and those projects that come up as priority 1 based on the water quality risk assessment (for degree of urbanization – coverage, proximity to the lake, erosion hazard, and slope) will be considered critical to mitigating the water quality impacts of developed areas. In the proposed criteria highway projects that have high percent coverage and segments within 1000 feet of Lake Tahoe would likely be high priority (e.g. WQ #954 – Erosion Control HWY 50 from Cave Rock to Glenbrook, #994 – HWY 50 South Tahoe “Y” to Stateline, Phase I has proximity to the lake). See recommendations C.1, D.5, and E.3.

WQ-4. The LTIMP Analysis completed through water year 1998 (WQ #429) is critical to the evaluation of loading from monitored tributaries. Discussions are underway to add tributary data from water year 1999, 2000, and 2001 for a longer-term look at tributary loading. WQ #626 is an ongoing process to “Refine Tributary Monitoring Program. Another Critical project is WQ #10108 – Fine-Grained Sediment and Nutrient Research, which will quantify sources and loading rates of fine-grained sediments and nutrients discharged from tributaries to Lake Tahoe. SEZ, Fisheries, and upland restoration projects (as well as the WQ EIP projects to be listed under WQ-2-A) are critical to reducing loads from these tributaries. Examples of these critical projects are the Trout Creek Restoration completed in 2001 (SC/SEZ #22, F #904), Upper Truckee River Elks Club to Airport SEZ Restoration (SC/SEZ #948) and Upper Truckee – Cove East SEZ Restoration (SC/SEZ #560), Blackwood Creek SEZ/Fishery Restoration (SC/SEZ #27),

Ward Creek SEZ Restoration (SC/SEZ #24), Third/Incline Creeks: Third Creek – Lower Reach SEZ Restoration (SC/SEZ #562), and the Edgewood Creek Restoration (SC/SEZ #250).

WQ-5 and WQ-6. In addition to the WQ-2-A critical projects to be listed above, several research and monitoring projects are critical to evaluating stormwater runoff treatment: WQ #628 – Urban Runoff Model, #10071 – Wetland Treatment Effectiveness, #10109 – BMP Effectiveness, #10110 – Direct Loading from Urbanized and Non-urbanized Areas, and #10111 – Loading Rates from Stormwater Runoff.

WQ-7. One of the critical projects for this threshold is WQ #10117 – Other Lake Monitoring. The intent is to use existing data to initiate a feasibility study on the need to establish water quality standards for other lakes in the Tahoe Region. WQ #661 – Focused Research on Impacts of Motorized Watercraft has the potential to add other lakes sampling constituents beyond those required for motorized watercraft impacts monitoring. WQ #704 – Fallen Leaf Lake (area BMP) is critical to maintaining the specific water quality standards for that lake.

NEW EIP PROJECT APPROACHES. With so many projects already outlined in the EIP it is difficult to imagine what new projects may be needed for water quality. However, consideration of project approaches or comprehensive watershed implementation provides potentially accelerated implementation of the EIP and benefits towards meeting water quality thresholds. More intensive management of stormwater runoff for removal of nutrients and fine sediments may be required to meet discharge standards and significantly reduce loading to Lake Tahoe. Comprehensive watershed assessments such as in the Third / Incline, Edgewood Creek, and Upper Truckee Focused Watershed should lead to more cost effective and beneficial coordination (perhaps combination) of projects on a watershed scale.

EIP Units of Benefit		
TH Index	TH Indicator	TH Unit of Benefit
Water Quality		
WQ1	Turbidity	*Reduced Sediment /Nutrient Discharge
WQ2	Pelagic Lake Tahoe Winter Clarity (Secchi depth)	*Reduced Sediment/Nutrient Discharge
WQ2-A	Pelagic Lake Tahoe Winter Clarity (CIP)	Acres treated, source control
WQ2-B	Winter Clarity- (% of private properties, BMP's)	Miles of roads BMP
Mitigation –C	Pelagic Lake Tahoe Winter Clarity (Road BMPs)	Miles Improved
Mitigation –D	Pelagic Lake Tahoe Winter Clarity (Trail BMPs)	Miles Improved
Mitigation –E	Pelagic Lake Tahoe Winter Clarity (Slope Stabilize/Revegetation)	Acres Improved
Mitigation –F	Pelagic Lake Tahoe Winter Clarity (Runoff Treated)	Miles conveyance treated
WQ3	Phytoplankton PPR	* < N, P, Fe discharge
WQ4	Tributary Water	% Watershed treated
Mitigation –A	Runoff Volume	% Runoff Treated
WQ5	Runoff Water	Acres intervening treated
WQ6	Groundwater	Volume runoff infiltrated
WQ7	Other Lakes	Maintain 1991 study level water quality
NOTE: * These potential benefit units may vary with the specifics of the project.		

VII. SUPPLEMENTAL INFORMATION

A Conceptual Process Model: An evaluation of water quality conditions in the Lake Tahoe Region should start with a firm understanding of the mechanisms at work in Lake Tahoe, its watershed, and its airshed, which dictate water quality conditions at any given time. TRPA has developed, and continues to refine, a conceptual process model that summarizes what is known—and not known—about the mechanisms that drive water quality trends. The background section that follows explains Lake Tahoe's unique characteristics and the water quality processes that form the basis for water quality management in the Region.

Water Quality Processes

Lake Tahoe has an exceptionally long residence time, with the typical drop of water residing in the Lake for approximately 700 years (Byron and Goldman, 1986). In other words, if Lake Tahoe was drained, it would take approximately 700 years to refill it (TRPA, 1982d). The result of this remarkable residence time is that discharges to the Lake remain, either in solution or mainly in the Lake's bottom sediments. Thus, Tahoe does not benefit from the flushing action of precipitation and runoff, as do other water bodies. The Lake's only outlet, the Truckee River located near Tahoe City, California, represents a minimal loss of nutrients and sediments in the overall nutrient budget based on outflow calculations (TRPA, 1988). More recently, Lake Tahoe did not flow into the Truckee River from September 1990 to May 1993 and again from September 1993 to March 1995 due to below normal precipitation years. Lake Tahoe reached its lowest recorded level of 6220.26 feet above sea level on November 30, 1992. Beginning in March of 1995, with above average snowmelt and precipitation, the lake level rose to the maximum legal lake elevation of 6229.05 feet by June 21 of 1996, less than 15 months later. The lake level has remained well above the natural rim, reaching 6229.4 ft. on Jan. 4, 1997 in response to the flood events of New Year's 1997.

In contrast, the residence time of Fallen Leaf Lake (which is located less than two miles from Lake Tahoe) is only eight years.

Given undisturbed conditions, the algal productivity of Lake Tahoe would be expected to change so slowly that changes would be imperceptible over a normal human lifetime. Over geologic time, the Lake would experience a natural increase in algal productivity and loss of clarity and slowly fill with sediment.

Limnologists classify Lake Tahoe as "oligotrophic," meaning that it has very low concentrations of nutrients to support growth of algae. Under natural conditions, the Lake receives a small amount of nutrients from the surrounding watersheds. Consequently, only a small population of algae can be sustained. The exceptional clarity of the waters results from the relative absence of algal growth and represents a condition of stability in cycling nutrients. Such stability is fragile, however, as indicated by Lake Tahoe's response to nutrients such as nitrogen and phosphorus. Accelerated algal growth can be induced by small incremental additions of these nutrients to the waters of Lake Tahoe.

Historically, Lake Tahoe has been nitrogen limited; however, monitoring conducted by the Tahoe Research Group-U.C. Davis (TRG) indicates that since the mid-1980s phosphorus is the more limiting nutrient. This is thought to be the result of increased

atmospheric nitrogen deposition over time, currently 56 percent of the total nitrogen input to the Lake (Jassby *et al*, 1994). Phosphorus in Tahoe is likely to be more tightly bound in particulate form than nitrogen and is transported downward as particles and held in the sediments with greater efficiency (Hatch, TRG, 1997). Phosphorus and nitrogen limit algal productivity in the Lake. Algal growth bioassay results show increased productivity with the addition of nitrogen, phosphorus, or nitrogen and phosphorus in combination.

Lake Tahoe is suffering from cultural eutrophication resulting in a greater than 30 percent loss of clarity since 1968. Cultural eutrophication is a lake's response to accelerated input of nutrients into the lake due to influence of civilization. This disturbance results in imbalances in the lake's nutrient budget, accelerating increases in algal productivity. Indicators of eutrophication in Lake Tahoe are phytoplankton (free-floating algae), primary productivity (PPr), Secchi disk depth (water clarity), and periphyton (attached algae) productivity and biomass (Goldman 1981, 1985, 1986; Goldman, et al. 1982, TRPA 1982; Loeb and Reuter 1984; Loeb and Palmer 1985).

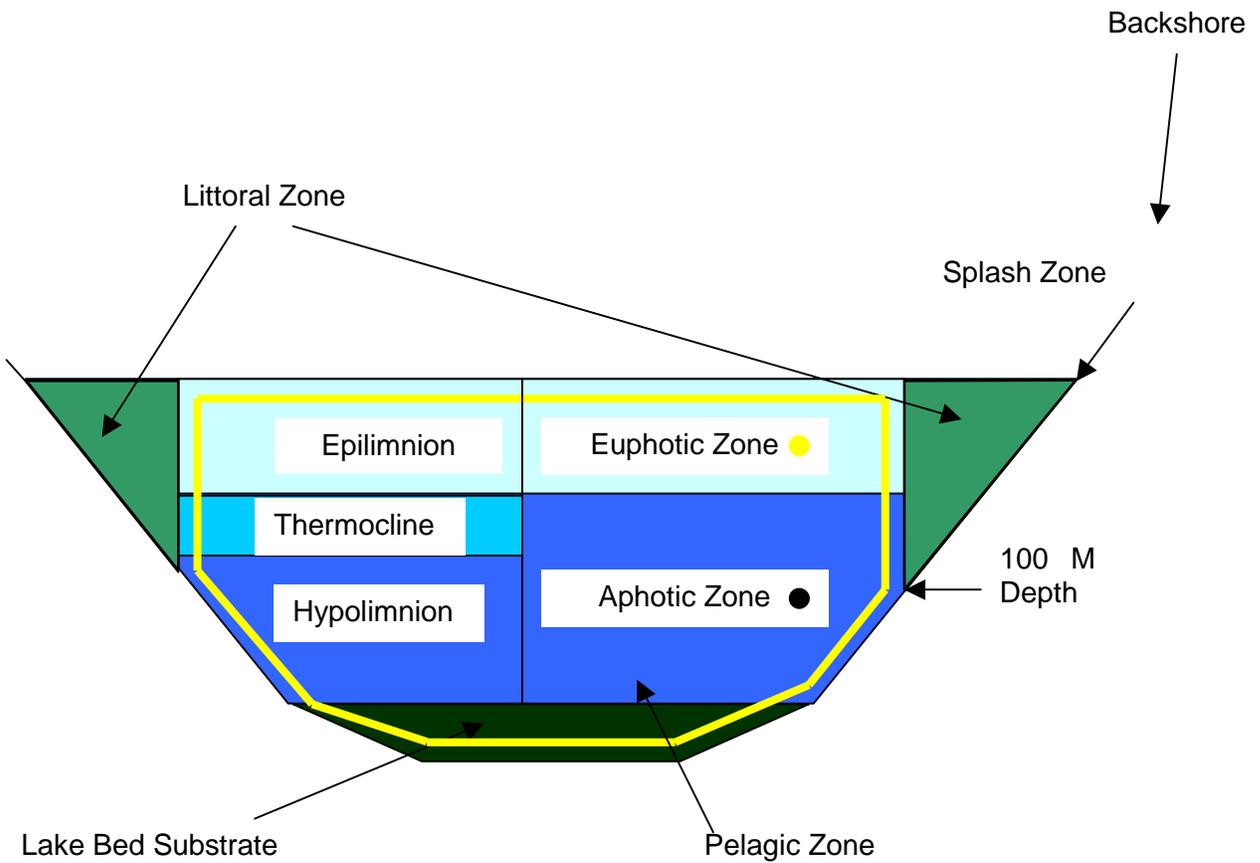
The presence of phytoplankton in the water column reduces clarity by absorbing light. In addition to nutrient budget imbalances and resultant algal blooms, water clarity may be greatly reduced by the accumulation of fine size particulate matter (mineral sediments) in Lake waters. These particles efficiently scatter light, resulting in clarity loss (Geoff Schladow, The Lake Tahoe Clarity Model, 2000.)

Researchers at the University of California, Davis, stated in 1997 that restoration has to be undertaken at an accelerated rate over the next ten years, if current negative trends are to be reversed. In order to accomplish this, it is imperative that the existing condition of the Region be more accurately assessed, that systems be developed to more quickly measure responses to management actions designed to protect water quality, and that approaches be developed to increase the efficiency and effectiveness of management actions proposed to improve the Region's environmental conditions. To begin this process, the Lake Tahoe Watershed Assessment was recently completed.

The assessment compiles a scientific foundation for the restoration of the Lake Tahoe ecosystem and describes what is known about the function and conditions of the ecosystem. It clarifies gaps in our knowledge by describing what we still need to know in order to restore the Lake and it's setting, and finally, it proposes a strategy to acquire critical missing information and use it. As part of an Adaptive Management Strategy, models are currently being developed which will be used to predict the outcomes of different management actions. The Lake Clarity Model and others will be integrated with TRPA's Real Time Management Program, discussed elsewhere in this document.

To follow the discussion that follows, it is helpful to review the terminology employed by those who study lentic (lake) systems. Lake Tahoe can be divided into four zones: (1) littoral zone, (2) pelagic zone, (3) euphotic zone, and (4) aphotic zone. The littoral zone, or nearshore waters, is the area around the Lake's perimeter less than 100 meters deep. This zone represents approximately 20 percent of the lake's surface area with the pelagic zone (water in excess of 100 meters deep) accounting for the remaining 80 percent. The euphotic zone is that portion of the Lake's column where sufficient light penetrates for algal photosynthesis, typically 0 - 100 meters in depth. The aphotic zone is the portion of the water column where light does not penetrate. See Figure 3-18.

Figure 3-18 Lentic (Lake) System Terminology



Notes:

Euphotic Zone depth may not be equal to depth of thermocline.
The splash zone consists of the eu-littoral and sublittoral zones.

Nutrient Cycles

There are many chemical forms of phosphorus and nitrogen in Lake Tahoe, and they follow complex cycles, changing from one form to another with the assistance of bacteria, algae, fish, other animals, and physical stresses. The phosphorus cycle is simpler than the nitrogen cycle in terms of algal availability. Inorganic phosphorus, typically orthophosphate, is assimilated by algae and thus converted to particulate organic phosphorus—the algae. The algae excrete wastes, are eaten, and die, and the waste and decay products form dissolved organic phosphorus compounds. Through bacterial action, the dissolved organic compounds are then converted back to orthophosphate and the cycle starts over.

Although dust particles deposited upon Lake Tahoe by the wind and particulate phosphorus can go into solution and contribute dissolved inorganic phosphorus to the Lake, a other main sources of soluble phosphorus are tributary streams and direct runoff, which contribute all three forms: dissolved inorganic, particulate organic, and dissolved organic. All three forms are important, and additional research is needed into the rates of transformation and relative contributions of the various forms to algae growth.

Dissolved inorganic phosphorus has a high propensity to adsorb on the surface of soil particles as it travels through the watershed in surface waters or the groundwater. Normally, one would expect the contribution of inorganic phosphorus from groundwater to be relatively low, but a 1987 study found fairly high concentrations in groundwater in the Ward Creek watershed. This situation may be an example of conversion of bound phosphorus to a soluble form due to release from the soil.

It is not known to what extent inorganic phosphorus adsorbed on soil particles in tributary flows is available to algae. Although bacteria can colonize the soil particles and release dissolved phosphorus for eventual use by algae (Pearl and Goldman, 1972), many soil particles settle out quickly and do not contribute greatly to Lake Tahoe's phosphorus budget. Fine clay particles have the highest adsorption potential due to their large surface area, and these particles tend to settle near the mouths of tributary streams. Mineral fines may remain in suspension indefinitely. Algal uptake of orthophosphate is very rapid. In the euphotic zone, most dissolved inorganic phosphorus is immediately taken up by the algae and incorporated into their tissues.

The nitrogen cycle is more complex than the phosphorus cycle. In Lake Tahoe, the cycle starts with the simple inorganic form, nitrate (NO_3), which algae assimilate in the process of photosynthesis. The nitrate comes from the air, the watershed, the groundwater, or storage in Lake Tahoe. Lightning and man-made air pollutants are sources of airborne nitrate. The algae give up waste products and eventually die, or are eaten by animals that also give off waste products and later die. Their wastes and decay products form dissolved organic forms of nitrogen such as urea, uric acid, and amino acids. Bacteria then convert these dissolved organic forms to ammonia, which is inorganic, then back to nitrate, and the cycle starts again.

In Lake Tahoe, the atmosphere is a large source of nitrate nitrogen and ammonium. Streams contribute not only nitrate nitrogen, but also ammonia nitrogen and both dissolved and particulate organic nitrogen. Although only the nitrate and ammonium immediately available to algae, all forms can eventually be transformed to nitrate through the nitrogen cycle and, therefore, they are all important to the nitrogen budget.

Additional research is needed into the rates as which the transformations occur and the relative contributions of the various forms to the growth rate of algae.

Nutrient Budgets

When evaluating inputs, outputs, sinks, and storage of nutrients in a lake, it is useful to consider a nutrient budget. Lake Tahoe's cultural eutrophication is the result of, and evidence of, unbalanced nutrient budgets, in which inputs of nutrients exceed the outputs, resulting in increased storage of nutrients in the water column. Although various nutrient budgets have been proposed over the years, at this time there are still too many unknowns to allow TRPA to exactly describe the budgets for phosphorus and nitrogen. See Table 3-1 for the latest estimated nitrogen and phosphorus budgets of the Tahoe Research Group.

The unique characteristics of phosphorus, including its lack of a gas phase and its tendency to associate with sediments, suggest that management practices may more easily balance the phosphorus budget than the nitrogen budget. This is fortunate, since phosphorus currently is the nutrient most limiting to algal growth. Sediment transport through the watershed and into Lake Tahoe alone may account for up to 50 percent of the apparent loss of Lake clarity. Fine particulate matter of clay-silt size may remain in suspension for years, and contribute to clarity loss by scattering light.

Lake Mixing

Mixing occurs in Lake Tahoe in response to sustained winds and water temperature. Partial mixing of the Lake occurs at varying depths each year, but until 1997, complete mixing occurred infrequently. Near complete mixing has occurred in the last three Water Years (TRG, 1999). See Table 3-7 below for Lake Tahoe data, 1995 through 1999. Complete mixing takes a combination of sustained strong winds and temperature. When nutrients are available, algae will exploit them, rising in number until they have used the available nutrients, at which time they begin to die off. As more nutrients become available, higher rates of growth occur and clarity of the water decreases.

Table 3-7 LAKE TAHOE WATER QUALITY DATA, 1995 through 1999.

YR	(1) PPr	(2) Index Stn. SECCHI	(2) Mid-lake Stn. SECCHI	(3) MIXING DATE	(4) MIXING DEPTH
1995	164.365	21.47	22.86	15-Mar-95	300
1996	154.772	23.45	24.30	07-Mar-96	300
1997	168.934	19.51	21.79	12-Mar-97	450
1998	194.262	20.14	21.12	04-Mar-98	450
1999	190.408	21.04	22.51	02-Mar-99	450

(1) Annual Total PPR ($G C M^{-2} Y^{-1}$)

(2) Annual Average Secchi Depth (M)

(3) Approximate Date Of Mixing

(4) Approximate Depth Of Mixing (M)

Different temperature layers within the Lake's water column cause the Lake to become stratified. Typically this stratification begins in the spring when the upper layer (epilimnion) begins to warm. This makes the upper layer lighter than the thermocline, which lies between the epilimnion and the deepest part of the lake. Nutrients are usually

tied up in the hypolimnion, being unavailable to the algae in the epilimnion. The reverse process occurs in the fall when partial mixing occurs, allowing nutrient transfer to reach the epilimnion and thermocline. This mixing is accelerated under strong wind conditions. Leonard and Goldman (1981) and Goldman et al., (1982) found that the deeper the mixing of the Lake in a given year, the greater the transfer of nutrients to the littoral zone. In addition, it was found that algal growth rates increased in the summer periods following mixing. As mentioned earlier, TRG reported a complete mixing of Lake Tahoe most recently during 1997, 1998, and 1999. Deeper mixing usually corresponds to higher PPr values. Prior to 1997, shallow mixing (300 meters or less) has occurred in 1976 through 1982, 1984, 1986-1988, 1990-1992, and 1995. Deeper mixing previous to 1995 (400 meters or greater) occurred in 1973-1975, 1983, 1985, 1989, and 1993 (Jasby, Goldman, 1995, Goldman, 1999). In years of deeper mixing, winter usually starts off cold and continues to stay cold, even if winters are dry. TRG has documented that PPr rates are typically highest in the spring runoff period.

Lake Tahoe's Watershed

Sediment transport depends upon a stream's kinetic energy. As water moves downhill through the watershed, potential energy is converted to kinetic energy. Some kinetic energy is dissipated through friction; leftover kinetic energy transports sediment. Kinetic energy is proportional to the volume of water in the stream, and proportional to the square of the stream's velocity. The total sediment load a stream carries is composed of two parts: the bedload component and the suspended component. Bedload is the heavier portion moved downstream along the stream's bottom. Suspended sediments are lifted off the bottom and travel long distances supported by the water.

As the watershed slowly erodes from wind, rain, and runoff, sediments build up in stream channels until large flows clear them out. Sediment production is related to the density of stream channels in a watershed. As the density of drainage increases, more sources of sediment are contacted and sediment yield increases.

Suspended sediment typically consists of particles smaller than 0.5 mm. The very small silt and clay particles (below 0.05 mm) contribute the most to turbidity of the water, because they have large surface areas that refract and absorb light. Very small particles also have the highest associated nutrient content.

Runoff Processes

Precipitation and snowmelt reach tributary streams in four basic ways:

1. Hortonian overland flow is the flow of water over the land surface when delivery exceeds the infiltration rate. The primary influence on infiltration rates is soil type. Other factors are soil depth, depth to an impermeable layer, depth to water table, percolation rate of subsurface soil, and soil structure. Vegetation removal, soil compaction, and soil removal decrease a soil's infiltration capacity.
2. Unsaturated or subsurface flow is the flow of water through the unsaturated zone of the soil. Contributions to streamflow from this source are relatively small, while contributions to the groundwater are substantial.

3. Groundwater flow is the flow of water in the saturated zone of the soil. Groundwater is the source of the base flow of a stream between storms and during the summer.

4. Saturated overland flow is a combination of direct precipitation onto a saturated area and infiltrated water that has returned to the surface. When a rainstorm or snowmelt event is intense enough, the water table will rise to the surface, creating saturated areas that extend along the sides of streams and into ephemeral channels and gullies. These saturated areas provide a direct path for precipitation and snowmelt to reach a stream, and their contributions can be substantial.

When storms or snowmelts create runoff, scientists describe the runoff with a hydrograph. The "rising limb" of the hydrograph displays the rapid rise in stream level and discharge associated with storms and snowmelt. The "recession limb" displays the return to normal base flow, which is the contribution of groundwater. The time between the middle of a rainstorm or snowmelt event, and the peak discharge in the stream, is the "lag to peak" time. This lag time may be minutes, or may be many hours long, depending on the characteristics of the watershed and weather conditions.

Nutrient Inputs and Outputs in the Watershed

Sources and sinks of the key nutrients, phosphorus and nitrogen, in Lake Tahoe's watershed differ. Phosphorus sources within the watershed are mainly erosion, natural and man-made, that releases free phosphorus and clay-bound phosphorus into the watershed. Phosphorus is also released upon the death and decomposition of plants, but this source tends to be taken up quickly by other plants or adsorbed onto the soil as it moves through the soil column.

In contrast, sources of nitrogen in the watershed include scavenging of the by-products of combustion from the atmosphere (both wet and dry) and nitrogen gas fixation by bacterial symbionts of plants. Nitrogen is lost from the watershed by the process of denitrification, in which microorganisms release nitrogen gas and nitrous oxide gas under anaerobic conditions, often found in meadows and riparian areas. (Tarnay, et al., 1999).

Fertilizer applications and losses from sewage systems could add both phosphorus and nitrogen to the watershed. In some areas, the magnitude of these sources could be substantial, despite efforts to control them. However, no data on sewer exfiltration is available. Public Utility Districts are responsible for detection of leaks and prompt repairs.

Nitrate nitrogen is highly mobile in soils, with little adsorption. Studies have shown that the rate of nitrate movement through soils is about the same as the rate of water movement. Nitrate will continue to migrate through the soil until it is utilized by vegetation or reaches a receiving water. Inorganic phosphorus, on the other hand, has high adsorptivity, and readily binds to inorganic and organic particles. Its delivery through the watershed is closely associated with sediment delivery.

Groundwater

The contribution of groundwater to water quality in Lake Tahoe is not well understood. However, research indicates that ground water may contribute substantial loads of both nitrogen and phosphorus to Lake Tahoe.

A 1987 study (Loeb, 1987) found that groundwater concentrations of nitrate nitrogen were lowest in those areas furthest from Lake Tahoe. Concentrations increased down gradient toward the Lake, corresponding to the increasing proportion of disturbed land and urbanization, and the possibility of leaching of nutrients from land disposal of sewage in the 1950s and 1960s. The U.S. Geological Survey is conducting additional research, funded by TRPA and USGS, into the contributions of groundwater.

Impacts of Urbanization on the Watershed

A natural, undisturbed watershed is very efficient in its treatment of nutrients. Studies have found that undisturbed alpine watersheds are capable of removing almost 100 percent of the incoming nitrogen. A 1986 study of water nitrogen concentrations in stream water and groundwater immediately adjacent to the Tahoe Basin found that nitrate nitrogen concentrations were 30 times lower than in incoming precipitation. The highest reductions occurred in well-vegetated areas.

Urbanization of a watershed inevitably increases the density of drainage channels, because streets, roads, sidewalks, driveways, and other structures, create new unnatural drainage ways. As drainage density increases, eight results occur: (1) sources of sediment increase; (2) sediment yield increases; (3) nutrient yield increases; (4) peak flow increases; (5) flow velocities increase; (6) stream energy and ability to transport sediment increase; (7) lag time decreases; and (8) flow time decreases.

When these things happen, part of the watershed becomes "short-circuited" in terms of its ability to remove nutrients. The control measures of the Regional Plan have been designed, in large part, to counteract these results.

Minimizing concentrations of sediments and nutrients in runoff depends on: (1) a healthy vegetative cover for nutrient uptake and incorporation; (2) denitrification for nitrogen removal; (3) adsorptivity for phosphorus removal; and (4) filtration and settling for removal of sediment and nutrient particles. Riparian and wetland areas are believed to be critical to good water quality due to their high rates of nutrient sediment removal compared to surrounding vegetation; however, a recent study concludes that bioavailable nutrient removal efficiency of wetlands is predicted to be lower than reported because nearly all of the loading occurs during the dormant season, when biological removal processes are at a minimum. (Hydroscience, 2000. Bioavailable Nutrient Loading Into Lake Tahoe and Control Opportunities with an Emphasis on Utilizing SEZs to Treat Urban Runoff). If further study validates this finding, than the large area of non-riparian vegetation provides an even more important function in removing sediments and nutrients from runoff.

Urbanization of a watershed increases sediment and nutrient yields by providing new sources of sediments and nutrients and interfering with removal mechanisms. Urbanization of the watershed of Lake Tahoe has led to five new direct sources of nutrients and sediment: (1) fertilizers not taken up by vegetation; (2) exfiltration from sewer lines and sewage spills; (3) leachate from land disposal of sewage in the past; (4)

in-Basin contributions of nitrogen and phosphorus to the atmosphere; and (5) increased erosion. A 1981 study (Glancy, U.S. Geological Survey) in the Tahoe Region found that urbanization can increase sediment yields up to 100 times. TRPA recently estimated that 4 percent of the 890 sewer lines in the Lake Tahoe Region are located in the shorezone, much of it underwater. Replacement of the sewer infrastructure in the shorezone alone is estimated to cost \$61 million.

Control programs typically target nutrient sources that are most apparent, and are most easily controlled. Recently, concern over pet wastes (including domestic Canada geese), and pyrotechnic displays have been suspected of being significant sources of nutrients that deserve employment of control measures. These are highly sensitive subjects that do deserve attention, however, until the use of fertilizer alone is truly controlled in the Region, measures to control pet waste and fireworks should be deferred.

Compacted areas and impervious surfaces prevent rainfall and snowmelt from infiltrating into the soil, and form a direct conduit for delivery of water and nutrients to the drainage system and tributary streams, thereby short-circuiting the watershed's nutrient removal mechanisms. Urbanization within the Tahoe Region has resulted in an extensive road network, which exposes new sources of sediment, requires drainage ditches to collect and drain water away, and intercepts subsurface flow, bringing it back to the surface and adding to runoff. Buildings and parking areas contribute to the runoff problem by concentrating runoff from their impervious surfaces and creating overland flow, which in the natural watershed is rare.

A study conducted Strecker and Reininga (1999) found that watershed processes are measurably disrupted by the placement of over 10 percent impervious coverage in the watershed. This suggests that adherence to coverage standards in the Lake Tahoe Region is extremely important towards maintaining the health of a watershed.

The above discussion outlined the impact of algal nutrients on water quality. Increased sediment production from the watershed also has impacts on Lake Tahoe and its tributaries. In streams, sediment silts over spawning areas, causes the water to be turbid, destabilizes channels, degrades aesthetics, and generally indicates poor health and instability of the watershed. In Lake Tahoe, sediments also degrade fisheries and contribute to turbidity in the littoral zone.

Lake Tahoe's Airshed and Atmospheric Deposition

The atmosphere acts as a source of nutrients to Lake Tahoe and its watershed (Jassby *et al*, 1994). Vegetation and water surfaces scavenge gaseous compounds (e.g., nitrogen dioxide, NO₂) from the air. Liquid and solid particles (e.g., ammonium nitrate, NH₄NO₃) settle on vegetation, land, and the Lake. Snow and rain scavenge gaseous and particulate forms from the air, depositing them on land and the Lake, in the process known as "wet deposition."

Since gaseous forms (e.g., NO₂) are relatively short-lived and are quickly absorbed from the air, local emission sources probably dominate distant sources. In contrast, fine particulates (e.g., NH₄NO₃) take time to form, travel long distances, and settle very slowly. Thus, emission sources upwind of the Tahoe Region dominate local sources, and ventilation of the Region by wind action minimizes deposition of particulates. Local sources are the dominant sources of coarse particulate matter, which settles quickly.

Since the concentration of gaseous nitric acid (HNO₃) and ammonia (NH₃) were the most elevated forms of nitrogen at Tahoe sites, it appears that transport from out of the Tahoe Basin may dominate atmospheric deposition of nitrogen to the Lake and watersheds (Tarnay *et al.*, 1999). For more discussion of atmospheric deposition and its importance, see the discussions later in this chapter, and in the Air Quality Chapter.

Process Summary:

- Lake Tahoe is suffering from cultural eutrophication due to an unbalanced nutrient budget, which has resulted in a greater than 30 percent loss of clarity since 1968. The algae are nutrient-starved, and the limiting nutrient is phosphorus at this time. Nitrogen and phosphorus budgets are both out of balance according to the most recent estimates of the Tahoe Research Group. The phosphorus budget may be easier to balance.
- Large annual variations in algal productivity are associated with varying precipitation and depth of mixing of Lake Tahoe, but the long-term trend in algal productivity increase is significant.
- Natural watershed areas are very effective at removing nutrients from incoming precipitation. Removal rates of up to 100 percent have been observed in natural areas. Overland runoff is rare in natural areas.
- Stream environment zones may be capable of rapid uptake of nutrients, depending upon timing of delivery, are conducive to denitrification, and have other benefits to water quality, such as filtering sediments and spreading peak flows.
- Especially when disturbed, SEZs can also be a source of sediments (e.g. streambank erosion) and dissolved nutrients.
- If rain or snowmelt exceeds a soil's infiltration rate, water will flow overland. Vegetation removal, soil compaction, and soil removal decrease infiltration capacity.
- Urbanization of the watershed increases runoff and yields of sediments and dissolved nutrients. In developed areas, man-made drainage ways increase drainage density and short-circuit natural treatment systems. The control measures of the Regional Plan are designed to counteract these impacts.
- In some parts of the Tahoe Region, contributions of dissolved nutrients from groundwater to Lake Tahoe are significant. Ground waters have higher nutrient concentrations close to Lake Tahoe where development is concentrated.
- Increased sediment production affects fish spawning, turbidity of receiving waters, channel stability, aesthetics, fish habitat, pelagic Lake clarity, and nutrient loading to Lake Tahoe.
- Local and distant sources of airborne nutrients contribute to Lake Tahoe's nutrient budget.

WATER QUALITY APPENDIX CONTENTS:

- Appendix 1: Littoral Turbidity Monitoring Results
- Appendix 2: Lake Tahoe Annual Average Secchi Depth / Winter (Dec-Mar) Secchi Depth.
- Appendix 3: Winter (Dec-Mar) Secchi Depth 1968 –1987: Summary Statistics
- Appendix 4: Winter (Dec-Mar) Secchi Depth 1988 – 2000: Summary Statistics
- Appendix 5: Erosion & Runoff Control Projects Constructed Since 1988
- Appendix 6: Completed EIP Projects as of Fall 2000
- Appendix 7: Hydrologic Features Map
- Appendix 8: Tributary Annual Average Concentrations
- Appendix 9: N Tributary Graphs
- Appendix 10: P Tributary Graphs
- Appendix 11: Fe Tributary Graphs
- Appendix 12: TSS Tributary Graphs
- Appendix 13: Surface Runoff at Point of Discharge

Endpapers:

- Appendix 14: LTIMP Monitoring Programs Paper
- Appendix 15: USGS MTBE Paper

Appendix 1

Littoral Turbidity Monitoring Results, TRPA

Sites		4/4/91	4/30/91	6/5/91	10/21/91	4/28/92	5/26/92	7/31/92	8/28/92	10/9/92	4/29/93	6/15/93	8/10/93	5/9/94	5/20/94	6/11/94	7/25/94	6/21/95
1	SURFACE	0.25	0.18	0.21	0.16	0.42	0.32	0.20	0.21	0.15	0.27	0.29	0.24	0.37	0.15	0.24	0.27	0.30
UPPER	5	0.13	0.26	0.20	0.10	0.11	0.13	0.18	0.26	0.09	0.29	0.41	0.19	0.30	0.19	0.30	0.21	0.34
TRUCKEE	10	0.17	0.10	0.32	0.18	0.35	0.14	0.18	0.15	0.14	0.21	0.35	0.19	0.37	0.18	0.25	0.28	0.31
RIVER	15	0.10	0.13	0.15	0.15	0.27	0.14	0.14	0.17	0.12	0.23	0.40	0.21	0.27	0.18	0.24	0.23	0.40
	20	0.13	0.24	0.16	0.23	0.47	0.15	0.14	0.25	0.14	0.26	0.25	0.18	0.51	0.25	0.26	0.25	0.30
	24	0.22	0.21	0.17	0.23	0.60	0.20	0.23	0.17	0.14	0.21	0.28	0.21	0.37	0.16	0.24	0.40	0.42
2	SURFACE	0.21	0.24	0.21	0.20	0.21	0.12	0.25	0.38	0.20	0.29	0.52	0.35	0.30	0.18	0.25	0.24	0.29
EL DORADO	5	0.30	0.23	0.16	0.12	0.37	0.14	0.14	0.17	0.13	0.22	0.31	0.21	0.33	0.25	0.34	0.19	0.32
BEACH	10	0.22	0.22	0.13	0.11	0.26	0.18	0.23	0.19	0.20	0.29	0.36	0.23	0.31	0.30	0.23	0.20	0.29
	15	0.22	0.30	0.12	0.13	0.20	0.21	0.22	0.25	0.14	0.26	0.25	0.35	0.28	0.30	0.37	0.23	0.30
	20	0.11	0.21	0.14	0.17	0.35	0.18	0.20	0.22	0.15	0.25	0.40	0.25	0.33	0.42	0.35	0.24	0.33
	24	0.11	0.31	0.14	0.15	0.28	0.30	0.22	0.25	0.14	0.33	0.30	0.33	0.35	0.37	0.29	0.25	0.29
3	SURFACE	0.23	0.70	0.20	0.14	0.55	0.34	0.18	0.17	0.19	0.41	0.39	0.19	0.37	0.22	0.18	0.20	0.47
EDGEWOOD	5	0.09	0.23	0.11	0.17	0.46	0.15	0.22	0.24	0.11	0.37	0.48	0.18	0.34	0.20	0.20	0.15	0.27
CREEK	10	0.11	0.18	0.11	0.21	0.16	0.17	0.20	0.22	0.13	0.38	0.41	0.17	0.40	0.23	0.23	0.26	0.33
	15	0.08	0.24	0.13	0.21	0.42	0.31	0.26	0.20	0.16	0.31	0.39	0.25	0.31	0.25	0.33	0.30	0.35
	20	0.17	0.15	0.09	0.18	0.26	0.31	0.23	0.20	0.12	0.26	0.41	0.45	0.42	0.23	0.20	0.34	0.48
	24	0.10	0.12	0.14	0.13	0.30	0.14	0.20	0.31	0.18	0.22	0.38	0.18	0.37	0.22	0.22	0.33	0.50
4	SURFACE	0.10	0.15	0.14	0.21	0.41	0.18	0.18	0.19	0.18	0.35	0.31	0.23	0.30	0.27	0.28	0.20	0.28
NEVADA	5	0.07	0.22	0.13	0.19	0.40	0.24	0.16	0.26	0.20	0.36	0.24	0.20	0.29	0.23	0.17	0.18	0.32
BEACH	10	0.20	0.20	0.12	0.17	0.18	0.31	0.22	0.27	0.23	0.31	0.24	0.20	0.40	0.23	0.24	0.18	0.45
	15	0.12	0.35	0.10	0.15	0.41	0.26	0.21	0.17	0.26	0.26	0.31	0.24	0.40	0.21	0.19	0.15	0.30
	20	0.28	0.15	0.14	0.18	0.29	0.15	0.21	0.23	0.14	0.22	0.40	0.23	0.37	0.28	0.18	0.24	0.66
	24	0.11	0.16	0.12	0.17	0.40	0.32	0.19	0.23	0.25	0.21	0.32	0.26	0.37	0.28	0.19	0.31	0.34
5	SURFACE	0.31	0.40	0.26	0.28	0.14	0.28	0.30	0.30	0.22	0.40	0.46	0.27	0.54	0.18	0.24	0.20	0.50
INCLINE	5	0.31	0.28	0.21	0.16	0.22	0.19	0.24	0.15	0.14	0.40	0.44	0.25	0.26	0.16	0.24	0.17	0.40
CREEK	10	0.90	0.30	0.16	0.20	0.18	0.25	0.18	0.15	0.15	0.35	0.32	0.28	0.37	0.17	0.26	0.20	0.32
	15	0.12	0.29	0.11	0.16	0.17	0.30	0.18	0.20	0.14	0.28	0.30	0.38	0.26	0.19	0.27	0.30	0.64
	20	0.27	0.23	0.14	0.13	0.15	0.20	0.21	0.20	0.09	0.26	0.25	0.48	0.40	0.14	0.33	0.32	0.35
	24	0.25	0.20	0.12	0.16	0.27	0.21	0.24	0.24	0.16	0.17	0.20	0.36	0.64	0.18	0.25	0.20	0.31
6	SURFACE	0.11	0.17	0.15	0.13	0.38	0.24	0.35	0.28	0.11	0.41	0.20	0.26	0.27	0.15	0.28	0.16	0.53
BURNT	5	0.11	0.20	0.12	0.22	0.22	0.22	0.24	0.28	0.14	0.33	0.24	0.22	0.33	0.24	0.30	0.15	0.32
CEDAR	10	0.12	0.18	0.10	0.23	0.23	0.31	0.26	0.32	0.14	0.28	0.22	0.24	0.28	0.24	0.29	0.19	0.42
	15	0.08	0.15	0.11	0.16	0.14	0.18	0.20	0.30	0.12	0.23	0.24	0.24	0.23	0.18	0.23	0.16	0.68
	20	0.12	0.18	0.09	0.18	0.16	0.15	0.28	0.26	0.18	0.24	0.33	0.22	0.31	0.15	0.21	0.22	0.62
	24	0.09	0.15	0.10	0.21	0.26	0.10	0.26	0.24	0.16	0.19	0.20	0.28	0.35	0.20	0.31	0.20	0.52

Appendix 1

Littoral Turbidity Monitoring Results, TRPA

Sites		4/4/91	4/30/91	6/5/91	10/21/91	4/28/92	5/26/92	7/31/92	8/28/92	10/9/92	4/29/93	6/15/93	8/10/93	5/9/94	5/20/94	6/11/94	7/25/94	6/21/95
7	SURFACE	0.12	0.14	0.15	0.25	0.20	0.24	0.26	0.22	0.17	0.76	0.58	0.24	0.35	0.18	0.24	0.16	0.38
TAHOE	5	0.11	0.30	0.10	0.24	0.22	0.27	0.25	0.20	0.14	0.35	0.42	0.21	0.34	0.18	0.24	0.18	0.27
CITY	10	0.14	0.13	0.10	0.16	0.26	0.22	0.22	0.18	0.20	0.33	0.34	0.29	0.28	0.21	0.30	0.28	0.26
	15	0.10	0.15	0.14	0.22	0.21	0.24	0.24	0.16	0.17	0.43	0.25	0.33	0.35	0.17	0.40	0.21	0.31
	20	0.17	0.42	0.22	0.18	0.16	0.21	0.26	0.20	0.18	0.36	0.28	0.24	0.53	0.17	0.27	0.24	0.27
	24	0.08	0.12	0.18	0.26	0.22	0.26	0.23	0.25	0.14	0.42	0.46	0.30	0.41	0.20	0.37	0.22	0.44
8	SURFACE	0.13	0.15	0.15	0.19	0.17	0.25	0.21	0.18	0.24	0.33	0.55	0.29	0.43	0.17	0.29	0.15	0.42
WARD CREEK	5	0.08	0.12	0.12	0.20	0.26	0.21	0.24	0.20	0.14	0.31	0.46	0.26	0.37	0.20	0.27	0.14	0.31
	10	0.09	0.10	0.12	0.17	0.23	0.23	0.13	0.18	0.17	0.30	0.36	0.22	0.37	0.16	0.28	0.17	0.32
	15	0.12	0.11	0.14	0.18	0.14	0.12	0.22	0.22	0.15	0.31	0.48	0.27	0.29	0.15	0.28	0.30	0.30
	20	0.10	0.14	0.23	0.25	0.31	0.19	0.22	0.22	0.18	0.26	0.45	0.20	0.39	0.14	0.43	0.36	0.44
	24	0.13	0.13	0.21	0.17	0.28	0.17	0.19	0.34	0.20	0.27	0.58	0.26	0.70	0.15	0.33	0.30	0.42
BLACKWOOD CREEK	SURFACE																	
	5																	
	10																	
	15																	
	20																	
	24																	
Source: TRPA, 2001																		

Appendix 1

Littoral Turbidity Monitoring Results, TRPA

Sites		7/13/95	10/10/95	1/12/96	2/7/96	2/13/96	6/4/96	6/12/96	6/19/96	8/16/96	10/4/96	8/13/97
1	SURFACE		0.20		0.31		0.7	0.55			0.24	0.17
UPPER	5		0.20		0.31		0.36	0.4			0.32	0.17
TRUCKEE	10		0.20		0.41		0.42	0.43			0.33	0.29
RIVER	15		0.35		0.42		0.3	0.45			0.25	0.26
	20		0.26		0.63		0.26	0.35			0.41	0.21
	24		0.31		0.56		0.47	0.6			0.25	0.27
2	SURFACE		0.20		0.35			0.76			0.31	0.25
EL DORADO	5		0.19		0.35			0.42			0.25	0.26
BEACH	10		0.21		0.33			0.46			0.35	0.64
	15		0.87		0.31			0.63			0.2	0.33
	20		0.25		0.35			0.62			0.25	0.36
	24		0.22		0.31			0.92			0.28	0.23
3	SURFACE		0.29	0.25				0.65			0.39	0.17
EDGEWOOD	5		0.18	0.28				0.75			0.38	0.14
CREEK	10		0.20	0.40				0.72			0.31	0.25
	15		0.20	0.23				0.9			0.32	0.3
	20		0.35	0.30				0.44			0.34	0.32
	24		0.37	0.30				0.65			0.35	0.32
4	SURFACE		0.22	0.30				0.68			0.24	0.13
NEVADA	5		0.22	0.34				0.6			0.32	0.18
BEACH	10		0.21	0.36				0.61			0.25	0.33
	15		0.20	0.31				0.75			0.26	0.19
	20		0.28	0.34				0.48			0.35	0.43
	24		0.88	0.44				0.4			0.39	0.36
5	SURFACE	0.25	0.25	0.30		0.22	0.28		0.4	0.28	0.31	0.37
INCLINE	5	0.25	0.23	0.35		0.33	0.23		0.37	0.26	0.3	0.16
CREEK	10	0.39	0.24	0.27		0.24	0.38		0.35	0.35	0.34	0.19
	15	0.30	0.24	0.31		0.21	0.35		0.31	0.26	0.36	0.12
	20	0.38	0.21	0.35		0.28	0.36		0.38	0.3	0.37	0.14
	24	0.35	0.23	0.32		0.25	0.42		0.35	0.35	0.34	0.17
6	SURFACE	0.49	0.27	0.25		0.21	0.28		0.5	0.19	0.41	0.19
BURNT	5	0.69	0.24	0.25		0.28	0.58		0.37	0.2	0.34	0.2
CEDAR	10	0.56	0.21	0.44		0.25	0.42		0.53	0.27	0.28	0.21
	15	0.61	0.22	0.43		0.23	0.45		0.4	0.26	0.29	0.25
	20	0.93	0.22	0.13		0.40	0.63		0.45	0.29	0.26	0.24
	24	0.66	0.23	0.14		0.25	0.53		0.32	0.28	0.39	0.41

Appendix 1

Littoral Turbidity Monitoring Results, TRPA

Sites		7/13/95	10/10/95	1/12/96	2/7/96	2/13/96	6/4/96	6/12/96	6/19/96	8/16/96	10/4/96	8/13/97
7	SURFACE	0.15	0.22			0.25	0.51	0.45		0.3		
TAHOE	5	0.23	0.26			0.34	0.32	0.52		0.45		
CITY	10	0.25	0.23			0.28	0.43	0.68		0.27		
	15	0.40	0.20			0.28	0.36	0.55		0.27		
	20	0.35	0.24			0.45	0.3	0.35		0.51		
	24	0.38	0.27			0.24	0.54	0.65		0.69		
8	SURFACE	0.40	0.18	0.23		0.25	0.26	0.83		0.3		0.17
WARD CREEK	5	0.42	0.18	0.23		0.20	0.31	0.67		0.33		0.17
	10	0.46	0.23	0.36		0.27	0.49	0.92		0.39		0.21
	15	0.56	0.22	0.27		0.35	0.3	0.55		0.51		0.28
	20	0.48	0.21	0.28		0.32	0.42	0.51		0.61		0.18
	24	0.87	0.25	0.28		0.30	0.54	0.45		0.45		0.33
BLACKWOOD CREEK	SURFACE											
	5											
	10											
	15											
	20											
	24											
Source: TRPA, 2001												

Appendix 1

Littoral Turbidity Monitoring Results, TRPA

Sites		4/29/98	7/22/98	7/23/98	5/20/99	8/3/99	8/4/99	10/15/99	10/18/99	4/10/00	4/11/00	5/24/00	6/5/00	9/29/00
1	SURFACE	0.43		0.14	0.24		0.24	0.25			0.23		0.23	0.18
UPPER	5	0.35		0.2	0.28		0.22	0.21			0.23			0.19
TRUCKEE	10	0.31		0.25	0.16		0.23	0.2			0.26			0.19
RIVER	15	0.32		0.14	0.24		0.24	0.45			0.26			0.2
	20	0.31		0.17	0.23		0.37	0.21			0.27			0.27
	24	0.53		0.21	0.23		0.31	0.2			0.29			0.2
2	SURFACE	0.18		0.42	0.45		0.34		0.25		0.24		0.3	0.16
EL DORADO	5	0.17		0.45	0.48		0.32		0.27		0.33			0.17
BEACH	10	0.25		0.33	0.15		0.31		0.26		0.22			0.2
	15	0.2		0.27	0.38		0.24		0.21		0.2			0.2
	20	0.26		0.29	0.3		0.25		0.22		0.23			0.26
	24	0.24		0.29	0.26		0.35		0.24		0.21			0.19
3	SURFACE	0.19		0.25	0.12	0.24			0.22		0.2	0.39		0.17
EDGEWOOD	5	0.23		0.19	0.26	0.23			0.22		0.24	0.29		0.19
CREEK	10	0.22		0.23	0.2	0.21			0.22		0.26	0.25		0.18
	15	0.19		0.3	0.18	0.15			0.25		0.24	0.26		0.18
	20	0.24		0.26	0.13	0.4			0.23		0.31	0.5		0.2
	24	0.2		0.31	0.15	0.26			0.28		0.24	0.27		0.21
4	SURFACE	0.26		0.25	0.22	0.26			0.24		0.26		0.3	0.18
NEVADA	5	0.21		0.28	0.24	0.21			0.22		0.26			0.22
BEACH	10	0.18		0.4	0.2	0.19			0.3		0.31			0.19
	15	0.21		0.28	0.17	0.24			0.28		0.22			0.19
	20	0.19		0.43	0.28	0.28			0.23		0.24			0.2
	24	0.18		0.49	0.24	0.21			0.23		0.27			0.22
5	SURFACE	0.23	0.18		0.27	0.2			0.26	0.19		0.25		0.19
INCLINE	5	0.18	0.11		0.25	0.18			0.26	0.18		0.28		0.23
CREEK	10	0.32	0.28		0.49	0.24			0.26	0.21		0.29		0.25
	15	0.22	0.24		0.2	0.16			0.25	0.19		0.3		0.23
	20	0.26	0.37		0.31	0.26			0.24	0.2		0.3		0.28
	24	0.44	0.33		0.32	0.29			0.3	0.18		0.68		0.28
6	SURFACE	0.18	0.39		0.34	0.23			0.19	0.22		0.21		0.18
BURNT	5	0.2	0.19		0.29	0.18			0.22	0.28		0.46		0.21
CEDAR	10	0.25	0.2		0.22	0.19			0.35	0.33		0.38		0.19
	15	0.18	0.25		0.28	0.21			0.22	0.22		0.49		0.23
	20	0.27	0.25		0.37	0.26			0.23	0.33		0.68		0.23
	24	0.31	0.41		0.46	0.35			0.2	0.33		0.51		0.34

Appendix 1

Littoral Turbidity Monitoring Results, TRPA

Sites		4/29/98	7/22/98	7/23/98	5/20/99	8/3/99	8/4/99	10/15/99	10/18/99	4/10/00	4/11/00	5/24/00	6/5/00	9/29/00
7	SURFACE	0.35	0.19		0.32	0.26			0.21	0.22		0.27		0.16
TAHOE	5	0.22	0.23		0.25	0.2			0.31	0.33		0.3		0.19
CITY	10	0.19	0.21		0.4	0.22			0.21	0.22		0.35		0.2
	15	0.29	0.41		0.35	0.26			0.22	0.37		0.24		0.31
	20	0.22	0.48		0.25	0.29			0.22	0.27		0.42		0.24
	24	0.28	0.24		0.23	0.25			0.21	0.24		0.34		0.27
8	SURFACE	0.24	0.23		0.68	0.21			0.25	0.3		0.29		0.17
WARD CREEK	5	0.29	0.27		0.49	0.23			0.36	0.21		0.36		0.18
	10	0.29	0.31		0.46	0.2			0.34	0.35		0.28		0.19
	15	0.18	0.42		0.34	0.21			0.44	0.24		0.33		0.19
	20	0.3	0.41		0.25	0.28			0.35	0.38		0.41		0.21
	24	0.22	0.35		0.35	0.26			0.39	0.27		0.39		0.29
BLACKWOOD CREEK	SURFACE								0.29		0.2	0.31		0.17
	5								0.35		0.25	0.97		0.22
	10								0.26		0.2	0.66		0.22
	15								0.29		0.24	0.38		0.18
	20								0.27		0.3	0.71		0.25
	24								0.25		0.3	0.42		0.26
Source: TRPA, 2001														

Appendix 2. Annual and Winter (Dec-March) Secchi Depth Comparison.

Lake Tahoe Annual Average Secchi Depth (m)						
Index Station						Winter
	Annual					(Dec-Mar)
Year	Secchi Depth (m)	min	max	1 s.d.	std. error	Secchi Depth (m)
1968	31.22	24	43.25	4.3864	0.2293	33.39
1969	28.57	15.5	40.5	6.1282	0.3208	36.18
1970	30.21	25.5	35	1.907	0.0998	30.3
1971	28.74	21	35.25	4.0971	0.2145	33.55
1972	27.41	22.5	37.75	2.826	0.1477	26.07
1973	26.08	19.5	33	3.4004	0.178	29.54
1974	27.21	16.5	41.25	4.0556	0.2123	29.74
1975	26.11	20	34	4.0107	0.2099	28.79
1976	27.38	22.5	37.5	2.3774	0.1243	27.63
1977	27.75	23	33.5	2.1572	0.1129	27.81
1978	25.95	19.5	33	3.0068	0.1574	26.72
1979	26.72	20	37.75	3.3584	0.1758	28.98
1980	24.82	19.5	33.5	3.3181	0.1734	27.67
1981	27.39	20.5	34	2.9002	0.1518	24.88
1982	24.31	14.5	35.5	5.1301	0.2685	27.57
1983	22.38	8.5	38.5	6.0738	0.3179	29.05
1984	22.79	14.5	30	3.1486	0.1646	21.97
1985	24.2	15.75	32.5	3.8958	0.2039	27.34
1986	24.08	18.5	29.5	2.5765	0.1349	26.87
1987	24.65	19.5	31.75	2.6909	0.1408	23.2
1988	24.66	15	35.5	4.0561	0.212	23.61
1989	23.64	14.5	41	5.6224	0.2943	26.65
1990	23.64	15	36.5	4.0028	0.2095	25.8
1991	22.43	15.75	27.5	2.3273	0.1218	21.64
1992	23.89	15.5	30.5	3.4687	0.1813	22.12
1993	21.47	10	40	5.0735	0.2656	25.81
1994	22.53	16.5	28.5	2.4865	0.1301	21.82
1995	21.47	11.25	29.75	4.0791	0.2135	22.86
1996	23.45	15.75	41	4.6415	0.2426	26.88
1997	19.51	13	25.5	2.6957	0.1411	19.97
1998	20.14	14.5	32.75	3.1758	0.1662	23.15
1999	21.04	13.25	32.5	4.5083	0.236	24.72
2000	20.53	14.5	33	3.6002	0.1882	21.51
2001						23.7

Appendix 3. Winter (Dec-Mar) Secchi Depth 1968-1987

SUMMARY OUTPUT

Regression Statistics

Multiple R	0.75312004
R Square	0.567189794
Adjusted R Square	0.543144783
Standard Error	2.268730471
Observations	20

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	121.4141288	121.4141288	23.5886681	0.000126691
Residual	18	92.64848313	5.147137952		
Total	19	214.062612			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	873.329756	173.976432	5.019816453	8.89E-05	507.8185526	1238.841	507.8185526	1238.840959
X Variable 1	-0.427291045	0.087977594	-4.856816664	0.000126691	-0.612125255	-0.2424568	-0.612125255	-0.242456836

Appendix 4. Winter (Dec-Mar) Secchi Depth 1988-2000

SUMMARY OUTPUT

Regression Statistics

Multiple R	0.302953932
R Square	0.091781085
Adjusted R Square	0.009215729
Standard Error	2.200373268
Observations	13

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	5.38205397	5.38205397	1.11161738	0.314338595
Residual	11	53.25806769	4.841642517		
Total	12	58.64012166			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	366.4770311	325.2269937	1.126834605	0.283793954	-349.3431177	1082.29718	-349.3431177	1082.29718
X Variable 1	-0.171964313	0.163102518	-1.054332671	0.314338595	-0.530950717	0.18702209	-0.530950717	0.18702209

Appendix 5. Erosion & Runoff Control Projects Constructed Since 1988

Jurisdiction	Project Name	Completed	Project Cost*
El Dorado County	(Includes phases of several projects, Rubicon, Tahoma, Montgomery Estates, Country Club, & Echo View)	1988	1,509,600
	Marshall Trail	1989	125,000
	Santa Fe	1989	37,000
	Tahoe Paradise #60	1989	10,000
	Tahoe Mountain	1989	322,000
	Montgomery Estates	1989	12,000
	Country Club	1989	842,000
	Rubicon	1989	200,000
	Pioneer Trail	1989	1,800,000
	Upper Truckee	1989	175,000
	1989 CCC	1990	200,000
	Arapahoe	1990	6,500
	North Upper Truckee	1991	760,000
	Golden Bear	1992	50,000
	Victoria Drive	1992	785,000
	Pat Lowe Bike Trail/ECP	1992	500,000
	Valley View	1993	220,000
	Del Norte	1993	83,000
	Apache I	1993	1,000,000
	North Upper Truckee	1993	1,200,000
	Black Bart Phase I	1996/96	342,951
	Black Bart Phase II	1995/96	984,211
	Angora/Bike Lane Phase I	1997	429,804
	Mountain Drive	1997	941,245
	Angora Creek ECP II- portion of Mountain View	1998	1,795,017
	Hepka Erosion Control Project	1998	790,422
Pioneer Trail III	2001	<u>2,942,283</u>	
	TOTAL		18,063,033
Placer County	Dollar Point	1989	630,000
	Tamarack Drive	1989	269,900
	Agate Bay	1990	156,000
	Carnelian Woods	1990	300,000
	Carnelian Drive	1990	437,760
	Regency Way	1990	350,000
	Trout Street	1990	76,500
	Alpine Peaks (I)	1990	360,000
	Alpine Peaks (II)	1991	400,000
	Estates Drive	1991	590,000
	Kahula Park	1991	305,475
	McKinney Estates	1991	457,663
	Skyland Phase I and II	1991	569,000
	Holly Road	1992	80,000
	Kingswood West II	1992	100,000
	Nightingale	1992	130,000
	Ridgewood	1993	421,904
	Fox Street	1993	250,000
	Chambers Lodge	1995/96	404,000
	Forest Road	1995/96	640,000
	Agate Road Phase I	1995/96	630,000
	McKinney Rubicon Springs Phase I	1995	52,901
	Fir Avenue	1995	45,000
	Tahoe Swiss Village	1996	543,000
	Tahoe Park Heights	1996	107,020
	Speckled/Pine Overlay	1996/97	340,000
McKinney Rubicon Springs Phase II	1997	324,176	
Blackwood Creek Debris Removal	1997	4,684	

Jurisdiction	Project Name	Completed	Project Cost*
Placer County (continued)	Ward Creek Debris Removal	1997	153,357
	Tahoe City Phase I	1997	4,503,000
	Agate Road Phase II	1997	43,906
	Homewood Canyon	1998	208,821
	Agate Road Phase III	2000	174,652
	Tahoe City Urban Improvement	2000	4,898,938
	Carmelian Area Drainage System	2000	500,000
	Lake Vista Dr. Stabilization Project	2000	91,560
	National Ave. Water Quality Project	2001	To Be Determined
	TOTAL		19,549,217
City of South Lake Tahoe	Bijou/Wildwood	1988	3,361,440
	Lake Christopher	1990	229,500
	Bijou	1990	272,000
	Ski Run I	1990	750,000
	Tahoe Valley	1991	350,000
	Gardner Mountain	1992	410,000
	Al Tahoe Pioneer Trail	1992	900,000
	Lakeview Avenue	1993	15,000
	Gardner Mountain	1993	48,000
	Lake Christopher	1994	600,000
	12th & 13 th Streets	1994	900,000
	Clement Street Erosion Control Project	1996	270,000
	Stateline Erosion Control Project	1996	2,121,080
	Al Tahoe/Pioneer Trail/Bijou Creek	1999	1,797,900
	Beecher/Lodi portion of Sierra Tract Residential	1999	1,025,990
	Ski Run Blvd. Improvement	2000	338,172
	Park Avenue Project Phase I	2000	244,572
	Regina Road BMP	2001	9,000
Ski Run Marina Drainage Retrofit	2001	253,000	
	TOTAL		13,895,654
Washoe County	Crystal Bay	1989	1,412,579
	Steven Parking Lot & Preston Field	1990	321,000
	Ski Way/R-2-1 & R-2-2	1990	522,000
	Ski Incline Parking	1990	257,000
	Incline Village II	1991	1,568,076
	Incline Village IV, Phase I	1993	670,000
	1st, 2nd, 3rd, & Woods Creek Water Quality Imprvmnt. Project	1995	772,000
	2 nd Creek & Country Club Drive	1997	19,625
	Goshute Road Crystal Bay	1997	68,435
	Ski Way portion of Mill Creek Water Quality	1998	576,892
	Incline Village Unit #1 BMP- includes Upper Jennifer	1999	1,317,070
	Incline Village Commercial and Lower Wood Creek	2000	1,525,000
Fairview Country Club Water Quality Project	2001	2,600,000	
	TOTAL		11,629,677
Douglas County	Elk Point	1988	42,623
	Chimney Rock	1989	108,000
	Hubbard Road	1990	127,000
	Kingsbury Highlands	1991	339,183
	Cave Rock	1991	1,062,394
	North Martin Street	1991	61,394
	Zephyr Knolls	1991	672,136
	Kingsbury Summit	1991	1,712,663
	Kahle Drive/Burke Creek	1992	532,635
	Lower Kingsbury	1992	1,471,196
Kingsbury Summit	1992	1,337,192	
Kingsbury Village	1993	1,380,530	

Jurisdiction	Project Name	Completed	Project Cost*
Douglas County (continued)	Glenbrook Slope Stabilization	1995	320,472
	Skyland	1995	292,549
	Elk Point/Round Hill GID	1997	130,983
	Marla Bay	2000	406,100
	Kingsbury Estates/Tahoe Village Phase I & II	2000	1,513,473
	Round Hill GID, McFaul Way	2000	48,323
	Kingsbury Village	2001	1,071,324
	Cave Rock Estates GID	2001	1,999,157
	TOTAL		14,629,327
Caltrans	Highway 28-mile post 8.4	1988	28,000
	Highway 89-mile post 4.42	1988	19,000
	Highway 89-mile post 7.6	1988	26,000
	Highway 50-mile post 71.5-73.5	1988	40,000
	0.02 miles west of Pioneer Trail on Highway 50	1989	10,000
	Highway 28-mile post 9.57	1989	31,000
	1.4 miles east of Highway 89 on 28	1990	10,000
	Highway 89 (Rubicon)-mile post 21.8-22.9	1990	500,000
	Emerald Bay	1991	2,460,000
	Highway 50 at the Airport	1991	250,000
	Elizabeth Drive	1991	188,000
	Cherry Street/Grimsel Pass	1992	188,000
	Tahoe Swiss Village/Trout Street	1992	40,281
	Airport	1992	250,000
	Taylor Creek Bridge	1994	690,000
	Cascade Creek Bridge	1994	690,000
	Rubicon Glen Drive to Silver Tip Drive	1994	1,128,000
	Dollar Grade Erosion Control	1995	725,000
	Brockway Summit Erosion Control	1998	2,715,000
	Burton Creek Culvert Replacement	1999	375,000
Snow Creek Water Quality/Culvert	1999	752,000	
	TOTAL		11,115,281
NDOT	Nevada 28-Crystal Bay to NV 431	1991	296,211
	Incline Village Highway 431 to Lakeshore Drive	1995	1,800,000
	SR 28 from WA mile post 3.19 to 4.98	1996	2,486,035
	Kingsbury/Hwy 50 Drainage: Edgewood System	1999	511,918
	SR 28 from DG mile post 0.00 to 1.23, CC 0.77	1999	2,750,000
	US 50 Kingsbury to Kahle	1999	2,659,907
	South Shore Casino Core Urban Runoff Treatment	2000	2,500,000
	TOTAL		13,004,071
GRAND TOTAL			88,882,189

*costs are provided by jurisdiction, subject to update

EIP #	Project Name	Lead Agency	Cost to Date
AIR QUALITY/TRANSPORTATION Projects			
507	CSLT SKI RUN TO TAHOE MEADOWS BICYCLE TRAIL	CSLT	\$436,500.00
757	CLASS ONE/TWO: INCLINE WAY COUNTRY CLUB DRIVE TO SOUTHWOOD BLVD.	WASHOE	\$321,000.00
783	U.S. HWY 50: KINGSBURY TO KAHLE ROADWAY AND SIDEWALK IMPROVEMENTS	NDOT	\$2,659,907.00
796	TAHOE CITY URBAN IMPROVEMENT PROJECT - Completion 2001	PLACER	\$7,047,902.00
813	INCLINE VILLAGE TRANSIT IMPROVEMENTS	WASHOE	\$244,744.00
818	PLACER COUNTY TRANSIT MAINTENANCE FACILITY CONSTRUCTION	PLACER	\$3,200,000.00
850	U.S. HIGHWAY 50: PIONEER TRAIL TO PARK AVENUE TURN LANE ADDITION	CSLT	\$515,000.00
851	U.S. HIGHWAY 50 AND PARK AVENUE INTERSECTION IMPROVEMENTS	CSLT	\$1,100,000.00
852	RECONSTRUCTION OF VAN SICKLE RD AND U.S. HWY 50 TO VAN SICKLE TRANSIT	CSLT	\$500,000.00
853	U.S. HIGHWAY 50 AND SKI RUN BLVD. INTERSECTION IMPROVEMENTS	CSLT	\$1,079,000.00
1021	ROCKY POINT CLASS ONE BICYCLE TRAIL	TCPUD	\$601,336.00
AIR QUALITY/TRANSPORTATION Subtotal:			\$17,705,389.00
FISHERIES Projects			
904	HABITAT RESTORATION-TROUT/PIONEER TO MARTIN PHASE I	CSLT	\$425,000.00
	Remainder of Funding Covered under #22 in Soil Conservation		
FISHERIES Subtotal:			\$425,000.00
RECREATION Projects			
294	CSLT SKI RUN PUBLIC BEACH ACCESS	CSLT	\$200,000.00
512	USFS/CA STATE PARKS EAGLE FALLS-VIKINGSHOLM TRAIL	C-PARKS	\$240,000.00
513	EMERALD BAY STATE PARK LAKESIDE TRAIL	C-PARKS	\$275,000.00
621	CTC CARNELIAN BAY ACCESS PHASE II & PHASE III	CTC	\$1,666,650.00
859	RAINBOW TRAIL REHABILITATION	USFS	\$295,000.00
862	MEMORIAL POINT OVERLOOK IMPROVEMENTS	N-PARKS	\$809,948.00
RECREATION Subtotal:			\$3,486,598.00
SCENIC Projects			
58	HWY 50 UTILITY UNDRGROUNDING ELKS CLUB DR AREA	SPPC	\$1,200,000.00
60	N STATELINE CP URBAN DESIGN PROJECT	NDOT	\$2,352,835.00
104	SCENIC ROAD UNIT #40 BROCKWAY CUTOFF IMPROVEMENT	PLACER	\$500,000.00
134	TAHOE CITY UTILITY UNDERGROUNDING PHASE 2	SPPC	\$900,000.00
336	TAHOE MEADOWS LINEAR PARK	CSLT	\$1,360,300.00
872	US 50/SKI RUN BLVD UTILITY UNDERGROUNDING	SPPC	\$700,000.00
SCENIC Subtotal:			\$7,013,135.00
SOIL CONSERVATION / SEZ Projects			
22	TROUT CREEK - PIONEER TO BLACK BART SEZ RESTORATION - PHASE I & II	CSLT	\$2,175,808.00
25	SNOW CREEK SEZ RESTORATION - S.R. 28 Portion Complete 2001	CTC	\$3,429,189.00
123	INCLINE CREEK SEZ/FISHERIES - HYATT	IVGID	\$939,098.00
263	SECOND CREEK SEZ REST	WASHOE	\$300,000.00
264	THIRD CREEK - VILLAGE BLVD SEZ RESTORATION - PORTION COMPLETE	PRIVATE	\$500,000.00
318	WILDWOOD (B/W SKI RUN & PINE GROVE) - PARK	CSLT	\$500,000.00
390	TAHOE VISTA BEACH AREA SEZ RESTORATION	NTPUD	\$20,000.00
446	COVERAGE - NORTH SHORE ECOSYSTEM MGT. PROJECT	USFS	\$76,000.00
447	EAST SHORE - LAND COVERAGE RESTORATION	USFS	\$37,000.00
559	ANGORA CREEK SEZ RESTORATION	C-PARKS	\$350,000.00
561	UPPER TRUCKEE - HWY 50 TO AIRPORT SEZ RESTORATION	NRCS	\$75,000.00
934	OSGOOD AVE. SEZ RESTORATION PROJECT	CSLT	\$150,000.00
961	HEAVENLY CWE IMPLEMENTATION PHASE 2	USFS	\$230,000.00
962	HEAVENLY CWE IMPLEMENTATION PHASE 3	USFS	\$205,000.00
969	SKY MEADOWS STREAM BANK STABILIZATION	USFS	\$25,000.00
1018	CARNELIAN CREEK SEZ RESTORATION: PHASE III	CTC	\$2,458,490.00
SOIL CONSERVATION / SEZ Subtotal:			\$11,470,585.00

EIP #	Project Name	Lead Agency	Cost to Date
VEGETATION Projects			
253	FOREST HEALTH - KINGSBURY DEFENSIBLE SPACE	N-LANDS	\$50,000.00
296	FOREST HEALTH - EAST SHORE PROJECT/SKUNK SALE	USFS	\$1,130,000.00
553	FOREST HEALTH - EAST SHORE PROJECT/CAMP SALE	USFS	\$1,120,000.00
580	PIONEER TRAIL PROJECT	USFS	\$520,000.00
914	BALDY HELICOPTER HAZARD REDUCTION	USFS	\$1,520,000.00
919	BLISS POND FUEL WOOD	USFS	\$30,000.00
920	MALLARD FUEL WOOD	USFS	\$30,000.00
921	ANGORA HAZARD REDUCTION	USFS	\$520,000.00
922	BRIGHT FOREST HEALTH SERVICE CONTRACTS	USFS	\$270,000.00
977	HABITAT PROTECT - TYC BALDWIN BEACH	USFS	\$40,000.00
VEGETATION Subtotal:			\$5,230,000.00
WATER QUALITY Projects			
1	TAHOE CITY URBAN IMPROVEMENT PROJECTS	PLACER	\$4,714,000.00
4	SOUTH SHORE CASINO CORE URBAN RUNOFF TREATMENT	NDOT	\$2,500,000.00
14	BROCKWAY SUMMIT EROSION CONTROL	CALTRANS	\$2,800,015.00
145	CARNELIAN AREA DRAINAGE SYSTEM	PLACER	\$500,000.00
172	BIJOU AREA WATER QUALITY - PORTION OF AL TAHOE/PIONEER/BIJOU CREEK	CSLT	\$1,797,900.00
188	HEPKA EROSION CONTROL PROJECT - EARLY PHASE NOT UNDER CTC EIP LIST	ELDOT	\$790,422.00
193	ANGORA CREEK ECP II - PORTION OF MOUNTAIN VIEW	ELDOT	\$1,795,017.00
242	UPPER KINGSBURY - PORTION COMPLETED, COMPLETE 2001	KGID	\$2,245,552.00
359	KINGSBURY/HWY 50 DRAINAGE: EDGEWOOD SYSTEM	NDOT	\$511,918.00
669	INCLINE VILLAGE COMMERCIAL & Lower Wood Creek	WASHOE	\$1,525,000.00
680	SR 28 EROSION CONTROL & WATER QUALITY MASTER PLAN	NDOT	\$1,000,000.00
682	SR 28 FROM DG MILE POST 0.00 TO MILE POST 1.23	NDOT	\$2,750,000.00
685	SR 28 WATER QUALITY, MILE POST CC 0.00 TO 2.00 - PORTION COMPLETE APPROX.	NDOT	\$1,000,000.00
693	BEECHER/LODI PORTION OF - PORTION OF SIERRA TRACT RESIDENTIAL	CSLT	\$1,025,990.00
	SKI RUN WATER QUALITY IMPROVEMENT PROJECT	CSLT	\$2,445,000.00
955	EAST SHORE BEACHES STABILIZATION	USFS	\$100,000.00
1008	HIDDEN BEACH REHABILITATION	N-PARKS	\$125,000.00
1010	HEAVENLY CWE IMPLEMENTATION	HEAVENLY	\$350,000.00
1011	MAGGIES'S CORNER BMP RETROFIT	USFS	\$23,000.00
10059	LAKE VISTA DR. STABILIZATION PROJECT	PLACER	\$91,560.00
10066	INCLINE VILLAGE #1 BMP - INCLUDES UPPER JENNIFER	WASHOE	\$1,525,000.00
10068	SKI WAY PORTION OF MILL CREEK WATER QUALITY	WASHOE	\$552,044.00
10069	MARLA BAY ECP	DOUGLAS	\$406,100.00
WATER QUALITY Subtotal:			\$30,573,518.00
WILDLIFE Projects			
1001	SNOW CREEK WILDLIFE-HABITAT RESTORATION	CTC	\$750,000.00
1003	RIPARIAN WILDLIFE HABITAT ENHANCEMENT - PHASE 1	CTC	\$1,867,000.00
10141	SUNSET STABLE ACQUISITION	CTC	\$321,000.00
WILDLIFE Subtotal:			\$2,938,000.00
THRESHOLD PROJECTS TOTAL:			\$78,842,225.00

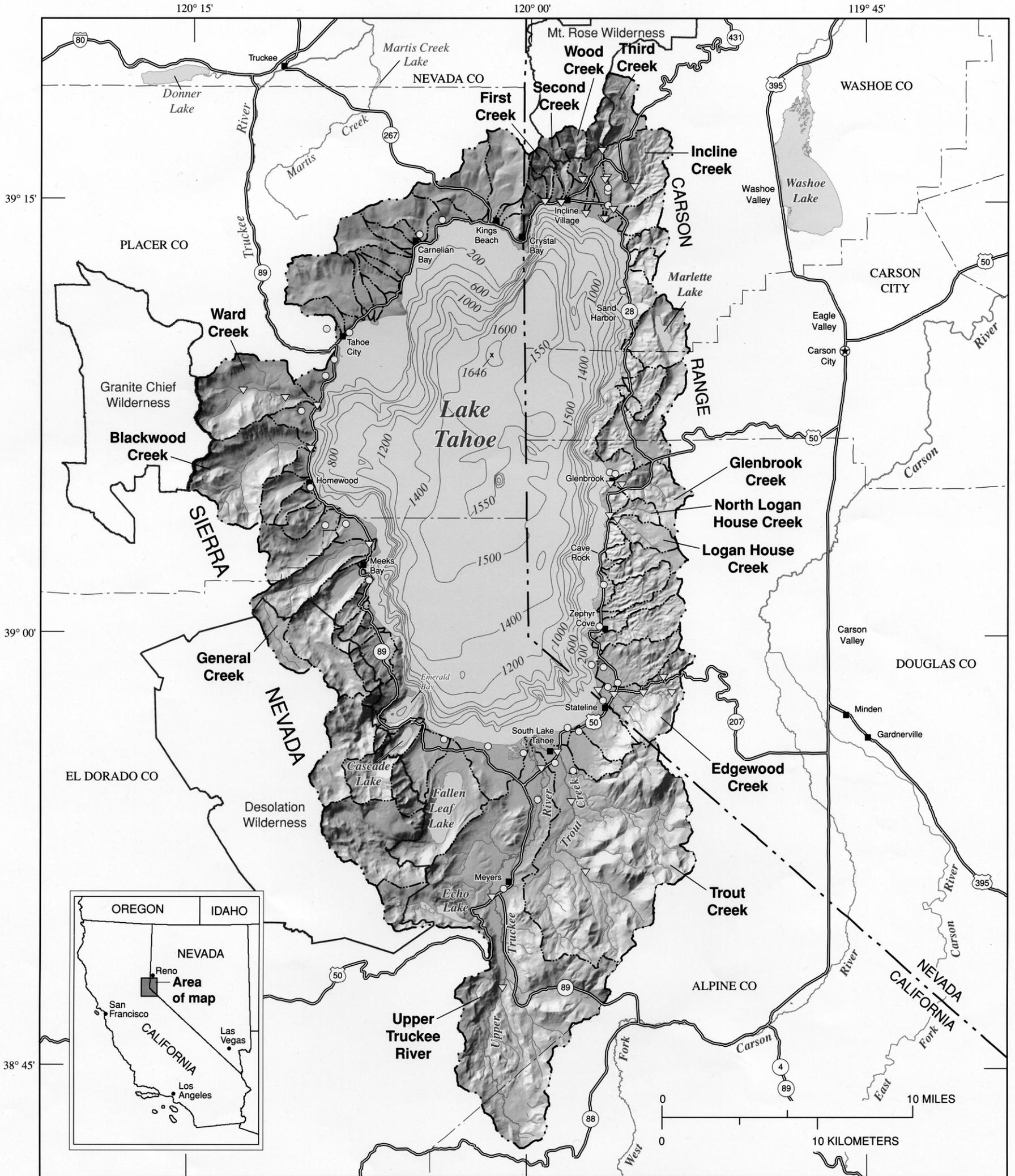
Amounts are approximate and include completed phases only for some projects.

SELECTED HYDROLOGIC FEATURES OF THE LAKE TAHOE BASIN, CALIFORNIA AND NEVADA



U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY
Open-File Report 97-384

By
Timothy G. Rowe and J. Christopher Stone
1997



Base from U.S. Geological Survey digital data, 1:24,000 and 1:100,000, 1969-85
Universal Transverse Mercator projection, Zone 11
Bathymetric contours from Rush, 1973. Compiled from soundings made
by U.S. Coast and Geodetic Survey (1923)
Wilderness areas from U.S. Forest Service digital data, 1997

For more information contact:
Public Information Assistant tel.: (702) 887-7649
U.S. Geological Survey fax: (702) 887-7629
333 W. Nye Lane, Rm 203 email: usgsinfo_nv@usgs.gov
Carson City, NV 89706 URL: <http://www.nv.wr.usgs.gov>

EXPLANATION

- | | | | |
|-----------|--|---|--------------------|
| — · · — | Boundary of Lake Tahoe Basin | ▽ | Surface-water site |
| — · — · — | Boundary of subbasin | ○ | Ground-water site |
| — 1200 — | Bathymetric contour, in feet below highest legal lake-surface altitude (6,229.1 feet above U.S. Bureau of Reclamation datum of 1929) | | |

Appendix 8. California Nevada Tributary Water Quality Data - Annual Average Concentrations

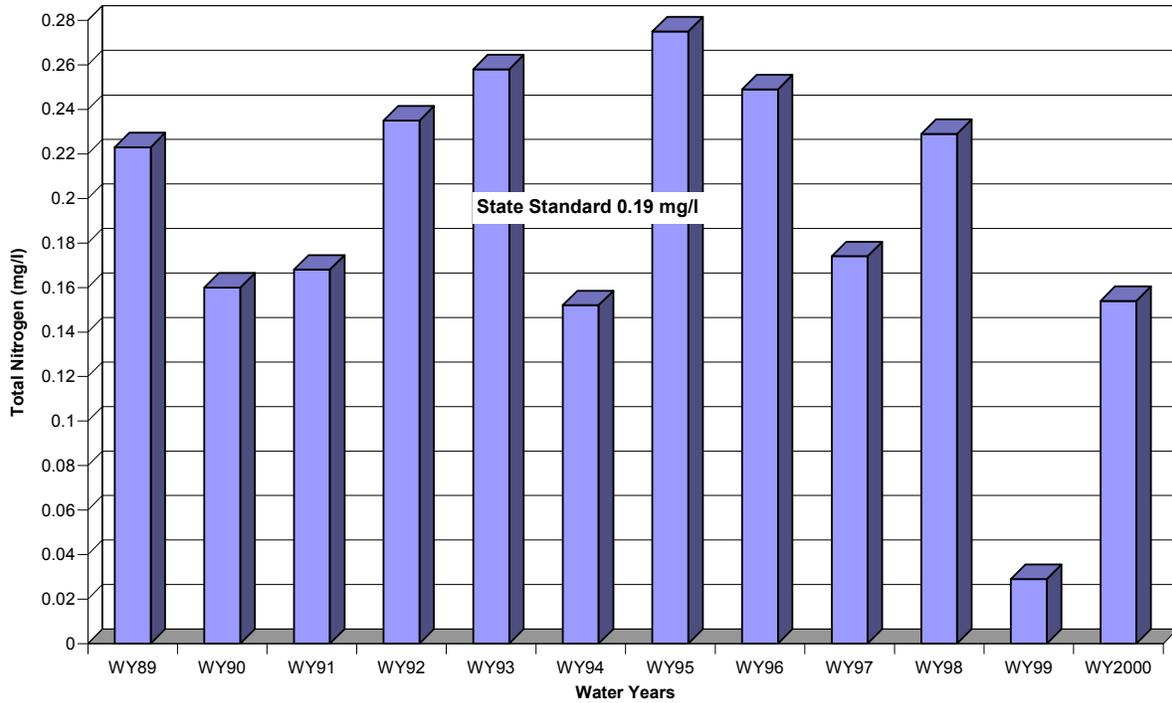
		WY80	WY81	WY82	WY83	WY84	WY85	WY86	WY87	WY88	WY89	WY90	WY91	WY92	WY93	WY94	WY95	WY96	WY97	WY98	WY99	WY2000	
CALIFORNIA																							
	Trout Creek	0.025	0.030	0.051	0.056	0.037	0.035				0.042	0.040	0.032	0.031	0.045	0.036	0.058	0.053	0.042	0.045	0.041	0.042	
	Upper Truckee	0.021	0.040	0.029	0.036	0.035	0.029	0.044	0.023	0.022	0.043	0.044	0.037	0.024	0.040	0.027	0.052	0.045	0.051	0.040	0.035	0.081	
Total P (mg/l)	Blackwood Creek	0.031	0.032	0.051	0.045	0.021	0.016	0.053	0.014	0.015	0.056	0.037	0.051	0.031	0.059	0.027	0.071	0.126	0.304	0.780	0.080	0.075	
	Ward Creek	0.027	0.036	0.044	0.026	0.027	0.018	0.034	0.013	0.014	0.032	0.035	0.039	0.033	0.055	0.076	0.069	0.125	0.354	0.062	0.047	0.079	
	General Creek		0.019	0.023	0.020	0.013	0.013	0.016	0.011	0.011	0.018	0.021	0.021	0.017	0.023	0.017	0.027	0.031	0.051	0.029	0.024	0.023	
	Trout Creek										0.223	0.160	0.168	0.235	0.258	0.152	0.275	0.249	0.174	0.229	0.029	0.154	
	Upper Truckee										0.271	0.204	0.204	0.212	0.278	0.146	0.281	0.192	0.173	0.170	0.207	0.255	
Total N (mg/l)	Blackwood Creek										0.197	0.137	0.218	0.161	0.255	0.103	0.293	0.270	0.297	0.233	0.194	0.191	
	Ward Creek										0.167	0.126	0.181	0.172	0.205	0.197	0.244	0.235	0.202	0.180	0.167	0.169	
	General Creek										0.166	0.131	0.161	0.145	0.169	0.123	0.231	0.195	0.169	0.136	0.155	0.156	
	Trout Creek										0.573	0.444	0.393	0.525	0.641	0.472	0.880	0.994	0.497	0.627	0.806	0.75	
	Upper Truckee										0.329	0.392	0.515	0.366	0.528	0.286	0.849	0.752	0.371	0.447	0.570	1.11	
Total Fe (mg/l)	Blackwood Creek										0.419	0.355	0.875	0.579	1.121	0.296	1.182	1.990	0.920	1.00	0.890	1.18	
	Ward Creek										0.254	0.220	0.357	0.278	0.518	0.826	0.720	1.690	0.580	0.610	0.460	0.805	
	General Creek										0.154	0.10	0.102	0.086	0.204	0.084	0.298	0.385	0.371	0.386	0.340	0.301	
	Trout Creek	48	5	44	43	34	20				7	5	7	5	11	11	50	27	15	20	24	18	
Total Suspended Sediment (mg/l)	Upper Truckee	49	24	42	24	48	31	55	23	8	34	9	31	12	26	11	46	39	36	26	32	73	
	Blackwood Creek	85	14	152	38	26	15	125	12	4	14	7	18	9	67	11	86	146	43	11	69	91	
	Ward Creek	16	9	171	30	18	8	55	6	2	6	4	10	8	43	59	69	177	46	78	13	56	
	General Creek		4	42	8	8	4	25	3	2	4	3	4	3	12	8	17	26	26	28	20	18	
NEVADA																							
	Third Creek										0.0051	0.0144	0.0100	0.0108	0.0105	0.0094	0.012	0.012	0.009	0.011	0.009	0.089	0.008
Soluble	Incline Creek										0.0101	0.0145	0.0141	0.0110	0.0122	0.0139	0.014	0.014	0.013	0.013	0.012	0.011	0.010
Reactive	Logan House Creek										0.0015	0.0050	0.0050	0.0031	0.0037	0.0042	0.004	0.005	0.0031	0.038	0.003	0.003	0.002
Phosphorus (mg/l)	Glenbrook Creek										0.0095	0.0114	0.0100	0.0151	0.0142	0.0122	0.013	0.014	0.021	0.018	0.029	0.014	0.016
	Edgewood Creek											0.0200	0.0184	0.0244	0.0119	0.012	0.013	0.014	0.067	0.016	0.01	0.009	
	Third Creek										0.0409	0.0319	0.0223	0.0259	0.0279	0.0349	0.010	0.033	0.020	0.019	0.026	0.031	0.014
Total Soluble	Incline Creek										0.0772	0.0487	0.0391	0.0404	0.0422	0.037	0.0268	0.0345	0.029	0.028	0.046	0.053	0.032
Inorganic Nitrogen (mg/l)	Logan House Creek										0.0474	0.0155	0.0250	0.0373	0.0365	0.0135	0.0158	0.0119	0.011	0.133	0.021	0.029	0.019
	Glenbrook Creek										0.0537	0.0274	0.0200	0.0200	0.0142	0.1243	0.0059	0.0293	0.016	0.019	0.021	0.155	0.022
	Edgewood Creek											0.0625	0.0359	0.0551	0.0362	0.0206	0.0351	0.035	0.062	0.032	0.027	0.03	
	Third Creek		13	105	48	28	27				16	8	80	447	332	1141	60	491	73	75	54	95	83
Total Suspended Sediment (mg/l)	Incline Creek										44	82	40	37	27	73	34	124	39	54	43	50	18
	Logan House Creek										3	10	5	3	7	10	5	43	19	88	11	23	10
	Glenbrook Creek										5	11	6	5	6	11	22	29	21	26	20	12	14
	Edgewood Creek											14	11	13	11	5	9	16	16	13	5.6	7.5	

Source: TRPA, 2000+

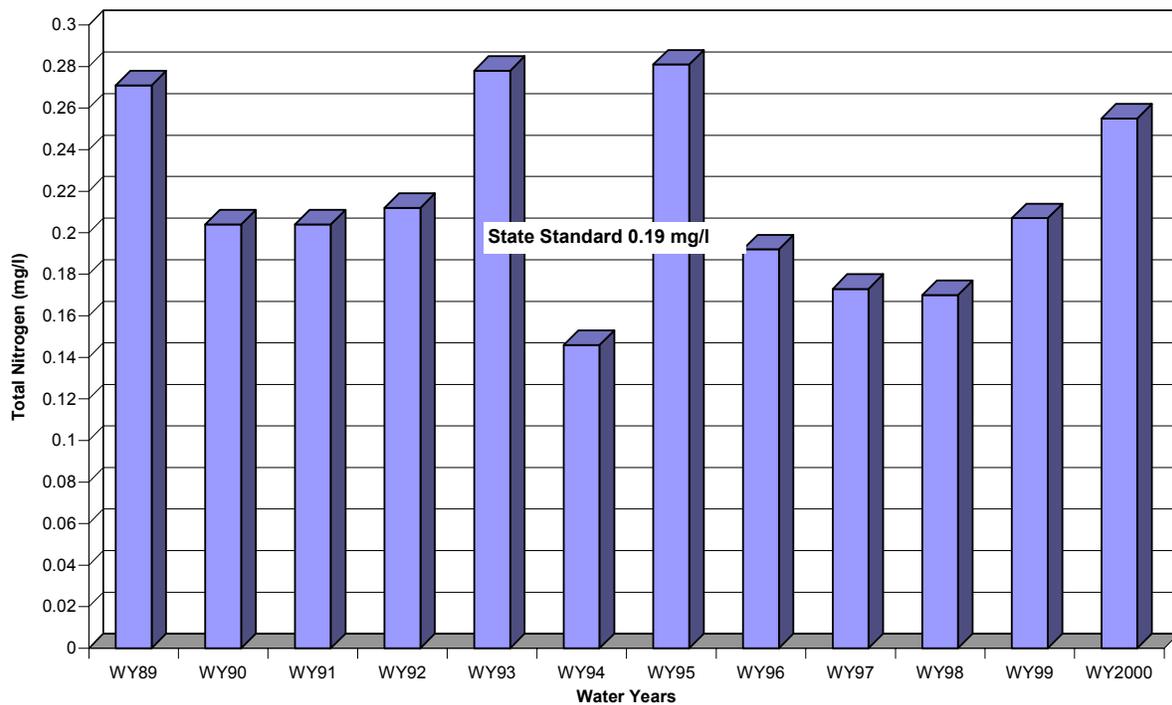
Appendix 9. Nitrogen, Annual Average Concentrations

CALIFORNIA TRIBUTARIES (Total Nitrogen)

Trout Creek

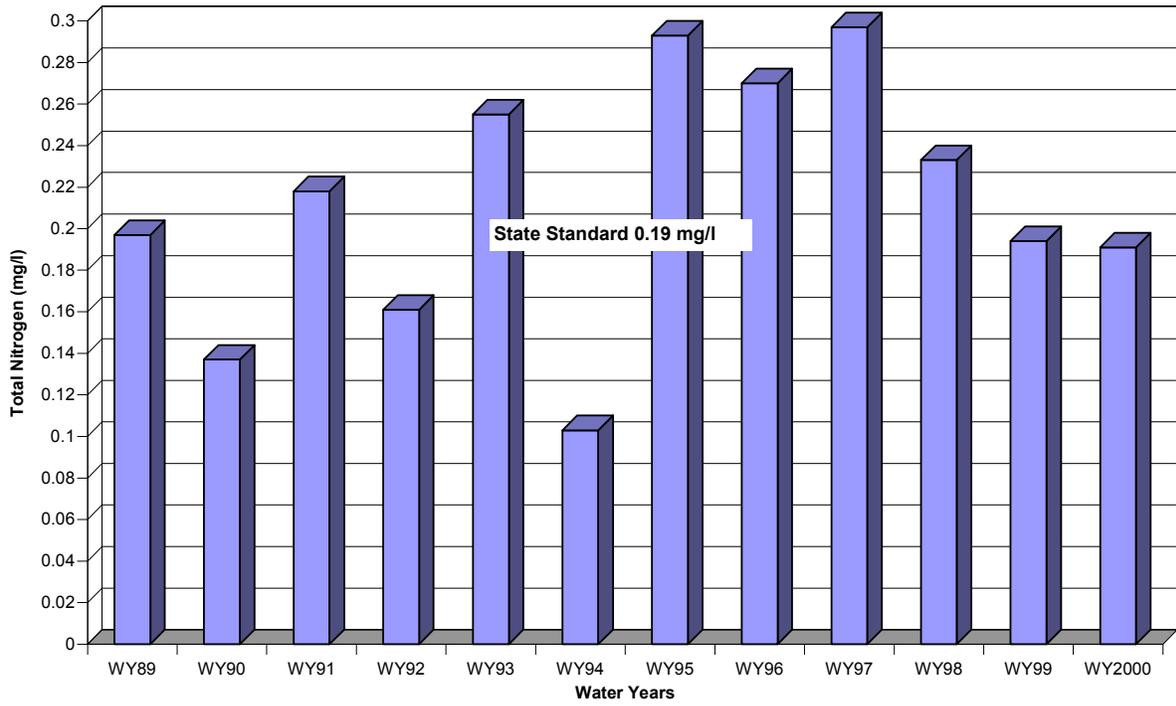


Upper Truckee Creek

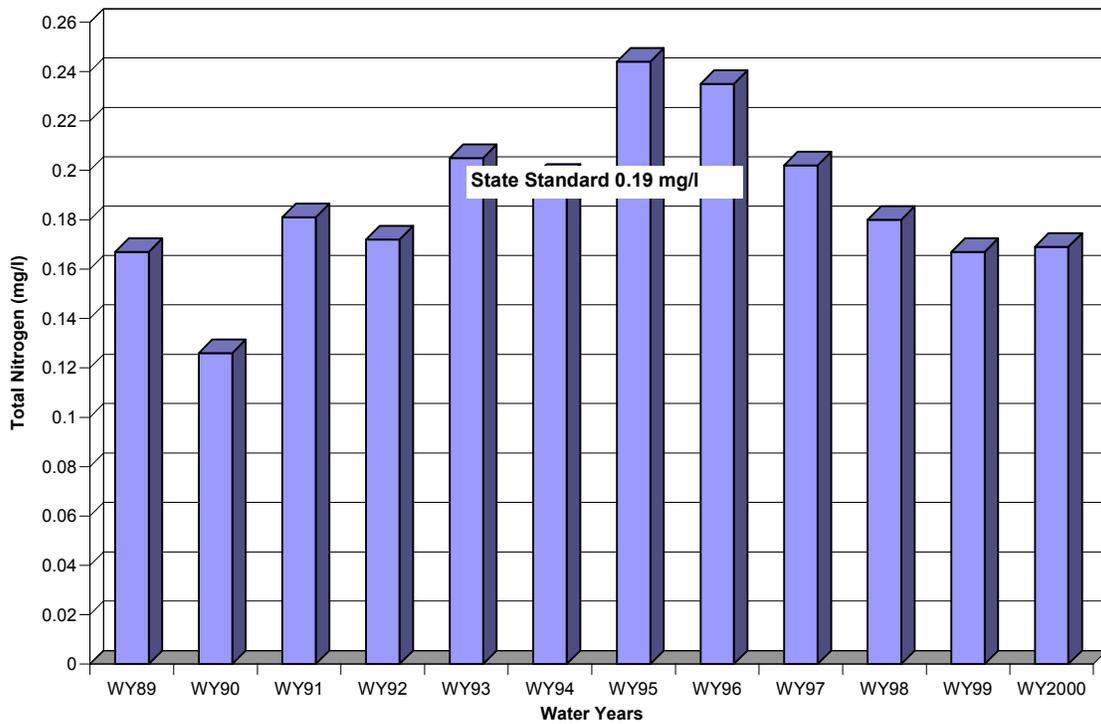


Appendix 9. Nitrogen, Annual Average Concentrations

Blackwood Creek

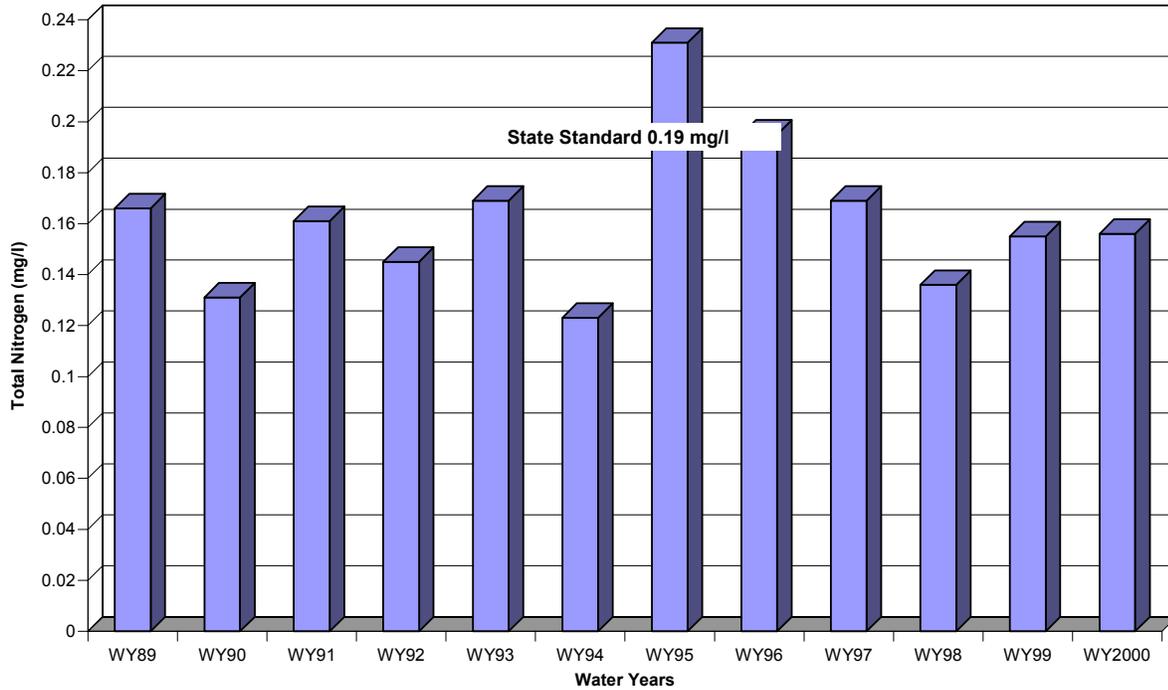


Ward Creek



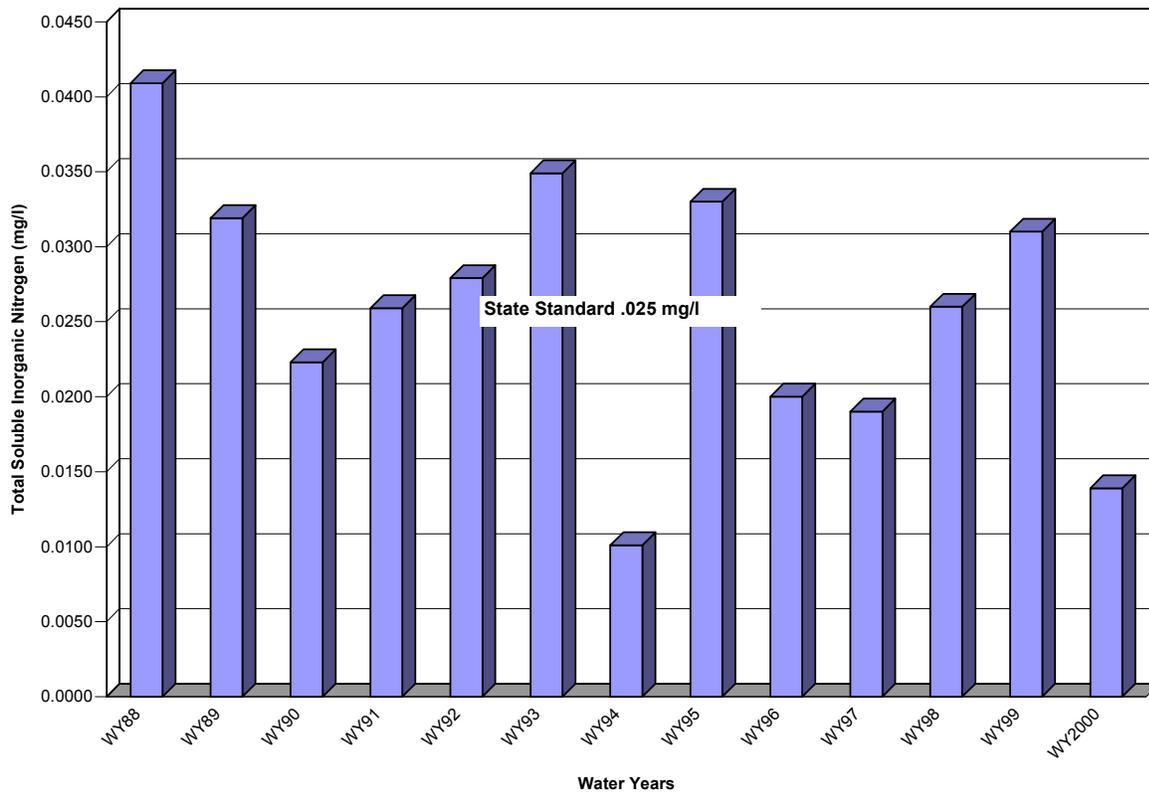
Appendix 9. Nitrogen, Annual Average Concentrations

General Creek



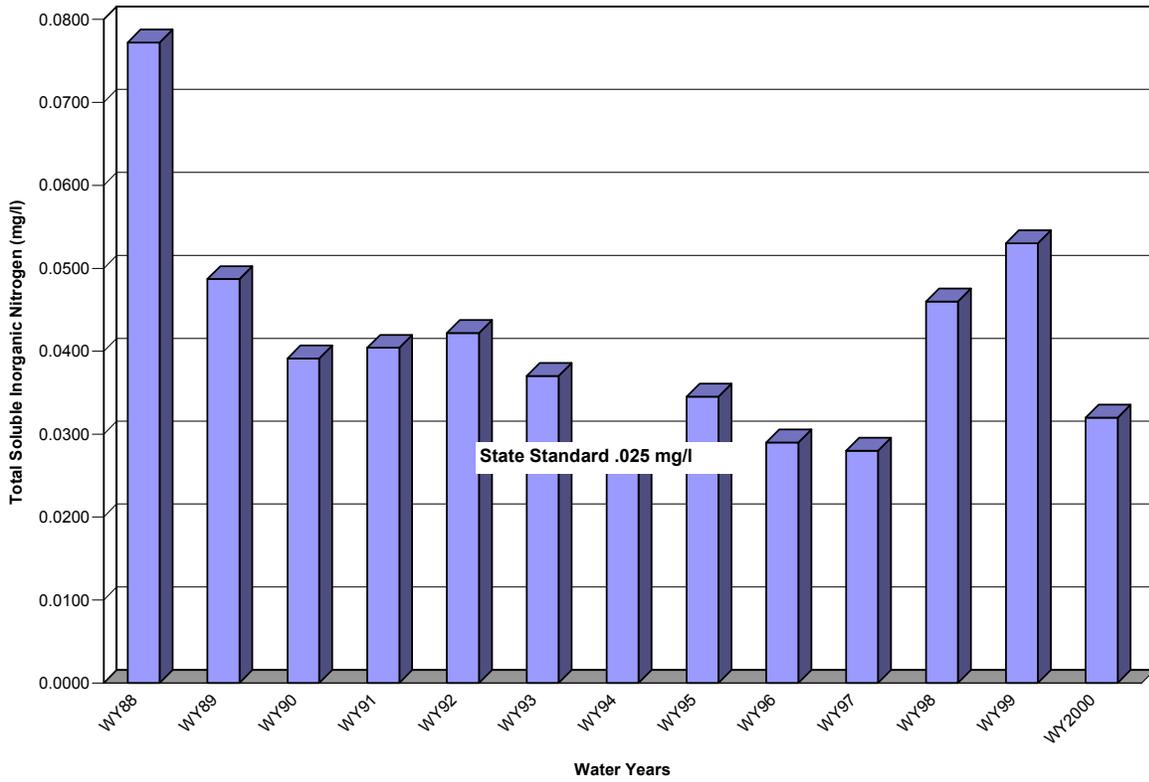
NEVADA TRIBUTARIES (Soluble Nitrogen)*

Third Creek

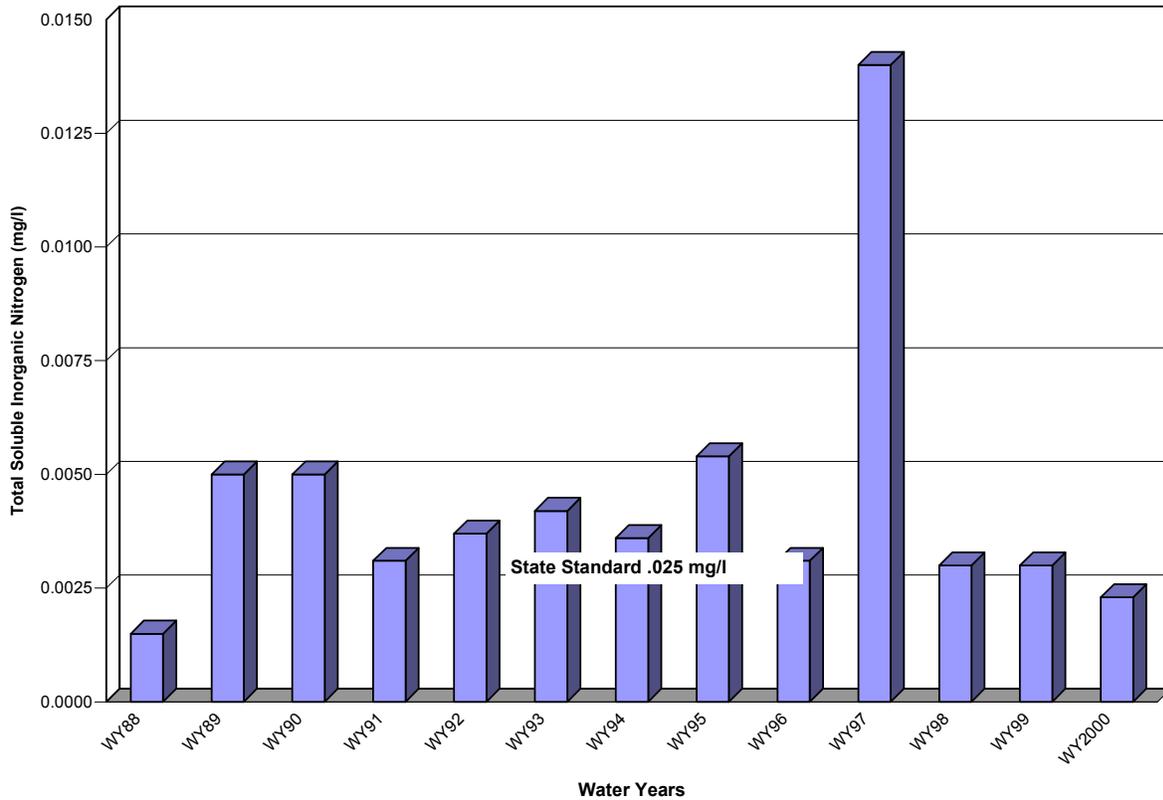


Appendix 9. Nitrogen, Annual Average Concentrations

Incline Creek

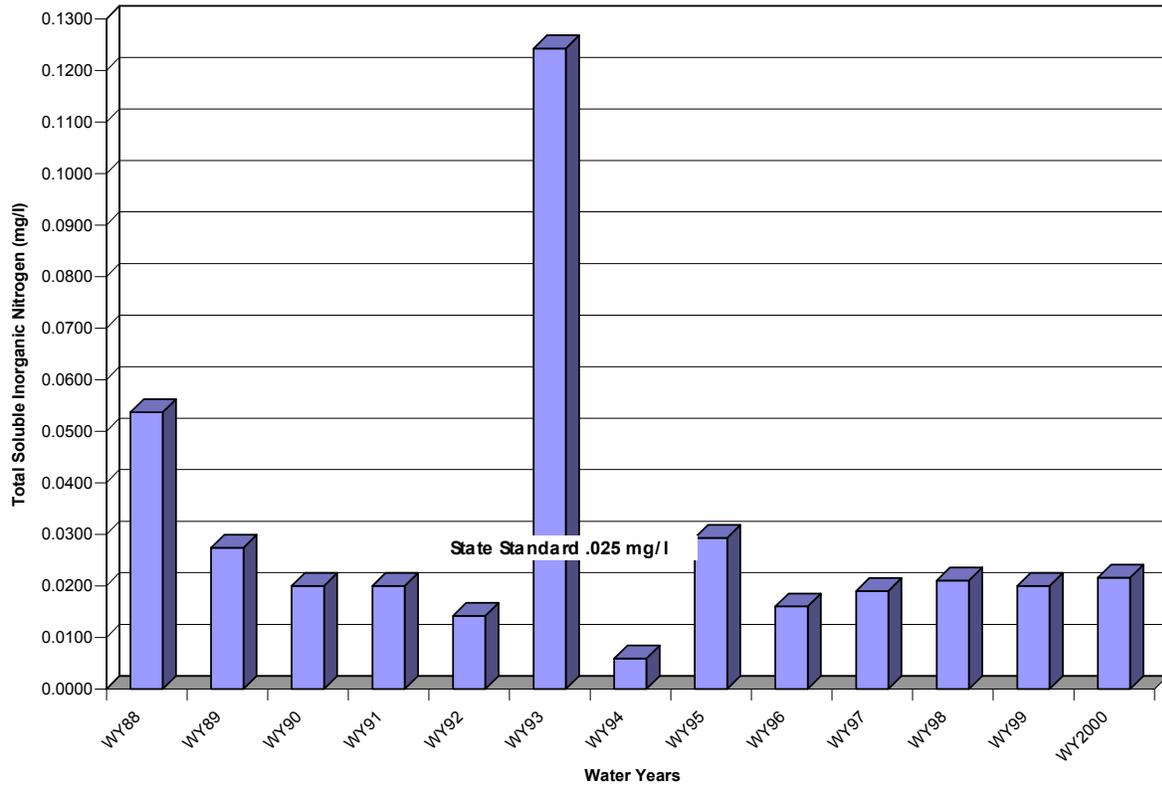


Logan Creek

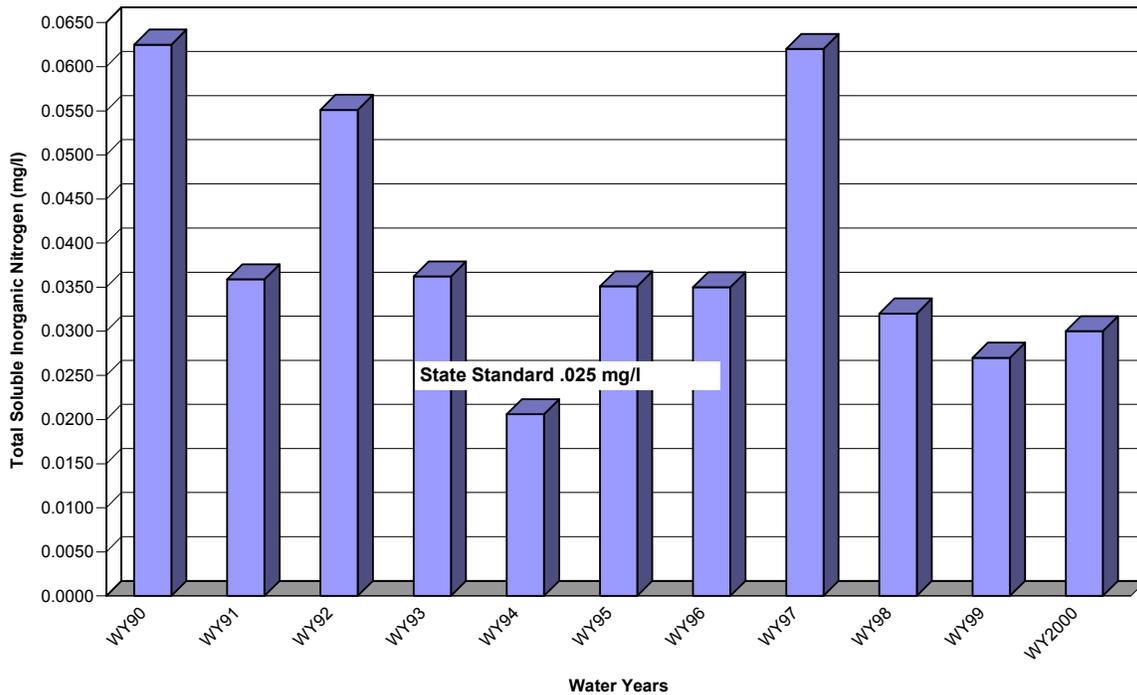


Appendix 9. Nitrogen, Annual Average Concentrations

Glenbrook Creek



Edgewood Creek

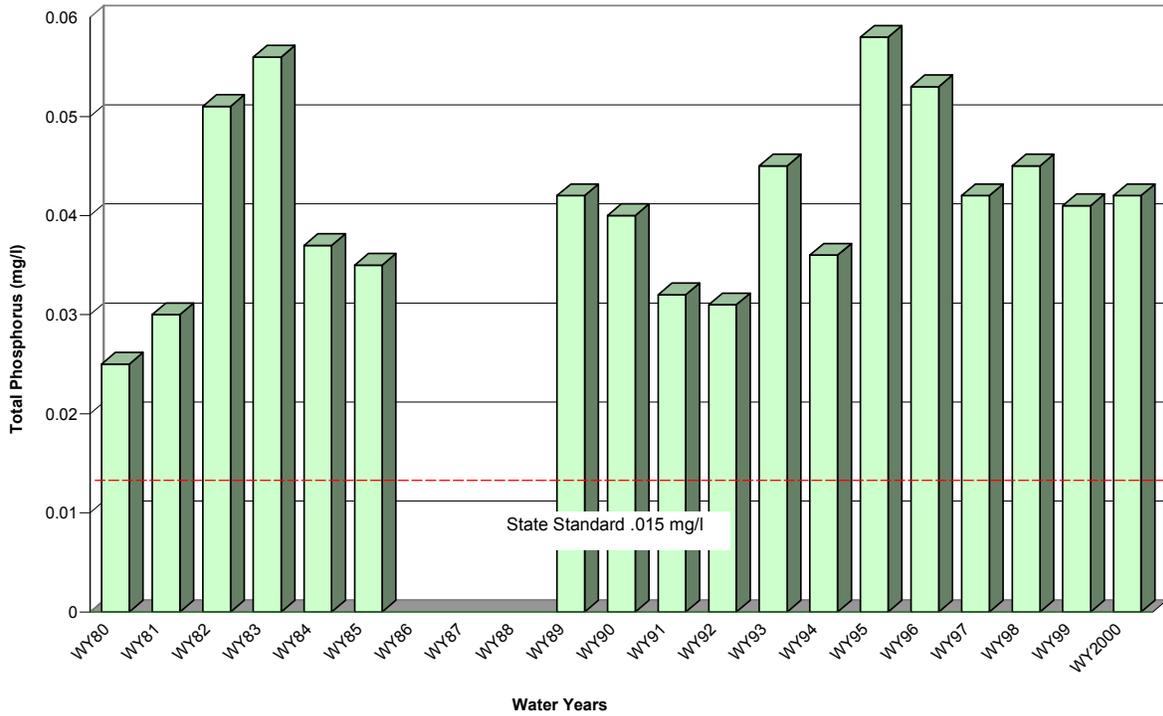


NOTE: Lake Tahoe standards for dissolved inorganic nitrogen are referenced in Figures for Nevada tributaries.

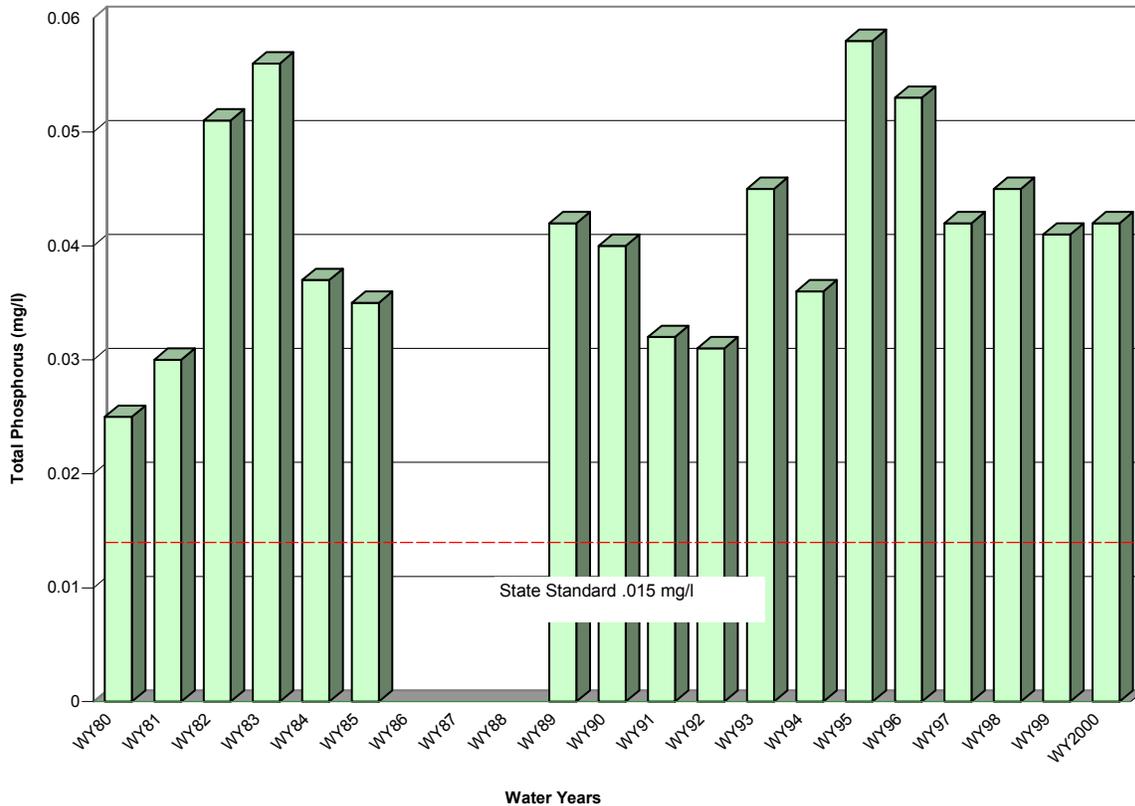
Appendix 10. Phosphorus, Annual Average Concentrations

CALIFORNIA TRIBUTARIES (Total Phosphorus)

Trout Creek

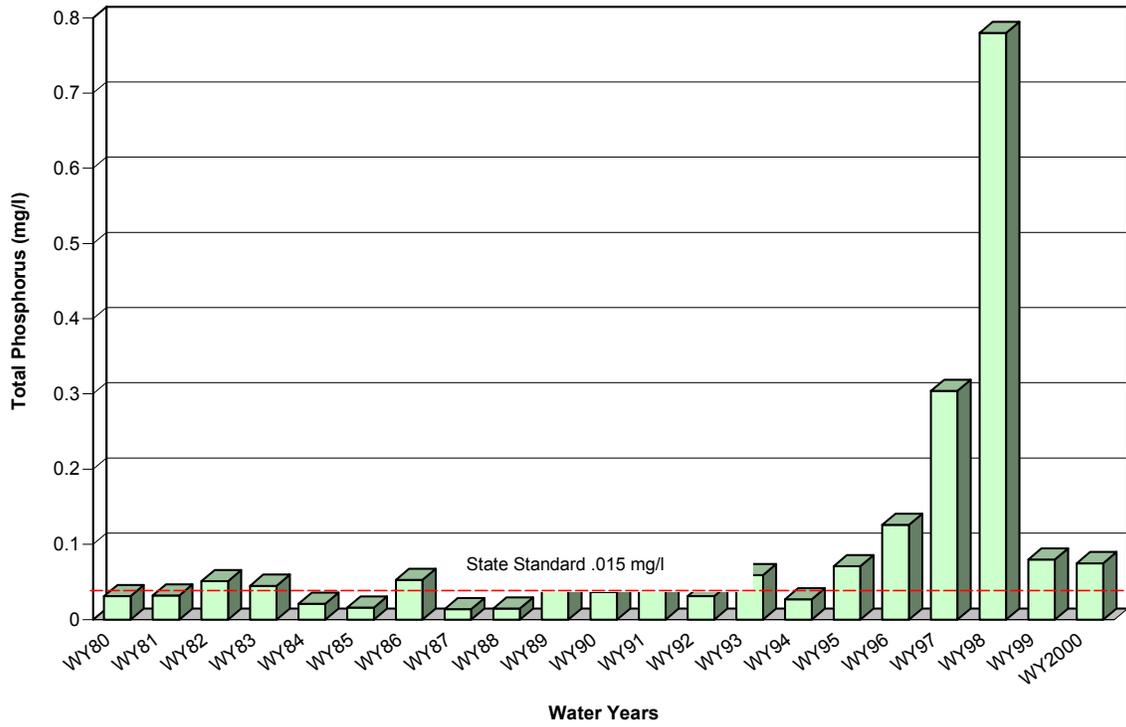


Upper Truckee Creek

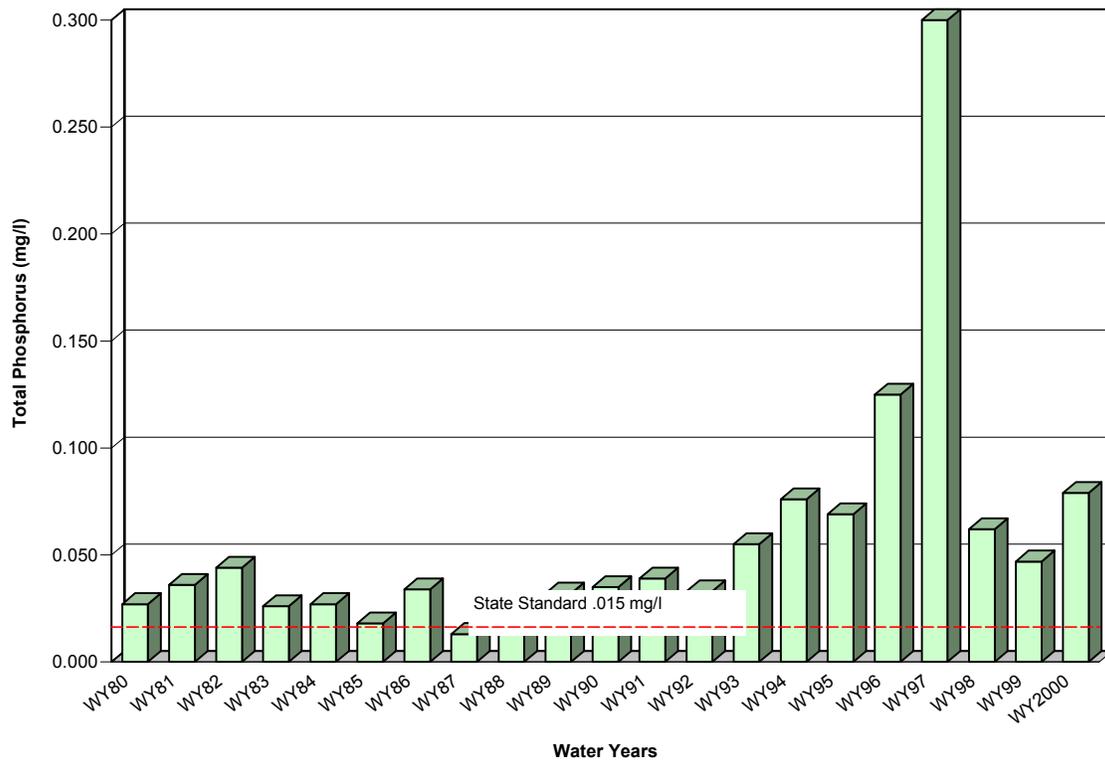


Appendix 10. Phosphorus, Annual Average Concentrations

Blackwood Creek

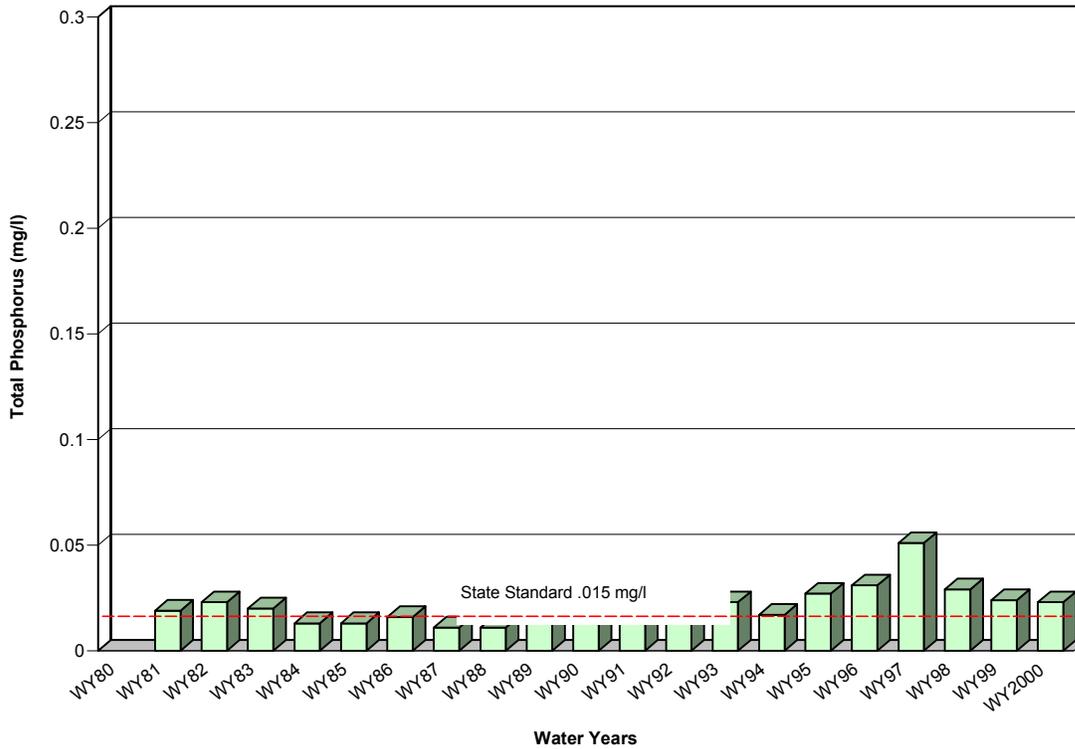


Ward Creek



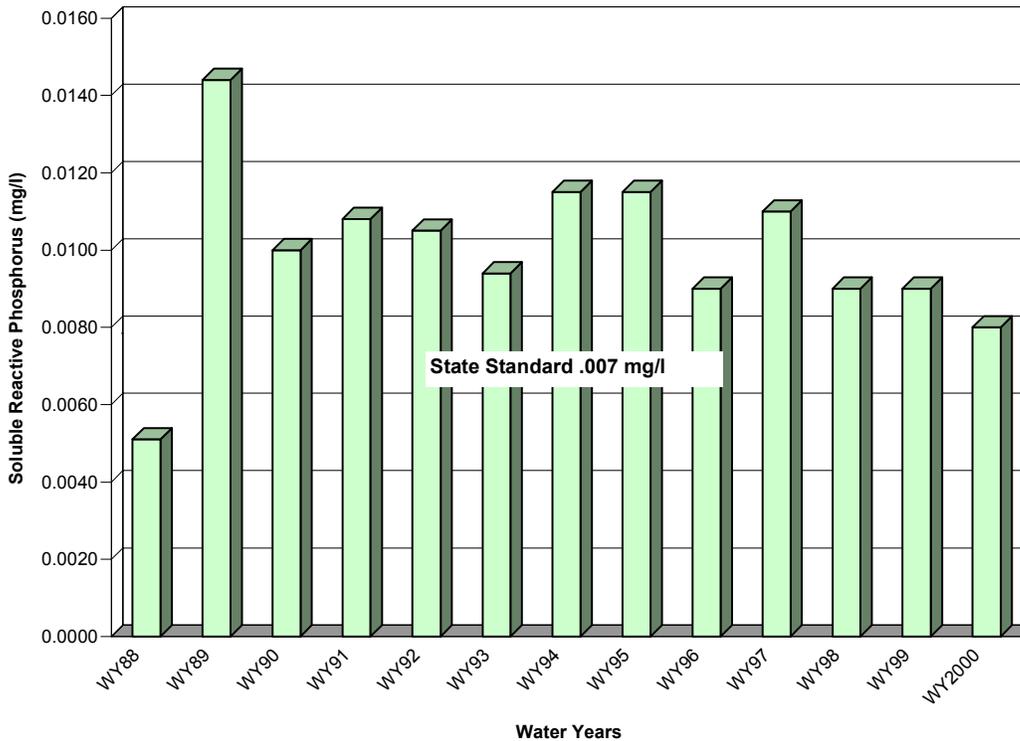
Appendix 10. Phosphorus, Annual Average Concentrations

General Creek



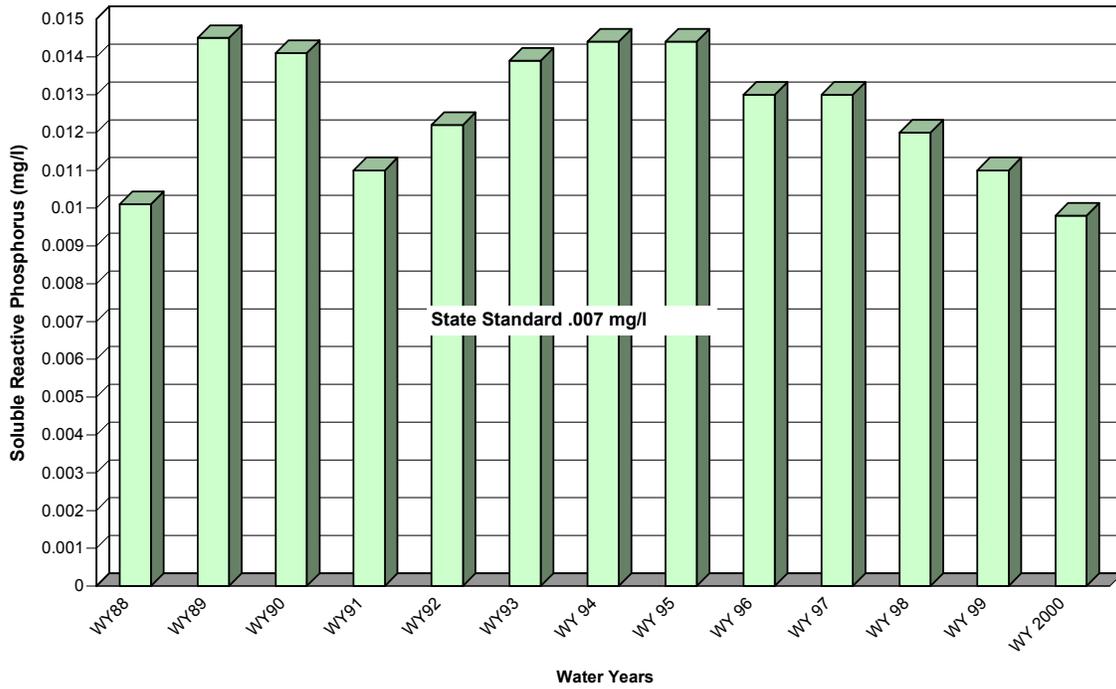
NEVADA TRIBUTARIES (Soluble Phosphorus) *

Third Creek

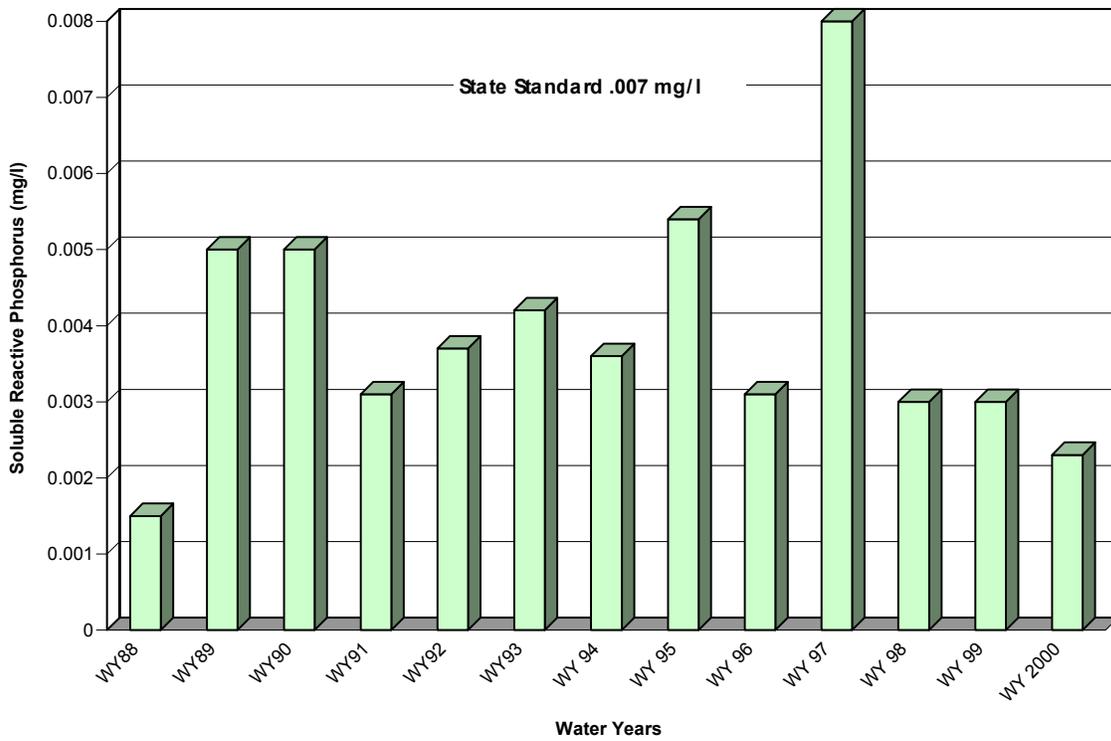


Appendix 10. Phosphorus, Annual Average Concentrations

Incline Creek

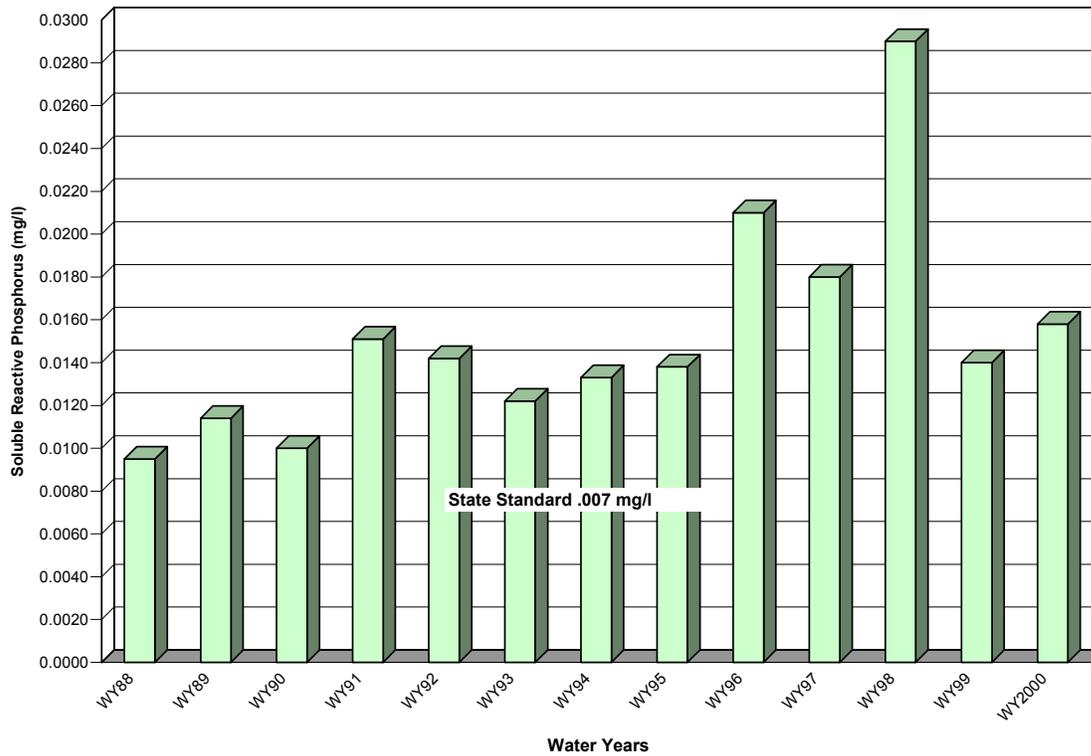


Logan Creek

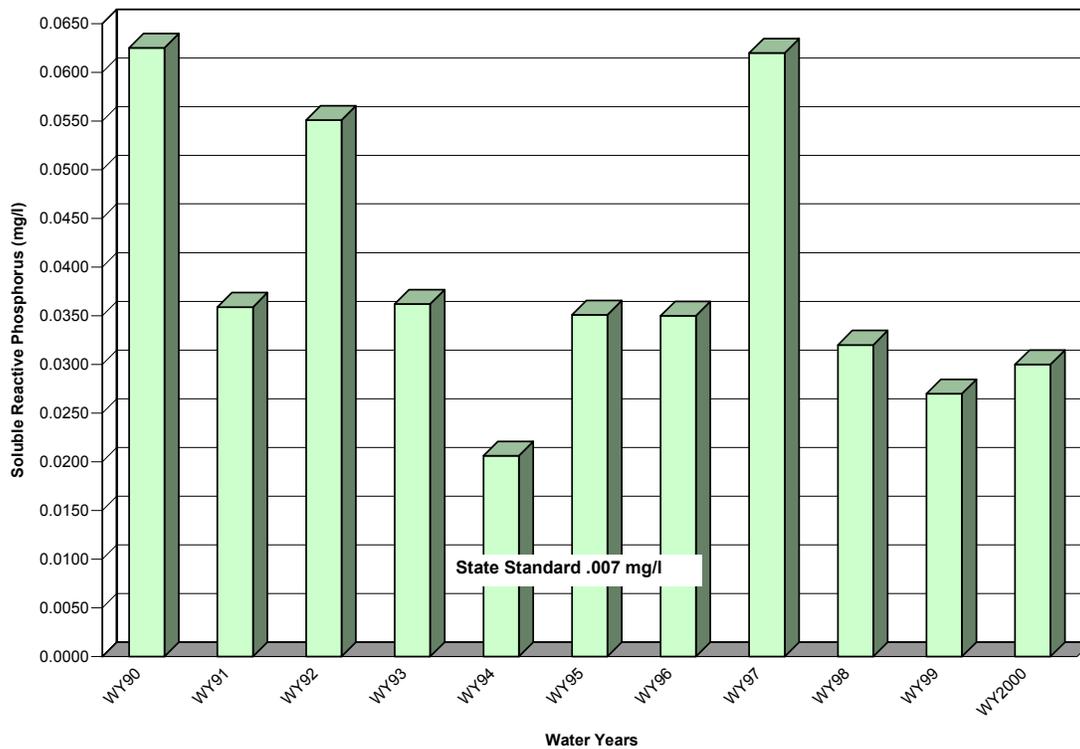


Appendix 10. Phosphorus, Annual Average Concentrations

Glenbrook Creek



Edgewood Creek

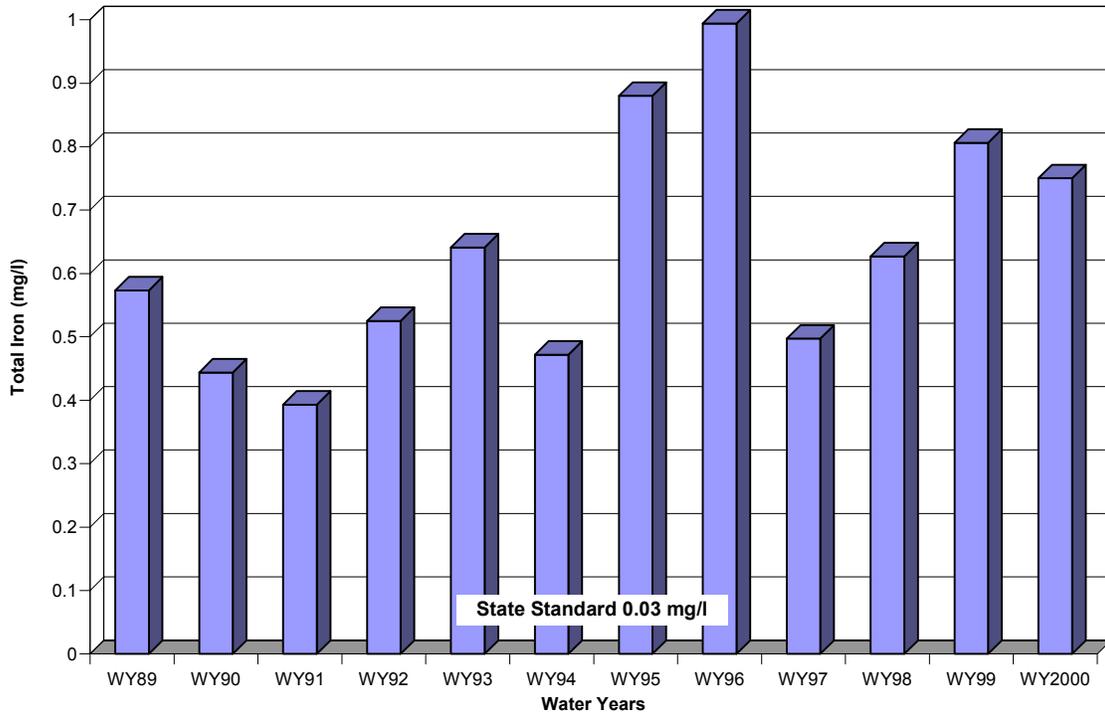


NOTE: Lake Tahoe standards for dissolved phosphorus are referenced in Figures for Nevada Tributaries.

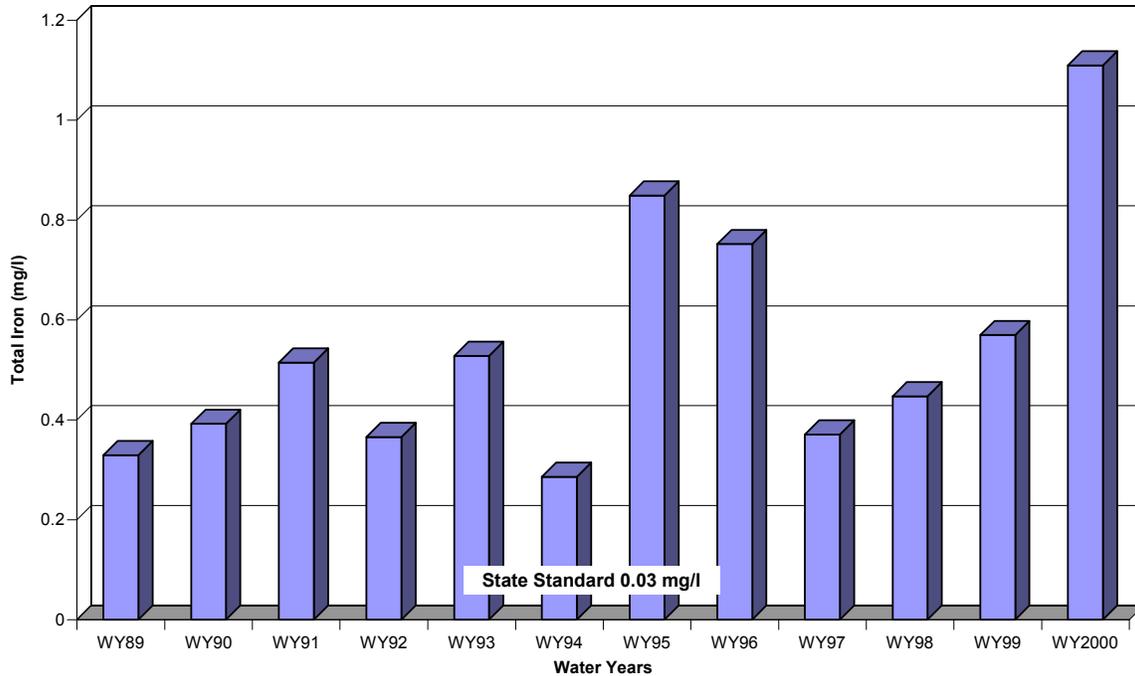
Appendix 11. Total Iron, Annual Average Concentrations

CALIFORNIA TRIBUTARIES

Trout Creek

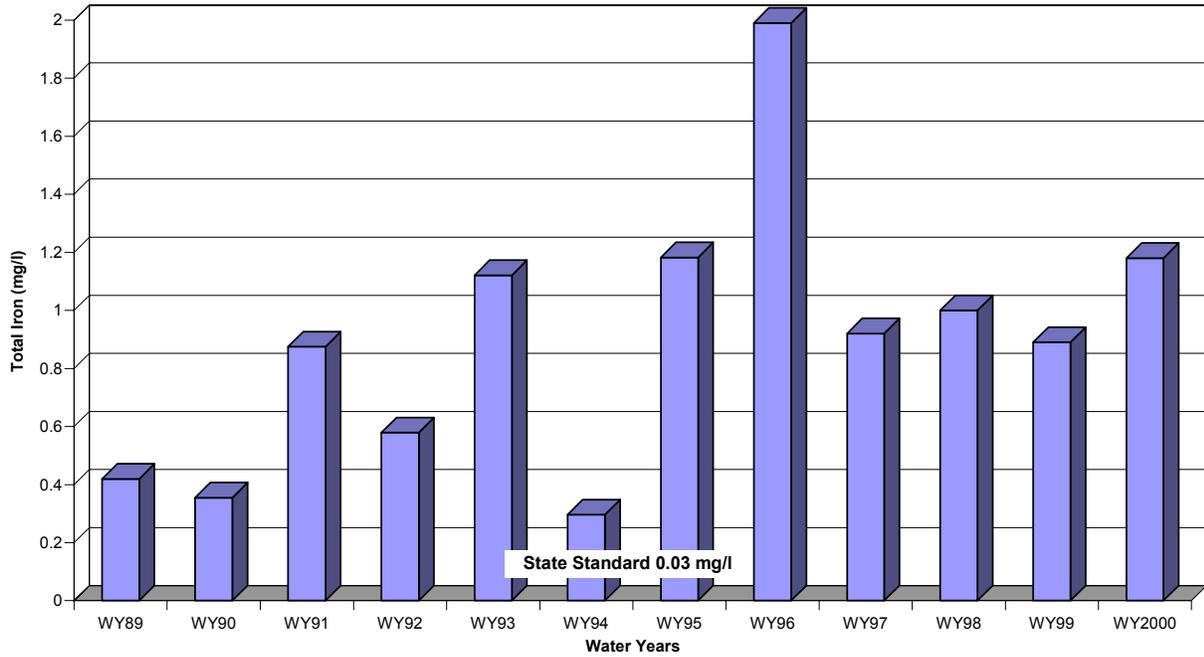


Upper Truckee Creek

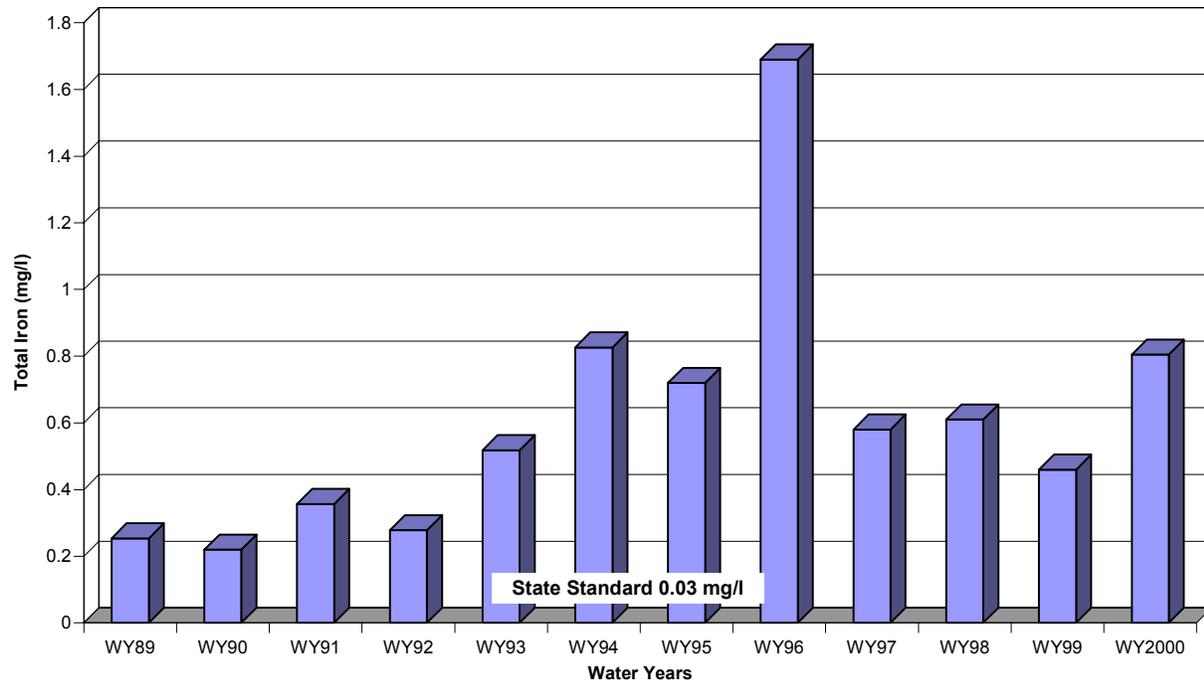


Appendix 11. Total Iron, Annual Average Concentrations

Blackwood Creek

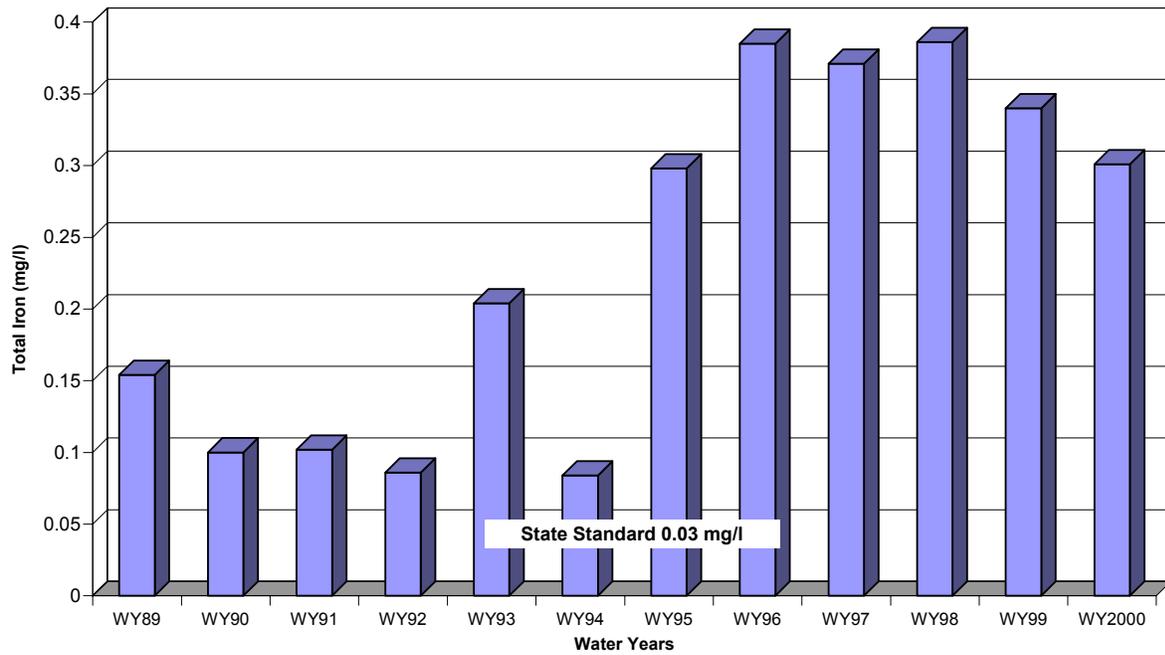


Ward Creek



Appendix 11. Total Iron, Annual Average Concentrations

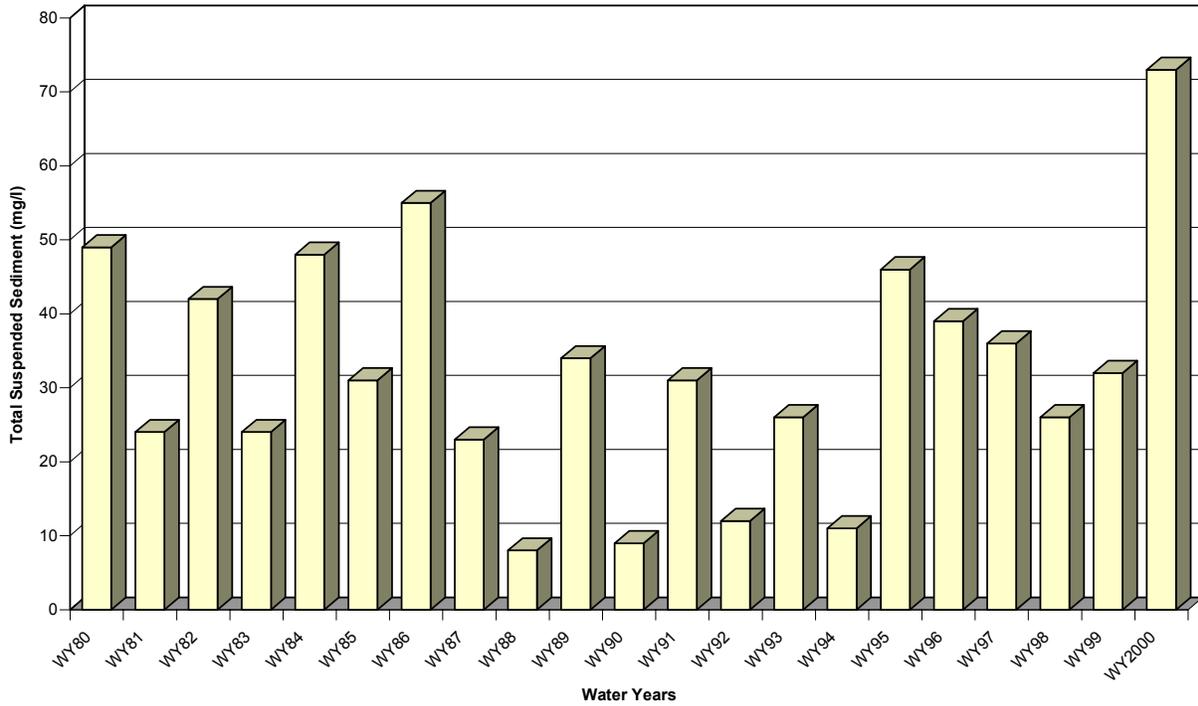
General Creek



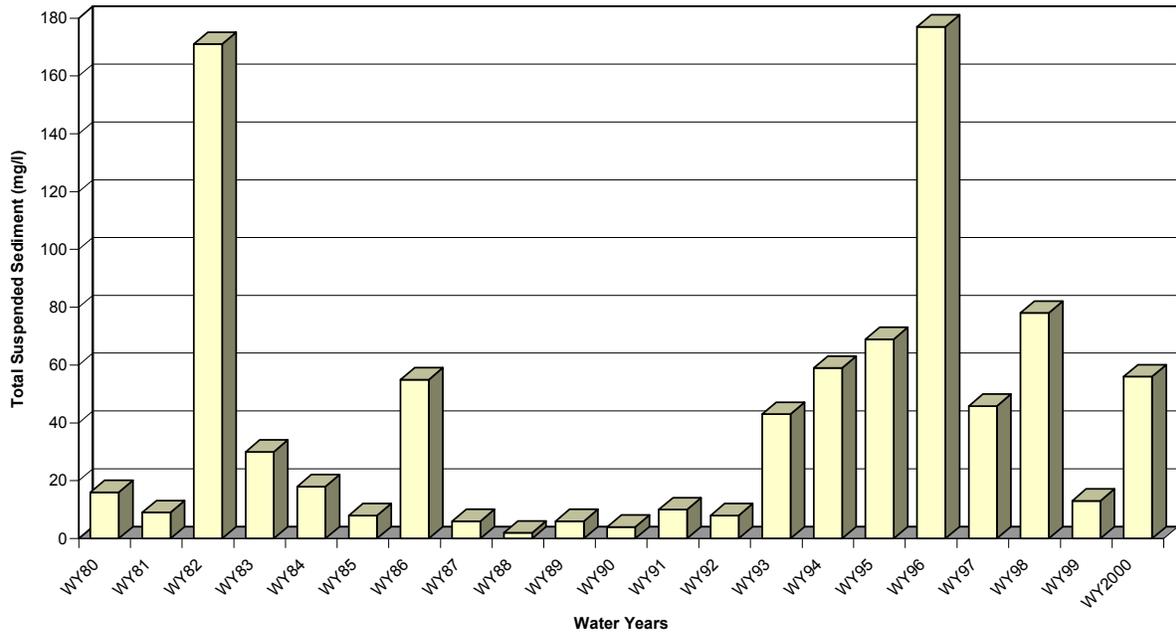
Appendix 12. Total Suspended Sediments, Annual Average Concentrations

CALIFORNIA TRIBUTARIES

Trout Creek

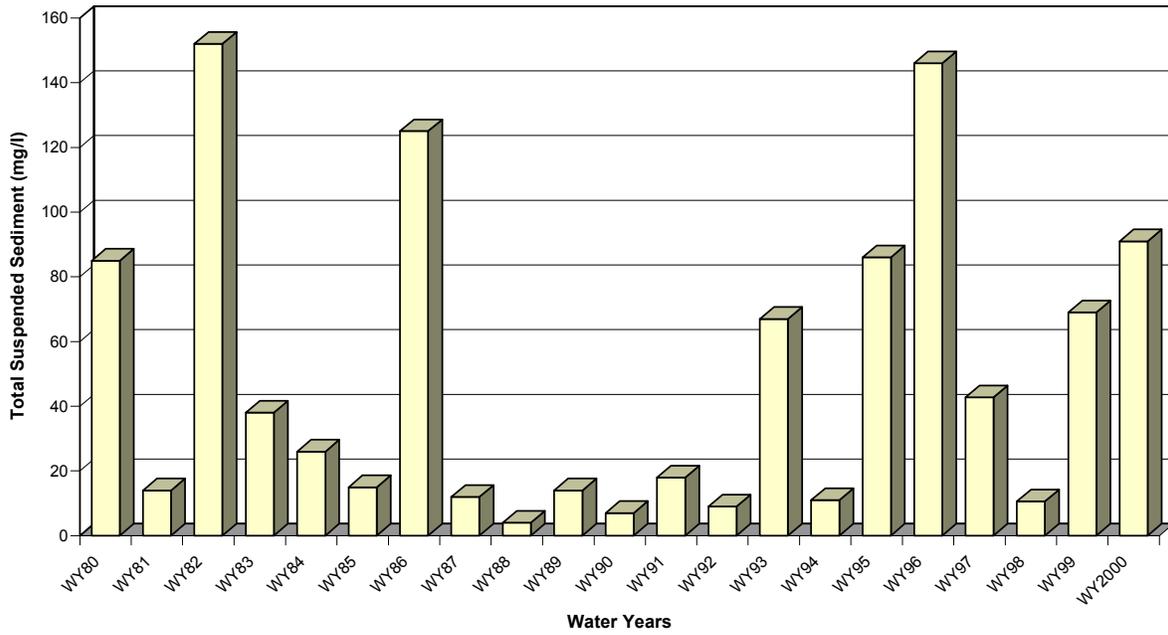


Upper Truckee Creek

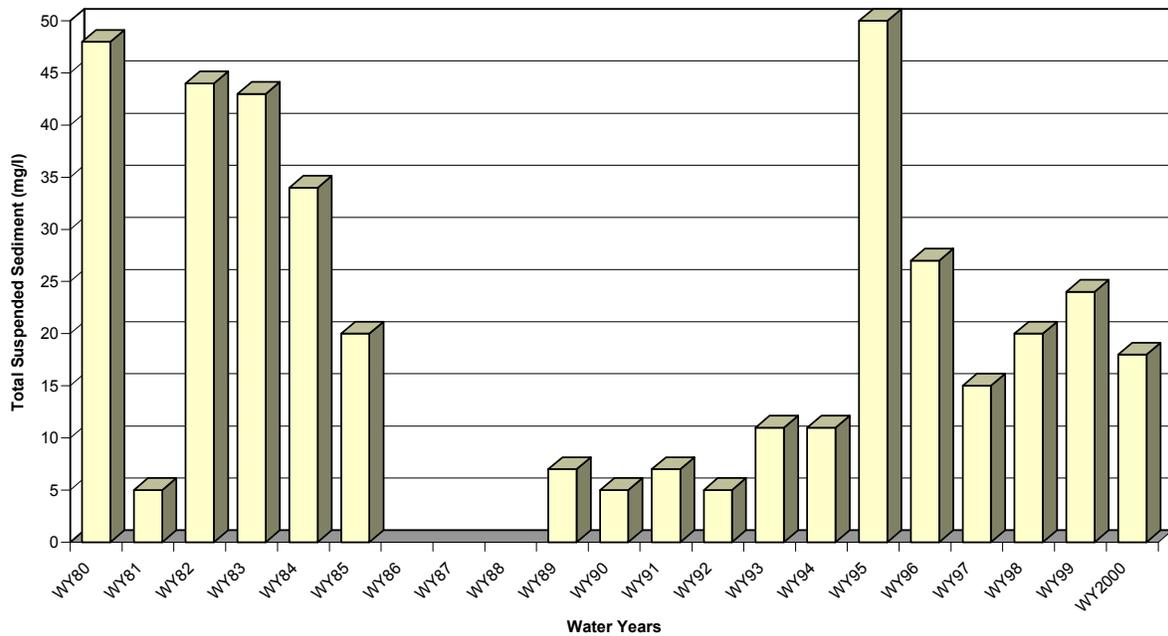


Appendix 12. Total Suspended Sediments, Annual Average Concentrations

Blackwood Creek

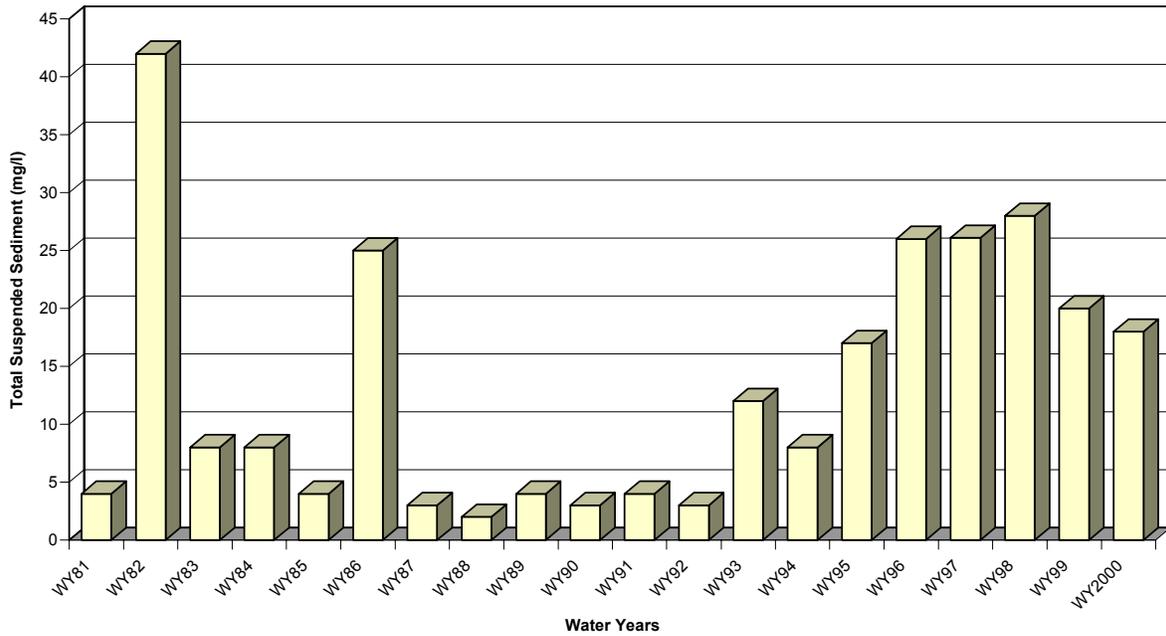


Ward Creek



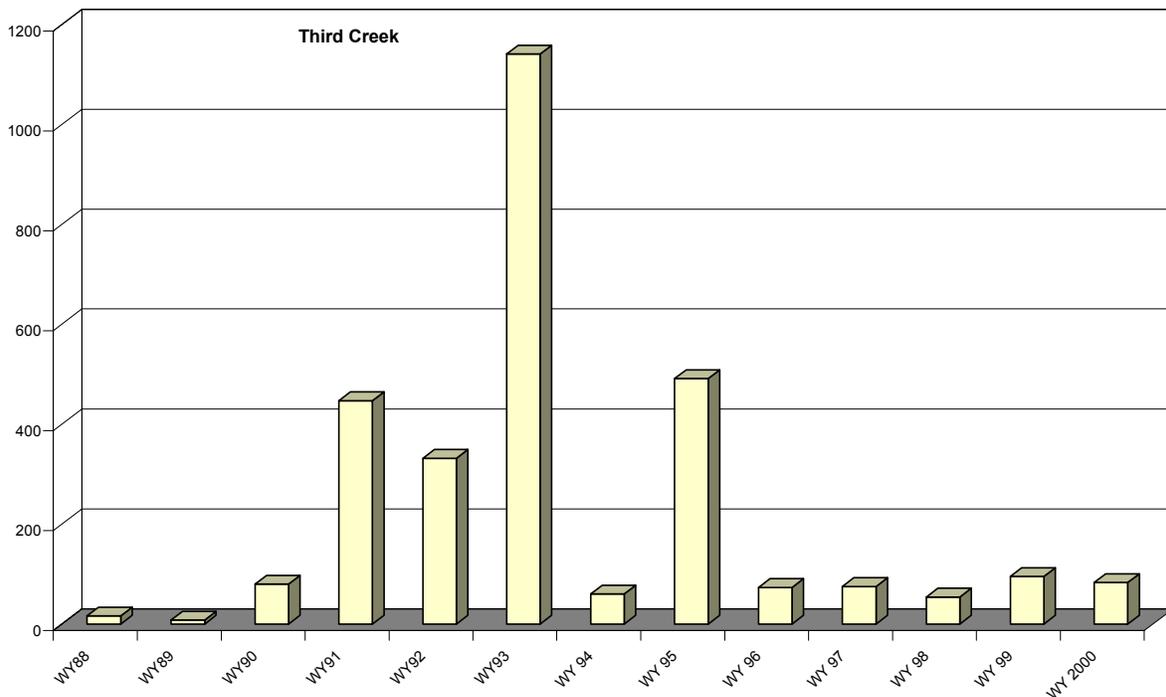
Appendix 12. Total Suspended Sediments, Annual Average Concentrations

General Creek



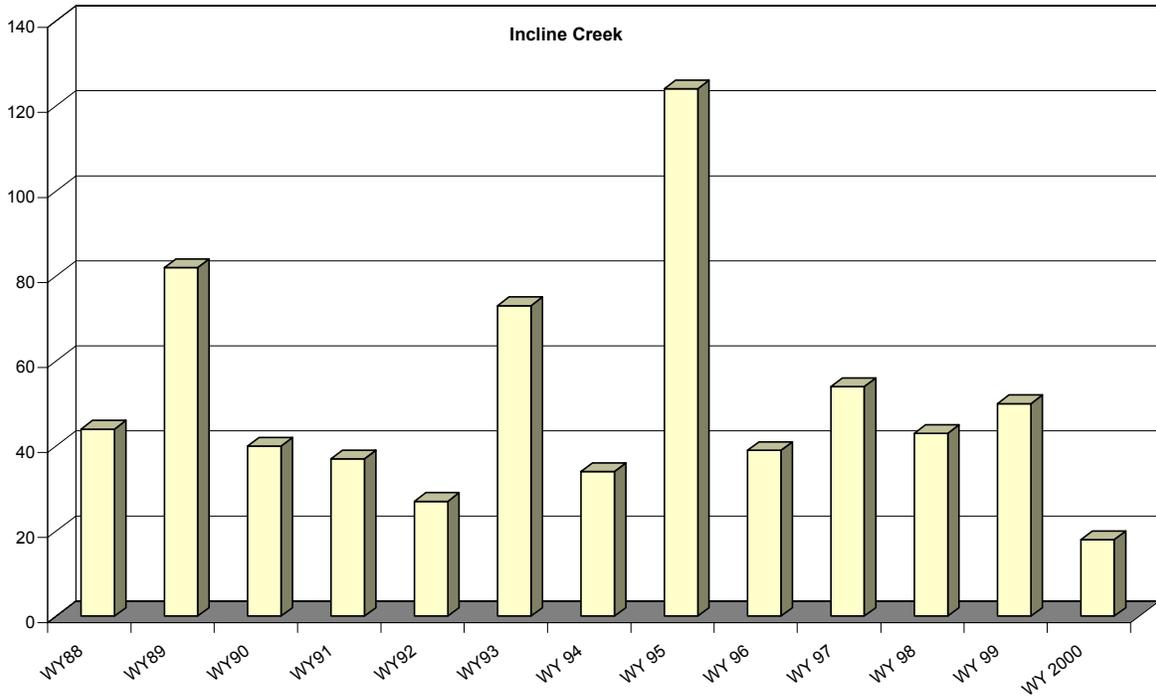
NEVADA TRIBUTARIES

Third Creek

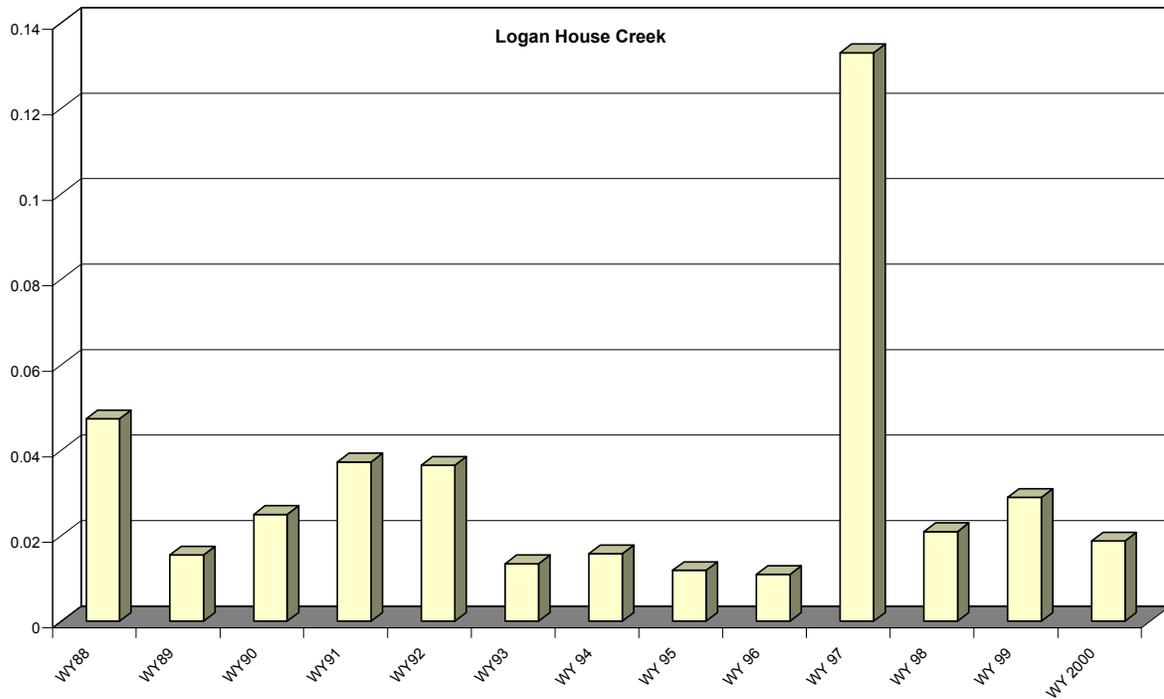


Appendix 12. Total Suspended Sediments, Annual Average Concentrations

Incline Creek

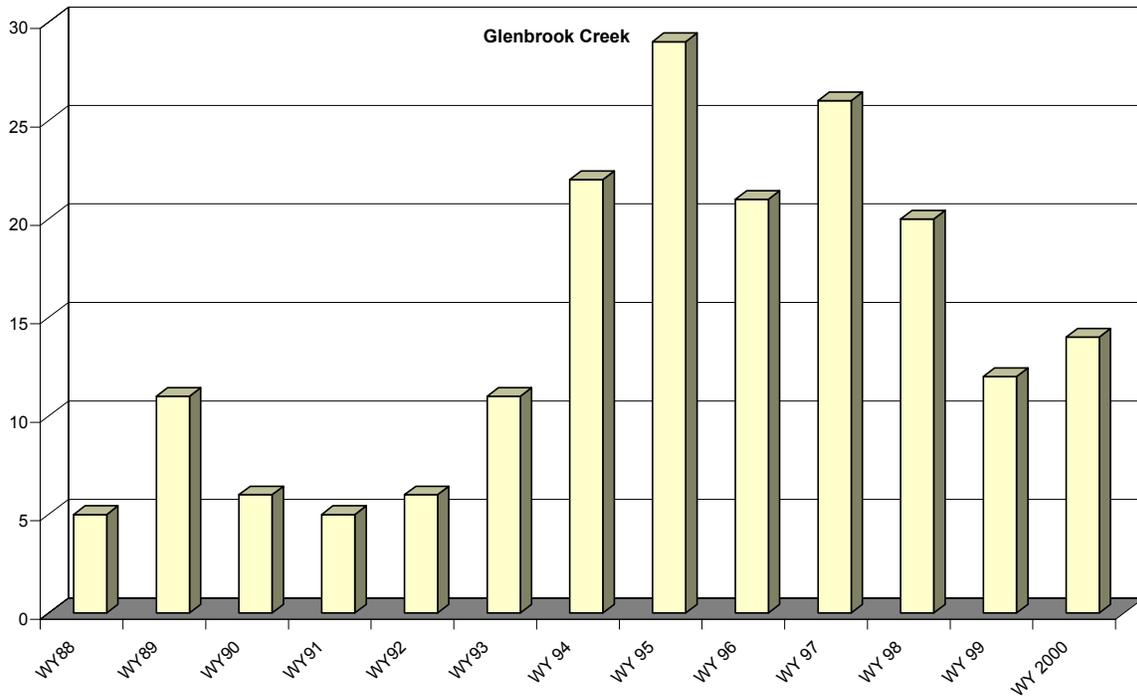


Logan Creek

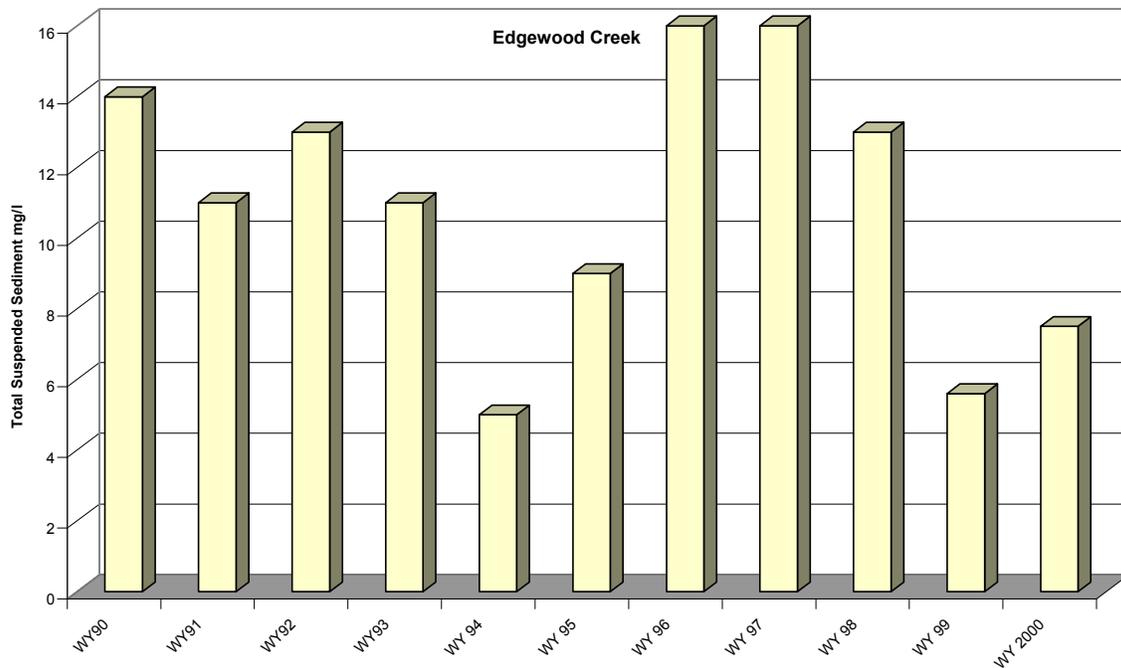


Appendix 12. Total Suspended Sediments, Annual Average Concentrations

Glenbrook Creek



Edgewood Creek



Appendix 13. Surface Runoff at Point of Discharge, LRWQB

Station	Date	(mg/l)			
		Total Phosphorus	Total Nitrogen	Total Iron	NTU Turbidity
Stateline Avenue	1/4/86	1.0	0.8	14	70
	1/15	0.4	0.6	5.1	70
	1/16	0.3	0.4	3.3	45
	1/23	0.2	0.7	0.02	140
	1/30	0.2	1.1	0.52	12
	2/4	0.1	0.3	7.3	76
	2/17	0.1	0.3	3.6	45
	3/7	0.3	0.3	2.9	65
	3/19	0.2	0.2	1.3	22
	4/7	0.2	1.6	1.2	17
	7/24	0.3	1.2	1.1	11
	9/17	0.9	3.4	5.8	41
	1/25/87	36	2.3	6.6	240
	4/14/88	0.2	0.8	3.3	30
	7/25	0.5	0.9	28	390
11/13	0.4	3.9	1.9	32	
1/31/89	0.47	4.2	6.6	80	
Wildwood	2/12/87	0.8	1.4	28	230
	3/15	0.4	0.6	17	220
	4/26	0.9	2.1	8.4	48
	5/20	0.1	0.4	2.6	23
	6/13	0.7	1.1	7.5	72
	3/18/89	0.24	1.1	3.8	55
	6/4	0.55	1.8	15	128
Ski Run Boulevard	2/12/87	0.6	1.4	25	250
	3/15	N.D.	0.1	0.41	2
	4/26	0.1	0.4	1.7	2.2
	5/16	N.D.	0.2	0.51	1.8
	6/13	0.4	0.9	2.8	27
	5/28/88	0.3	0.7	4.1	20
	2/20/89	0.07	N.D.	0.72	14
	3/5	0.14	0.6	2.7	35
	5/13	0.09	0.4	0.38	4
	6/4	0.40	1.0	7	44
	8/7	0.41	6.9	2.54	66
9/18	0.27	1.3	0.67	10	
10/2	0.34	2.0	2.5	35	
Pasadena Avenue	1/4/86	0.8	0.125	3.6	37
	1/15	0.3	1.6	5.6	73
	1/16	0.2	0.4	4.6	53
	1/30	0.5	0.8	1.2	13
	2/4	0.6	0.4	4.6	54
	2/17	0.2	0.3	2.5	31
	3/7	0.3	0.6	2.1	34
	3/19	0.1	1.1	2.1	20
	4/7	0.2	1.7	2.5	26
	7/24	1.7	5.7	16	100
	9/17	1.0	2.2	2.1	25
	1/25/87	1.0	2.4	0.44	10
	4/14/88	0.3	0.6	5.1	38
	5/28	0.3	0.8	1.91	8.1
	7/25	0.6	0.8	9.0	72
	8/4	1.0	0.6	1.7	28
	11/13	0.4	2.9	1.1	24
Lodi Avenue	8/7/89	0.51	4.8	4.48	54
	9/18	0.27	1.2	1.19	13
	10/2	0.31	2.4	1.98	27

N.D. Not Detectable

Source: Lahontan Regional Water Quality Control Board, 1991

Lake Tahoe has long been admired for its alpine setting and the clarity of its water. During the last half-century, however, human activity in the lake basin has increased while the lake has been losing water clarity at a rate of about 1 foot (ft) per year. The Tahoe Regional Planning Agency (TRPA), the U.S. Geological Survey (USGS), and the Tahoe Research Group of the University of California, Davis (TRG) are monitoring loads of sediment and important nutrients flowing into the lake from the streams and ground-water aquifers in the basin. This fact sheet provides an overview of that monitoring program and summarizes some of the results regarding loads of sediment and nutrients to the lake.

Basin Geography

The basin is surrounded by mountain peaks of the Sierra Nevada to the west and the Carson Range to the east (fig. 1). The lake is renowned for its deep, clear water which, on sunny days, appears to be cobalt-blue. The Lake Tahoe Basin was formed by downward block faulting during the uplift of the Sierra Nevada 2-3 million years ago, which resulted in dramatic topographic relief. Mountain peaks, snow capped nearly year-round, rise to altitudes above 10,000 ft above sea level. Lake Tahoe, 1,646 ft deep, is the second deepest lake in the United States and tenth deepest in the world. It has an average lake-surface altitude of about 6,225 ft.

The Lake Tahoe Basin is 506 square miles (mi²). The surface area of the Lake is 192 mi², and the watershed area is 314 mi². Most of the land in the basin is mountainous, limiting development mainly to relatively flat-lying areas along tributary streams, such as the southern part of the basin within the Upper Truckee River and Trout Creek Basins. About 78 percent of the basin is at altitudes from about 6,500 ft to greater than 10,000 ft. This altitude range, combined with other factors such as prevailing storm systems from the Pacific Ocean, causes an unequal distribution of precipitation throughout the basin. More than 80 inches per year (in/yr) of precipitation, mostly as snow, falls on the western side of the basin, whereas about 30 in/yr falls on the eastern side.

Since 1874, the outflow of Lake Tahoe into the Truckee River has been regulated by a dam at Tahoe City, Calif. The current dam was built by the Bureau of Reclamation in 1913 to provide irrigation water for the

Newlands Project in the Fallon, Nev., area. The upper 6 ft of the lake forms the largest storage reservoir in the Truckee River Basin, with an effective capacity of 745,000 acre-feet (acre-ft), about 0.6 percent of the estimated 122 million acre-ft in the lake. The dam is operated by the U.S. District Court Water Master under a complex set of legal agreements and operating rules to maintain levels between a maximum altitude of 6,229.1 ft and the altitude of the natural rim (6,223 ft). During droughts the

lake level can fall below the rim, and during wet years the lake level can rise higher than the legal maximum. Since 1987, the lake levels have fluctuated from 6,220.26 ft (about 3 ft below the rim), during a prolonged drought in 1992, to 6,229.39 ft (about 0.2 ft above the legal maximum), during the flood of January 1997.

The Lake Tahoe Basin is divided by the Nevada-California State line, with about one-third of the basin in Nevada and two-thirds in California. The

location of the basin, about 150 miles (mi) from the San Francisco Bay area and 90 mi from the Sacramento Valley, makes a wide variety of recreational opportunities available to a population of about 8 million. Major recreational activities within the basin include casino gaming in Nevada, alpine and cross-country skiing, golfing, water sports, hiking, fishing, camping, and bicycling.

History of Environmental Regulation

Until its “discovery” in 1844 by General John C. Fremont, the basin was occupied by the Washoe Tribe who had hunted and fished there for centuries. Upon discovery of gold in the South Fork of the American River in 1848, thousands of west-bound gold seekers passed near the basin on their way to the gold fields. “White-man’s” civilization first made its mark in the Lake Tahoe Basin with the 1858 discovery of the Comstock Lode, just 15 mi to the east in Virginia City, Nev. From 1858 until about 30 years later, logging in the basin supplied large timbers to shore up the underground workings of the Comstock mines. The logging was so extensive that almost all of the native forest was cut. In 1864, Tahoe City was founded as a resort community for Virginia City, the first recognition of the basin’s potential as a destination resort area.



Lake Tahoe, March 1995; northward view of Incline Village area, from near Sand Harbor, Nevada. Photograph by Timothy G. Rowe, U.S. Geological Survey.

Public appreciation of the Tahoe Basin grew, and during the 1912, 1913, and 1918 congressional sessions, unsuccessful efforts were made to designate the basin as a national park. During the first half of this century, development around the lake consisted of a few vacation homes. The post-World War II population and building boom, followed by construction of gambling casinos in the Nevada part of the basin during the mid-1950's, and completion of the interstate highway links for the 1960 Squaw Valley Olympics, resulted in a dramatic increase in development within the basin. From 1960 to 1980, the permanent resident population increased from about 10,000 to greater than 50,000, and the summer population grew from about 10,000 to about 90,000.

Increased development included urbanization of wetland areas that had formerly served as zones for retention of sediments and nutrients (nitrogen, phosphorus, and iron); development on steep mountain sides with consequent sediment erosion; discharge of septic and sewage systems within the basin; and increased airborne nutrients from automobile emissions and wood-burning stoves.

By the 1950's, evidence was mounting that the clarity of the lake was decreasing. Concerns about the effects of sewage effluent and septic-system leakage on stream and lake quality led to formation of the Lake Tahoe Area Council (LTAC) which, in a historic decision, acted to develop a basin-wide sewage-collection system by which the effluent would be exported from the basin, primarily to other areas in Douglas County, Nev., and in Alpine County, Calif. During this time, researchers of TRG documented increases in algal growth and decreases in lake clarity. It was suspected that development was increasing transport of nutrients to the lake, thus stimulating growth of algae.

In 1969, at the joint request of the States of California and Nevada, TRPA was chartered by Federal law under an Interstate Compact. TRPA



Sampling water quality at Incline Creek, January 1993. Photograph by Rita Whitney, U.S. Geological Survey.

was formed as a bi-state agency to better manage and regulate land use and development to protect the lake and the natural resources of the basin. The first two decades of TRPA's management focused on development and application of land-use regulations. In the early 1990's, the agency shifted focus from regulation to science-based environmental management and decision making.

LTIMP Cooperative Monitoring Program

In 1978, the Lake Tahoe Interagency Monitoring Program (LTIMP) was formed. This group included collaborative monitoring and research efforts among TRPA, USGS, TRG, U.S. Forest Service, California State Water Resources Control Board (CSWRCB), Lahontan Regional Water Quality Control Board, California Department of Water Resources (DWR), California Department of Transportation, California Air Resources Board, California Department of Fish and Game, Nevada Department of Environmental Protection, and U.S. Environmental Protection Agency (EPA). The combined resources of LTIMP have contributed significantly to the body of literature and hydrological and limnological data available for the Lake Tahoe Basin.

Although early concerns focused on suspended-sediment and nutrient transport to the lake by streams, potential nutrient contribution by ground water became recognized in the late 1980's. Suspected sources included abandoned septic systems, golf courses, organic-rich stream deposits, and contaminated surface-water infiltration into ground water.

In 1982, TRPA adopted Resolution No. 82-11, which includes environmental thresholds for the Lake Tahoe Basin. Among those thresholds is "Water Quality 4," which establishes standards for total nitrogen, soluble inorganic nitrogen, total phosphorus, soluble phosphorus, total iron, and suspended sediment in tributary streams.

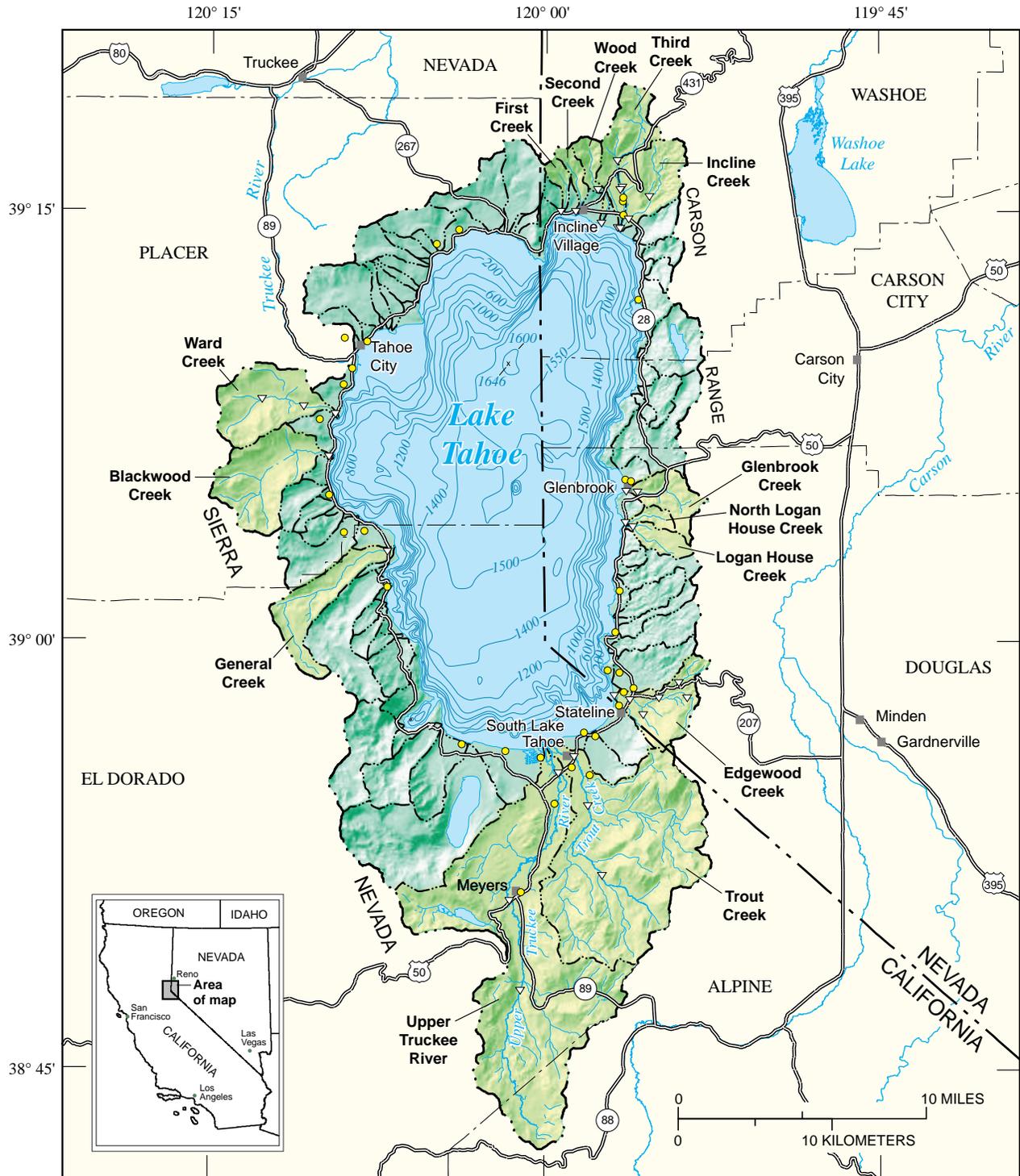
TRPA also adopted "Water Quality 6," a threshold that establishes standards for total nitrogen, total phosphorus, total iron, turbidity, and grease and oil in surface discharge to ground water.

These thresholds provide the basis for the current program for stream and ground-water monitoring operated cooperatively by TRPA, USGS, and TRG. Since 1988, funding for this program has been shared equally by TRPA and USGS, with additional support and services provided by TRG.

The California part of Lake Tahoe is designated by EPA as an Outstanding Natural Resource Water, which provides that no further degradation of Lake Tahoe can be allowed. All reasonable, cost-effective, best-management practices for nonpoint source control are required. Under



Lake Tahoe, September 1996; eastward view from Rubicon Point, California. Photograph by Timothy G. Rowe, U.S. Geological Survey.



Base from U.S. Geological Survey digital data, 1:24,000 and 1:100,000, 1969-85. Universal Transverse Mercator projection, Zone 11

Bathymetric contours from Rush, 1973. Compiled from soundings made by the U.S. Coast and Geodetic Survey (1923)

EXPLANATION

- Selected hydrologic basin used in this study
- Boundary of Lake Tahoe Basin
- Boundary of subbasin
- Bathymetric contour, in feet below highest legal lake-surface altitude (6,229.1 feet above U.S. Bureau of Reclamation datum of 1929)
- Surface-water site
- Ground-water site

Figure 1. Geographic setting, hydrologic basins, bathymetry, and surface-water and ground-water monitoring sites in the Lake Tahoe Basin.

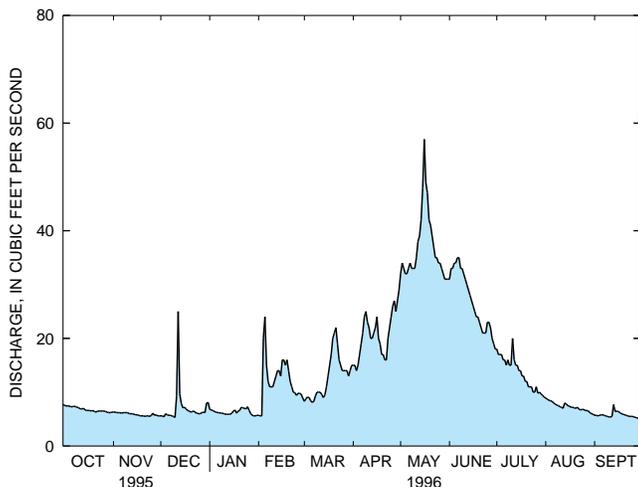


Figure 2. Daily mean discharge for Incline Creek during 1996 water year, representative of streams in the Lake Tahoe Basin.

Nevada Pollution Control Regulations, the Nevada part of Lake Tahoe has a designated beneficial use as a water of extraordinary ecological and/or aesthetic value, which is also a nondegradation standard (Adelle Basham, Nevada Department of Environmental Protection, oral commun., 1997). Although no specific monitoring program has been implemented within the basin to meet all the requirements of these policies, regulatory agencies rely upon LTIMP data in implementation of their programs.

Stream Monitoring Network

In 1979, the LTIMP stream-sampling network began as a cooperative effort of the CSWRCB, DWR, USGS, and TRG. The objectives of this network are to acquire and disseminate the water-quality information necessary to support science-based environmental planning and decision making in the basin. Seven major tributary streams were monitored for streamflow and suspended-sediment and nutrient contribution to Lake Tahoe. By 1987, decreases in funding had reduced the network to four streams in California: General, Blackwood, and Ward Creeks, and Upper Truckee River.

In 1987, TRPA and USGS provided funding to expand the program by adding four Nevada tributaries. By 1993, the LTIMP network had expanded to 32 sites in 14 basins (fig. 1). Of the 32 sites, 20 have recording streamflow gages. The 14 basins total 157 mi², or about half of the entire basin tributary to Lake Tahoe. The largest basin monitored is the Upper Truckee River Basin (56.5 mi², 18 percent of the total drainage to the lake); the smallest is the First Creek Basin (1.08 mi²).

Routine and storm-based monitoring is done to provide data for comparisons between spring runoff, storm-generated runoff, and base-flow, and for estimating suspended-sediment and nutrient transport. Comparisons can be made among the 14 monitored basins. Monitoring stations at the mouths of the basins measure loads to the lake and provide a basis for comparisons of the effects of the differing geology, soils, and land uses on those loads. Eight of the basins also have internal sampling stations to allow for comparisons of the effects of upstream and downstream land uses.

The greatest transport of sediment and some associated nutrients occurs during high flows caused by storms and snowmelt. To quantify transport during such events, individual samples must be collected as the streamflows rise, peak, and recede. A timely and steady field presence in the basin during storms is required to accomplish this. During runoff monitoring, USGS field crews frequently collect hydrologic data late into the night and on weekends and holidays to meet the program objectives.

Tributary monitoring includes field measurement of streamflows, temperature, pH, dissolved oxygen, and specific conductance; and laboratory measurement of major nutrients (dissolved nitrate and nitrite, dissolved ammonia, total ammonia and organic nitrogen, dissolved orthophosphorus, total phosphorus, and total iron) and suspended sediment. These measurements are necessary to determine whether the environmental thresholds for the basin are being exceeded and to provide long-term data that can be used to determine suspended-sediment and nutrient loads to the lake.

Depth-integrating and equal-width-increment sampling techniques are used for suspended-sediment and nutrient sampling. Suspended-sediment analyses are made by the USGS California sediment laboratory in Salinas, Calif. Nutrient analyses are done at TRG laboratories in Tahoe City and Davis, Calif. The streamflow gages are operated by USGS personnel from the Carson City, Nev., and Carnelian Bay, Calif., field offices. LTIMP data are entered in national USGS data bases and published every year in USGS California and Nevada Water Data Reports.

Ground-Water Monitoring Network

In 1990, USGS and TRPA established a ground-water monitoring network with 32 sampling sites (fig. 1) to provide a long-term data base on ground water. Previous ground-water studies found concentrations of nitrogen, phosphorus, and iron to be greater in ground water than in the lake. These studies indicated the need to better describe ground-water quality and rates of ground-water flow into the lake.

Field measurements of water from wells include temperature, pH, dissolved oxygen, specific conductance, and water level. Laboratory measurements of dissolved nutrients, including iron, are made. Ground-water samples are obtained by pumping long enough to remove stagnant well water before sampling.

Monitoring Results

The monitoring provides scientific data on stream discharge and quality and ground-water levels, quality, and flow paths. Selected results are described below.

The hydrograph of daily mean discharge for Incline Creek (fig. 2) for 1996 shows a seasonal pattern that is typical of streams in the Lake Tahoe Basin. Most runoff is during the April through June snowmelt period. Sharp peaks represent fall rains, rain-on-snow storms, and summer thunder storms.

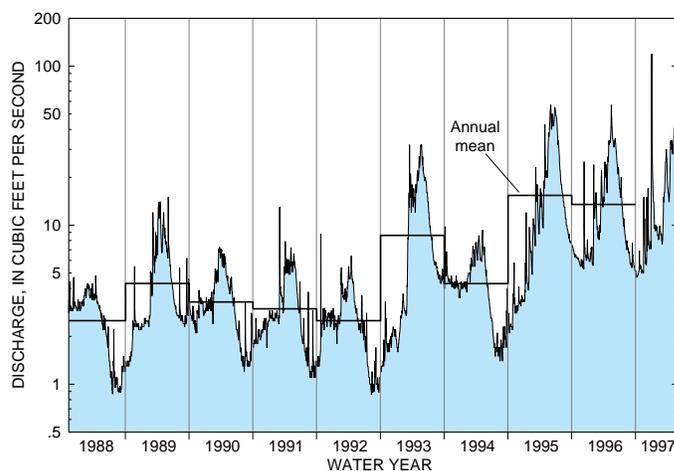
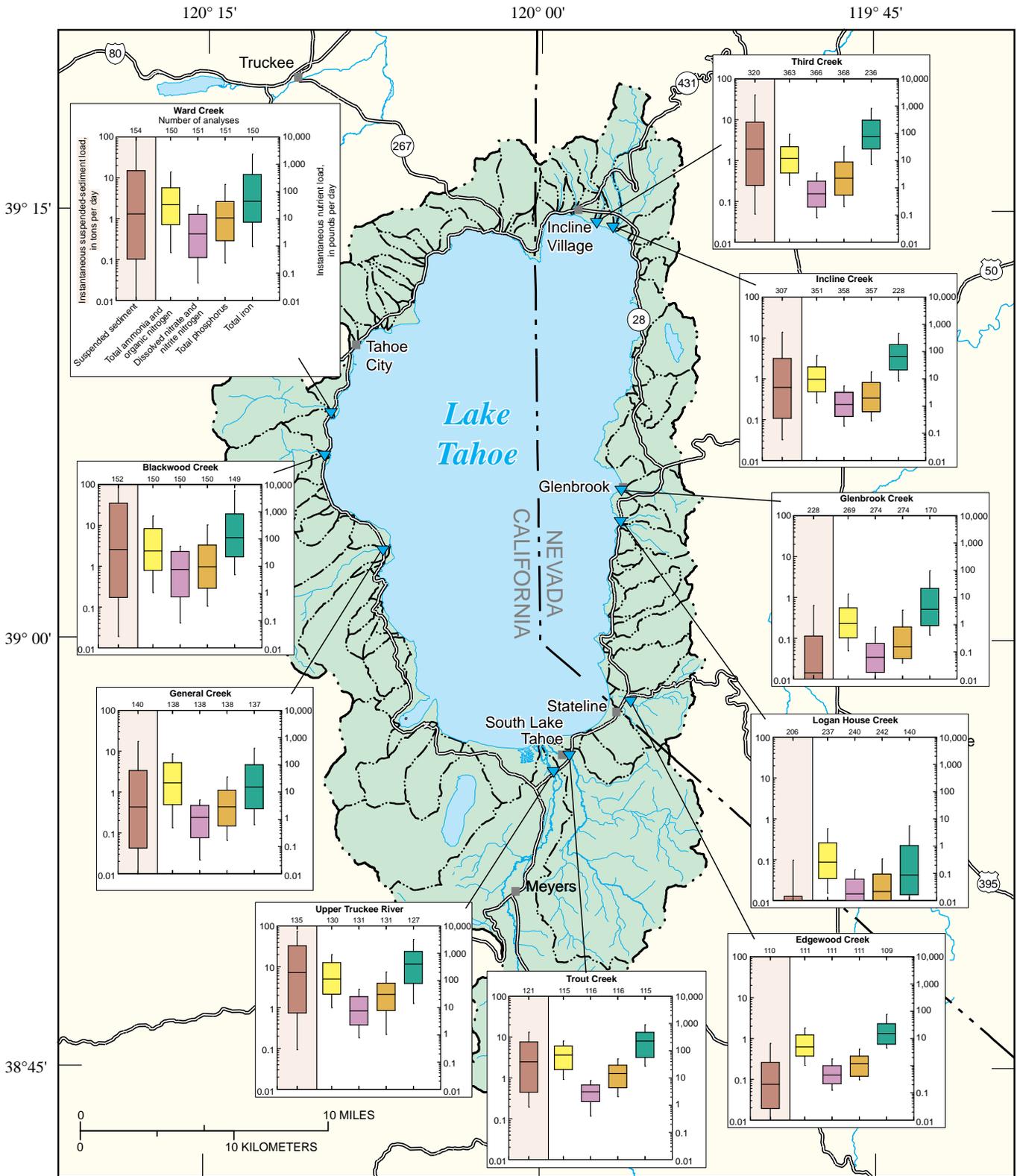


Figure 3. Mean daily discharge for Incline Creek, 1988-97 water years, representing years of drought and above-normal runoff.



Base from U.S. Geological Survey digital data, 1:24,000 and 1:100,000, 1969-85
 Universal Transverse Mercator projection, Zone 11

EXPLANATION

- Boundary of Lake Tahoe Basin
- Boundary of hydrologic basin—
Selected streams shown for study basins
- 90th Percentile
- 75th Percentile
- Median
- 25th Percentile
- 10th Percentile

Figure 4. Instantaneous suspended-sediment and nutrient loads depicted by box plots for selected surface-water monitoring sites in the Lake Tahoe Basin.



**Measuring streamflow at Third Creek, May 1993.
Photograph by Timothy G. Rowe, U.S. Geological Survey.**

The longer term hydrograph (fig. 3) for Incline Creek for the 9-year period of record clearly shows the effects of drought (water years 1988-92 and 1994) as compared to years in which runoff was above normal (1993, 1995, and 1996). The mean daily discharge for the 9 years is 6.38 ft³/s. The highest mean daily discharge (15.4 ft³/s) was in 1995 and the lowest (2.51 ft³/s) in 1992. The average annual runoff for the period of record is 5,160 acre-ft. Among the 14 basins monitored, the Upper Truckee River has the highest average runoff (101,500 acre-ft) and Logan House Creek (330 acre-ft) the lowest. Instantaneous suspended-sediment and nutrient concentrations are highest during summer thunderstorms and rain-on-snow storms, but overall loads are greater during spring runoff.

Calculations for measured loads of suspended sediment and nutrients are shown for 10 tributary watersheds in figure 4. As many as 368 analyses for a given variable are included. For each basin, "boxplots" are shown summarizing sampled loads for five selected constituents. For each constituent, the box shows the range in load for 25-75 percent of the samples. The median value (half the samples were less than this value and half were more) is indicated by the horizontal line through the box. The vertical lines above and below the box extend from the 10th percentile (only 10 percent of the samples were lower) to the 90th percentile (only 10 percent had higher values). For example, of the 307 suspended-sediment samples from the Incline Creek site, half (154) had loads between 0.11 ton per day (ton/d), the 25th percentile, and 3.1 ton/d, the 75th percentile. The range from 0.032 to 14 ton/d represented 80 percent of all samples (10th to 90th percentile). The median value was 0.61 ton/d.

The Upper Truckee River had the largest load of suspended sediment and all nutrients. This is because the Upper Truckee River Basin is the largest basin and contributes the most flow. The Logan House Creek Basin contributes the smallest sediment and nutrient loads. Watersheds on the western side of the basin (California) of the lake have higher loads of sediment and nutrients than the sites on the eastern side (Nevada) due to smaller drainage areas and less precipitation on the eastern side.

Summary and Conclusions

Lake Tahoe has long been admired for the clarity of its water and majestic mountain setting. Human activity in the basin has accelerated the decline in clarity and quality of this pristine lake. Resource-management agencies, such as TRPA, need long-term water-quality data to assess the effectiveness of both current and new projects and regulations. Since 1987,

the LTIMP has been monitoring the water quality of surface-water and ground-water flow tributary to Lake Tahoe. Additional data are necessary to provide the basis for reliable quantification of nutrient loads to the lake from ground water. Additional scientific data and interpretation are essential for water managers to prioritize their efforts for the most effective protection of Lake Tahoe.

—Carol J. Boughton, Timothy G. Rowe, Kip K. Allander, and Armando R. Robledo

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In cooperation with the National Water-Quality Assessment Program and Tahoe Regional Planning Agency

Volatile Organic Compounds in Lake Tahoe, Nevada and California, July-September 1997

Lake Tahoe, renowned for its high alpine setting and deep, clear waters, is designated an Outstanding Natural Resource Water. It lies in the Lake Tahoe Basin, approximately 240 kilometers (km) from California's San Francisco Bay metropolitan area. Because of its beautiful setting in the mountains of the Sierra Nevada to the west and Carson Range to the east and its proximity to large population centers, the lake has become a mecca for outdoor sports.

U.S. Environmental Protection Agency estimates that nationwide use of personal watercraft (PWC) constituted approximately 4 percent of all watercraft use in 1993 and will rise to over 20 percent by 2007 (U.S. Environmental Protection Agency, 1996). Two-cycle PWC's are estimated to discharge from 20 to 30 percent of the incoming fuel out of the exhaust (National Marine Manufacturers Association, written commun., 1997).

In February 1997, the Tahoe Regional Planning Agency (TRPA) governing board held hearings to gather information on the potential effects of watercraft powered by carbureted 2-stroke engines on Lake Tahoe water quality and whether their use in the lake should be banned. During the hearings, information about the potential effect of hydrocarbon emissions on lake-water quality was presented. However, no data specific to Lake Tahoe were available to characterize the occurrence of gasoline products from PWC or any other sources or the effects of such products on water quality in Lake Tahoe.

During the summer of 1997, the U.S. Geological Survey (USGS), in cooperation with TRPA and with assistance from Tahoe Research Group (TRG), sampled lake waters within the Lake Tahoe Basin for volatile organic compounds (VOC's) including methyl *tert*-butyl ether (MTBE), ethyl *tert*-butyl ether (ETBE), *tert*-amyl methyl ether (TAME), benzene, toluene, ethylbenzene, and xylene (isomers *ortho*-, *meta*-, and *para*-).

Sampling Sites and Procedures

Water samples were collected July 29 through August 2 and September 2 through September 5, 1997 (table 1). Site locations are shown in figure 1. During the first sampling period, sites were chosen to be consistent with those where long-term traditional limnological data have been collected by the TRG of the University of California, Davis: nearshore to Tahoe City (site 3) and offshore southeast of Tahoe City (site 4). Site locations during the second sampling period were chosen to provide spatially distributed data where watercraft activity is common. Sampling sites on Lake Tahoe were near Incline Village, Nev. (site 1); Kings Beach, Calif. (site 2); Glenbrook, Nev. (site 6); Homewood, Calif. (site 7); Zephyr Cove, Nev. (site 8); Tahoe Keys, Calif. (site 9); and the deepest part of the lake (site 5). Other lakes sampled during the second sampling period included Marlette Lake, Nev. (site 10); Cascade Lake, Calif. (site 11); and upper Angora Lake, Calif. (site 12). These three lakes were sampled as background reference sites because neither Marlette Lake nor upper Angora Lake has any motorized watercraft traffic. Cascade Lake has limited motorized watercraft traffic consisting of a few boats with small 2-stroke motors that are used by residents of seasonal homes around the lake.

Water temperature, pH, specific conductance, and dissolved-oxygen measurements were made at 1- or 2-meter (m) increments to the deepest sampling point. At the mid-lake Lake Tahoe sites (sites 4 and 5), and at the Marlette Lake, Cascade Lake, and upper Angora Lake sites (sites 10-12), a thermocline was detected and the deepest sampling point was below the thermocline. These onsite measurements were made by using a multi-parameter sensor, which was calibrated on location.

Sampling protocols outlined by Shelton (1997) were used for sampling the VOC's. The sampler used was a modified stream sampler lowered to the desired depth on a stainless-steel cable attached to a calibrated reel. The sampling equipment was cleaned before each sample as detailed by Shelton (1997).

Immediately upon retrieval, the sampler was placed in a preservation chamber (Shelton, 1994) to prevent contamination of the samples by atmospheric sources. Quality-control samples consisted of VOC-free water (blanks) exposed to the same sampling equipment and environment as the lake samples (table 1). Samples were preserved with 1:1 hydrochloric acid and sent overnight to the USGS National Water-Quality Laboratory in Arvada, Colo. Presence and concentrations of compounds were determined by gas chromatograph-mass spectrometer (Conner and others, 1998).

Results

Concentrations of the VOC's are shown in table 1. MTBE was detected in all Lake Tahoe samples. MTBE concentrations at nearshore sites, at a depth of 3 m, ranged from 0.30 microgram per liter ($\mu\text{g/L}$) near Glenbrook (site 6), to 4.2 $\mu\text{g/L}$ near Tahoe City (site 3). The MTBE concentrations at 3-m depth at offshore sites 4 and 5 were 0.59 $\mu\text{g/L}$ and 0.42 $\mu\text{g/L}$, respectively. These results indicate a variability in the spatial distribution of MTBE at shallow depths, with larger concentrations nearer sites with substantial watercraft activity. MTBE concentration near Tahoe City (site 3) on July 29 was 1.5 $\mu\text{g/L}$; on August 2, during a weekend with considerable watercraft activity, the concentration was 4.2 $\mu\text{g/L}$. At the Lake Tahoe

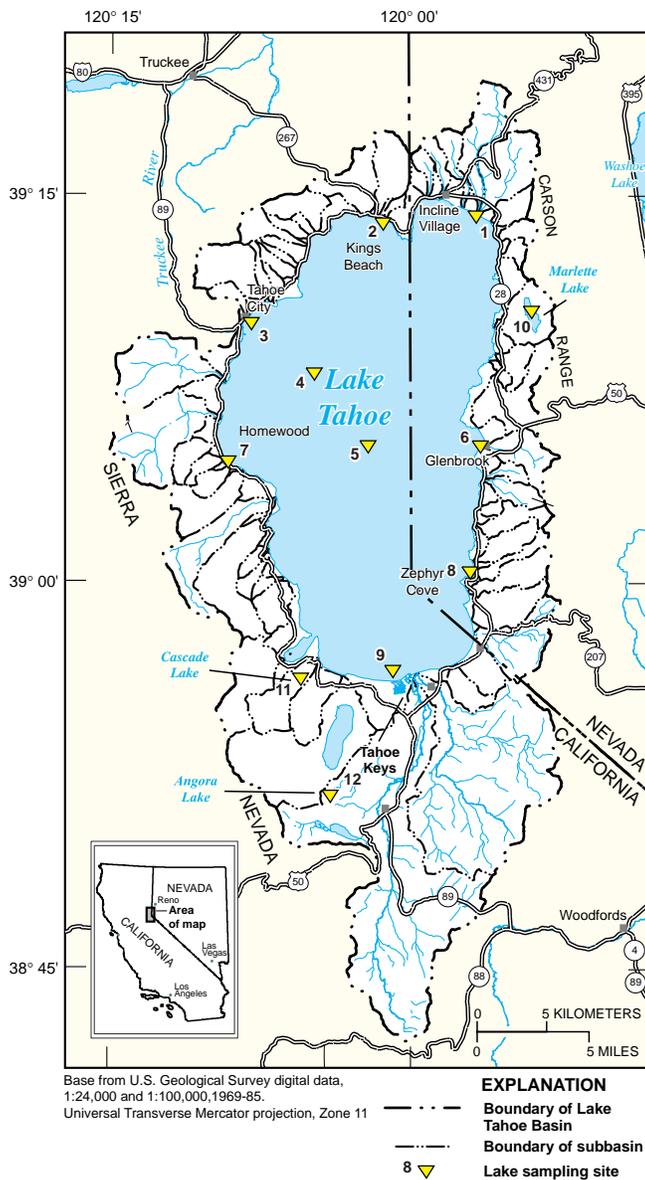


Figure 1. Lake sampling sites in Lake Tahoe Basin, Nevada and California.

Table 1. Volatile organic compounds in water samples collected at Lake Tahoe and other nearby alpine lakes, July 29-September 5, 1997

[Concentrations in micrograms per liter unless otherwise denoted; °C, degrees Celsius; <, less than; --, not determined]

Site (fig. 1)	Depth (meters below lake surface)	Date	Methyl tert-butyl ether ¹ (MTBE)	Ethyl tert-butyl ether (ETBE)	Tert-amyl methyl ether ¹ (TAME)	Benzene ¹	Toluene ¹	Ethylbenzene ¹	Ortho-xylene ¹	Meta- and para-xylene ¹	Xylene ¹ (total)	Water temperature (°C)
Lake Tahoe Samples												
1	3	Sept. 3	0.45	<0.054	E 0.05	E 0.5	0.13	E 0.02	E 0.03	E 0.09	E 0.1	--
2	3	Sept. 3	1.7	<.054	.14	.13	.68	.12	.20	.52	.72	--
3	3	July 29	1.5	<.054	E .09	.15	.58	E .09	.16	.42	.58	18.6
3	3	Aug. 2	4.2	<.054	.20	.33	1.9	.39	.60	1.6	2.2	18.5
4	3	Aug. 2	.59	<.054	E .04	<.06	<.06	<.030	<.064	E .03	E .03	17.8
4	10	Aug. 2	.61	<.054	<.11	<.06	<.07	<.030	<.064	E .04	E .04	17.6
4	30	July 29	.19	<.054	E .02	<.032	<.04	<.030	<.064	<.064	<.064	8.8
4	30	Aug. 2	.26	<.054	<.11	<.032	<.04	<.030	<.064	<.064	<.064	8.9
5	3	Sept. 3	.42	<.054	E .05	E .04	E .09	<.030	<.064	E .05	E .05	17.8
5	30	Sept. 3	.18	<.054	<.11	E .02	E .04	<.030	<.064	<.064	<.064	11.5
6	3	Sept. 2	.30	<.054	E .04	E .04	E .1	E .01	<.064	E .06	E .06	18.0
7	3	Sept. 2	.45	<.054	E .05	E .05	.15	E .02	E .04	E .1	E .1	17.5
8	3	Sept. 2	1.0	<.054	.14	.15	.70	.12	.23	.52	.75	18.0
9	3	Sept. 2	.68	<.054	E .07	E .07	.26	E .04	E .06	E .2	E .3	17.8
Other Nearby Lake Samples (background sites)												
10	3	Sept. 5	<.11	<.054	<.11	<.032	<.04	<.030	<.064	<.064	<.064	17.0
10	9.1	Sept. 5	<.11	<.054	<.11	<.032	E .01	<.030	<.064	<.064	<.064	15.0
11	3	Sept. 4	<.11	<.054	<.11	<.032	E .04	<.030	<.064	E .02	E .02	18.3
11	15	Sept. 4	<.11	<.054	<.11	<.032	E .02	<.030	<.064	<.064	<.064	6.9
12	3	Sept. 4	<.11	<.054	<.11	<.032	E .02	<.030	<.064	<.064	<.064	16.8
12	10	Sept. 4	<.11	<.054	<.11	<.032	<.04	<.030	<.064	<.064	<.064	7.8
Quality-Control Samples												
Sampler blank	July 28	<.11	<.054	<.11	<.032	<.04	<.030	<.064	<.064	<.064	<.064	--
Ambient blank	July 29	E .07	<.054	<.11	<.032	<.04	<.030	<.064	<.064	<.064	<.064	--
Source solution blank	Aug. 26	<.11	<.054	<.11	<.032	<.04	<.030	<.064	<.064	<.064	<.064	--
Sampler blank	Aug. 26	<.11	<.054	<.11	<.032	E .04	<.030	<.064	<.064	<.064	<.064	--
Canister blank	Aug. 26	<.11	<.054	<.11	<.032	E .04	<.030	<.064	E .02	E .02	E .02	--
Ambient blank	Sept. 2	<.11	<.054	<.11	<.032	E .01	<.030	<.064	<.064	<.064	<.064	--

¹ When an "E" is reported, the compound has passed all criteria used to identify its presence, and only the concentration is estimated (Conner and others, 1998). When a "<" is reported, compound was not detected in that sample.

offshore site (site 4) at a depth of 30 m, the MTBE concentration was 0.19 µg/L on July 29; four days later, on August 2, the MTBE concentration was 0.26 µg/L.

ETBE was not found at any site. TAME was detected in samples from all nearshore sites, with concentrations up to 0.20 µg/L near Tahoe City (site 3) on September 2. TAME concentration at the offshore site (site 4) at 30-m depth on July 29 was estimated to be 0.02 µg/L and at the offshore site (site 5) at 3-m depth on September 3 was estimated to be 0.05 µg/L (see footnote, table 1).

Benzene was detected in all nearshore samples from a depth of 3 m in concentrations ranging from an estimated 0.04 µg/L near Glenbrook (site 6) on September 2, to an estimated 0.5 µg/L near Incline Village (site 1) on September 3. Benzene concentrations from near Tahoe City (site 3), increased from 0.15 µg/L on July 29 to 0.33 µg/L on August 2 (weekend with heavy watercraft activity). Benzene also was detected at the offshore site (site 5) at estimated concentrations of 0.04 µg/L at 3 m depth and of 0.02 µg/L at 30 m on September 3.

Toluene was detected at all nearshore sites at 3 m in concentrations ranging from an estimated 0.1 µg/L near Glenbrook (site 6) on September 2, to 0.70 µg/L near Zephyr Cove (site 8) on that same date. On July 29, near Tahoe City (site 3), the toluene concentration was 0.58 µg/L and had increased to 1.9 µg/L on August 2. On September 3, at the offshore site (site 5), the estimated toluene concentration at 3 m was 0.09 µg/L and at 30 m was 0.04 µg/L.

Ethylbenzene was detected in all samples from shallow (3 m) nearshore sites. The highest concentration of ethylbenzene, 0.39 µg/L, was detected at the Tahoe City shallow site (site 3) on August 2. Ethylbenzene was not detected in any offshore samples. Total xylene was detected at all nearshore sites in concentrations ranging from an estimated 0.06 µg/L near Glenbrook (site 6) on September 2, to 2.2 µg/L near Tahoe City (site 3) on August 2. On September 3, an estimated meta- and para-xylene concentration of 0.05 µg/L was detected at an offshore site (site 5) at 3 m. The concentration of xylene for all other offshore samples (sites 4 and 5) was less than the detection limit of 0.064 µg/L.

With exceptions discussed below, no benzene, toluene, ethylbenzene, xylene, MTBE, ETBE, or TAME were detected in Marlette Lake (site 10), Cascade Lake (site 11), or upper Angora Lake (site 12). Toluene was detected in estimated concentrations ranging from 0.01 to 0.04 µg/L; however, three of six quality-control samples also had estimated concentrations ranging from 0.01 to 0.04 µg/L. Total xylene in Cascade Lake (site 11) at a depth of 3 m on September 4 was measured at an

estimated 0.02 µg/L, but a quality-control sample also had an estimated concentration of 0.02 µg/L. Because of these quality-control results, the toluene and xylene detections in the other alpine lakes may be from inadvertent sample contamination and may not be representative of conditions at those sites.

Summary and Conclusions

MTBE was detected in all samples from Lake Tahoe in concentrations ranging from 0.18 to 4.2 µg/L and to depths of 30 m. ETBE was not detected in any samples. Concentrations of TAME, benzene, toluene, ethylbenzene, and xylene ranged from non-detection to 2.2 µg/L (xylene; site 3). Concentrations of all compounds varied spatially and temporally during the sampling period. No exceedances of known drinking water standards or health advisories were detected.

—Carol J. Boughton and Michael S. Lico

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Chapter 4

SOIL CONSERVATION

I. INTRODUCTION

Since the late 1970s, regulatory agencies within the Tahoe Region, including the TRPA, have used the land capability classification system known as the “Bailey System” (*Land-Capability Classification of the Lake Tahoe Basin, California-Nevada A Guide to Planning*, Bailey, 1974) to evaluate applications that add new land coverage to existing developed lots, or to obtain building permits for new residences or other projects. Since 1989, the “Individual Parcel Evaluation System” (IPES) has replaced the Bailey System as the method for determining eligibility for building on vacant single-family parcels. Both of these programs were developed as erosion control techniques to mitigate the deleterious effects to water quality that result from excessive land coverage.

Both the Bailey System and IPES restrict the amount of impervious land coverage on all parcels and generally prohibit new land coverage within areas classified as SEZs. Land coverage is considered the major source of urban runoff and sediment/nutrient input to Lake Tahoe and its tributaries.

BACKGROUND

Impervious Coverage

Under the Bailey System in the Tahoe Region, land coverage should conform to the following coefficients of allowable land coverage:

<u>Land Capability Classification</u>	<u>Allowable Land Coverage (%)</u>
1a	1
1b	1
1c	1
2	1
3	5
4	20
5	25
6	30
7	30

To protect water quality and maintain natural hydrology in the Tahoe Region, TRPA adopted the following threshold for soil conservation in 1982:

Impervious cover shall comply with the Land Capability Classification of the Lake Tahoe Basin, California-Nevada, A Guide to Planning (Bailey 1974).

In some instances, the Regional Plan makes allowances for additional land coverage on a given parcel by transfer programs, which provide for direct offsets. Allowable land coverage may be increased by a transfer of land coverage within a hydrologically-related area up to the limit prescribed by the Regional Plan.

The Regional Plan allows no new land coverage or other permanent disturbance in land capability districts 1, 2 or 3 except for:

- Single-family dwellings reviewed under the Individual Parcel Evaluation System
- Qualifying public recreation facilities
- Qualifying public facilities

The Regional Plan recognizes several distinct types of land coverage: “hard” coverage (man-made structures), “soft” coverage (compacted soils without structures), and “potential” coverage (allowed but not yet existing).

Excess land coverage is defined as existing coverage beyond the total maximum allowable base coverage, the transferred coverage, and the coverage previously mitigated under this program. In the event that land coverage reduction is required for approval of a project, Chapter 20 of the TRPA Code of Ordinances allows a number of options that an applicant may use to comply with the land coverage requirements. These options include:

1. Reduction of coverage onsite;
2. Reduction of coverage offsite within the hydrologic area;
3. Area consolidation of parcels or adjustment of parcel boundary lines; or
4. Payment of a land coverage mitigation fee to be forwarded to a land bank to retire land coverage within the same hydrologic zone.

There are a number of exemptions from the Land Coverage Mitigation Program listed in Subsection 20.5.B of the TRPA Code. The Excess Coverage Fee is calculated by determining the amount of excess coverage in square feet and using this coverage amount to determine the appropriate fee percentage from Table A, located in Chapter 20 of the TRPA Code. The fee percentage is then multiplied by the estimated construction cost of the project. The coverage reduction credit given to the parcel is calculated by dividing the mitigation fee by the TRPA coverage cost of \$6.50 per square foot in California and \$12.00 per square foot in Nevada. It should be noted that previous Threshold Evaluations used a factor of \$5.00 per square foot for all counties; however, a new Code Ordinance (approved in April 2001 to become effective in July 2001) reflects more closely the square foot coverage prices in both California and Nevada. The numbers from previous evaluations have been updated to reflect this change, as most of the money disbursed to Nevada during that time remains unspent.

The Environmental Impact Study for the 1987 Regional Plan estimated that there were 7,000 acres of disturbed lands within the Tahoe Region. Goal #1, Policy 4 of the Land Use Element, Water Quality sub-element of the TRPA Goals and Policies requires the restoration of at least 80 percent of the disturbed lands within the Region to a natural state or near natural state of hydrologic function, by the application of Best Management Practices (BMPs).

The Water Quality Management Plan for the Lake Tahoe Region, 1988 (208 Plan), concentrates its efforts on the declining water quality of Lake Tahoe. Human activities, especially urban development, are altering the water quality of the Lake. One of the main sources of sediment and nutrients is surface runoff. Under natural conditions, surface runoff entering Lake Tahoe has very low concentrations of suspended sediment and

Chapter 5

VEGETATION

I. INTRODUCTION

The vegetation conditions and patterns in the Lake Tahoe Region of today are a reflection of past and current human activities. Logging activities began in 1859 and within 40 years about 60 percent of the Tahoe watershed had been clearcut. The remaining land was characteristically alpine, barren or inaccessible (USDA 2000). After most of the logging was complete, federal and state governments began acquiring lands in 1899, and intensified acquisition in the 1930's. The two primary results of the large amount of public ownership within the Region are that forestland is managed for non-economic goals, and uncommon plant communities and sensitive plants are afforded greater protection.

The resulting second growth forest that has grown in the past century has, until recently, received little active management, except fire suppression. As such, today's forest is even-aged and crowded, with many trees suppressed by the density of the surrounding forest. A drought, which started in the late 1980s, stressed the overstocked trees, making them susceptible to insects. In 1991 the United States Forest Service (USFS) estimated that 300 million board feet of timber were dying or dead (USDA 2000). This condition has increased the threat of large catastrophic fire and is indicative of a forest where many natural processes have been excluded.

Housing, commercial and infrastructure construction have also influenced today's vegetation patterns. Not only have large and small trees been removed for these projects, forest structure and composition are also manipulated around the urban area as a defensible space for fire protection. In addition, road salts and soil compaction can stress remaining trees to the point where the tree is later removed as a hazard. The impacts of construction and hazard tree removal are not known; however, the impacts have not been evenly distributed within the watershed. Indeed, roughly 95 percent of the urban area is within the montane major vegetation zone (below 7,000 feet). Roughly 27 percent of the montane zone is urbanized and, if a large fuel defensible profile zone is included around the urban areas, roughly 55 percent of the montane zone forest is manipulated both in structure and composition. New impacts as a result of construction will continue in the montane zone as most of the remaining buildable lots in the Basin are within the montane. Lost urban trees are not replaced quickly, nor are there mechanisms to ensure lost trees are replaced. An average tree planted in an average location within the montane zone will only grow between 15-25 feet within 20 years.

As a result of the past logging very little late seral or old growth stands remain in the basin. A conservative estimate from the USFS is that 5 percent of the conifer forest is either in a late seral or old growth condition. In May 2001, TRPA adopted a new vegetation threshold related to late seral and old growth stands. The threshold standard is that 55 percent of the forested area of the Recreation and Conservation Plan Areas in the basin should exhibit late seral or old growth characteristics.

BACKGROUND

The Tahoe Regional Planning Compact ("Compact", P.L. 96-551, 94 stat. 3233, 1980) finds that, "There is a public interest in protecting, preserving and enhancing [environmental and ecological] values for the residents of the region and for visitors to the region." The natural environment, "by virtue of the special conditions and circumstances of the region's natural ecology, developmental pattern, population distribution and human needs...is experiencing problems of resource use and deficiencies of environmental control." In order for the TRPA to protect the natural environment, the Compact directs TRPA to "establish environmental threshold carrying capacities." In 1982 the TRPA adopted three vegetation-related thresholds for common vegetation, uncommon plant communities, and sensitive plants.

To attain these thresholds, the TRPA adopted three vegetation-related goals in 1986. The goals are to provide for 1) an increase in diversity of plant communities, 2) the protection and restoration of unique ecosystems, and 3) conservation of sensitive plants species and communities. Twelve polices related to the above goals were also adopted at the same time.

Besides the value provided by vegetation directly, vegetation indirectly benefits each of the other eight thresholds. The Environmental Impact Statement for the Establishment of Environmental Threshold Carrying Capacities (1982) rated the interrelationship between the nine thresholds. The vegetation threshold was found to be the most related to the other thresholds. This study noted that:

"It [vegetation] is a major factor in maintaining water quality, stabilizing soil, producing oxygen, providing wildlife habitat, filtering noise, enhancing the recreation experience, and an integral part of the scenic resource. Adoption of a threshold that maintains this protective ability has a direct, positive impact on all other components for which [the other eight] thresholds are recommended."

Attaining, maintaining, and exceeding the vegetation thresholds would have a strong positive effect on both the natural environment and the human experience within that environment.

INDICATORS

V-1 Common Vegetation

The indicator to evaluate the first vegetation threshold, common vegetation, is area of vegetation coverage. Both relative abundance of different vegetation types and the pattern of vegetation can be evaluated using this indicator. The data used in this evaluation will be based on the U.S. Forest Service data.

V-2 Uncommon Plant Communities

Although the second vegetation threshold, uncommon plant communities, is a numerical threshold, the wording of the threshold does not allow for measurement or quantification to determine the status of the community. In this regard the indicator to evaluate uncommon plant communities is unitless. The second threshold states that there is a non-degradation standard applied to four specific

communities. Therefore, if a community has been degraded the threshold will not be in attainment. Either USFS staff or TRPA staff will evaluate the status of each uncommon plant community.

V-3 Sensitive Plants

Although the third vegetation threshold (sensitive plants) is a numerical threshold, the wording of the threshold does not allow for measurement or quantification to determine the status of the sensitive plant species. In this regard the indicator to evaluate the third vegetation threshold is unitless. The language of the third vegetation threshold states a minimum number of population sites for five sensitive plant species (see below). However, it is not clear what constitutes a “population” or the protection to be afforded to each population. The third threshold will be in attainment when there are a minimum number of populations for each species and these populations are protected from negative impact. Agency staff will identify the number of population sites and any impacts.

V-4 Late Seral/Old Growth Ecosystems

The fourth vegetation threshold is a numerical threshold. Fifty-five percent of the region’s forests shall be in late seral/old growth condition. In specific, 7,600 acres in the subalpine zone, 45,900 acres in the upper montane zone, and 30,600 acres in the montane zone shall be in late seral/old growth. This assessment shall be based on the USFS’ vegetation classification. This assessment is scheduled to occur every five years.

II. THRESHOLD SUMMARY

The threshold matrix serves as a summary of the trends, status, and recommendations for individual thresholds. It displays the trend toward attainment from 1987 to present, the current status of the threshold, progress on the 1996 recommendations, future threshold recommendations, interim targets and an attainment schedule to ensure the individual indicators and/or standards for the threshold are in attainment over time.

A. THRESHOLD MATRIX

See the following page for the Threshold Matrix for Vegetation.

B. MEASUREMENT AND MONITORING ACTIVITIES

There is no formal monitoring program for the vegetation threshold. The majority of the information is developed by the land management agencies, such as the USFS or Nevada Division of State Parks. Many of the uncommon plant communities and rare plant locations were visited.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

The results of these threshold-monitoring activities are expressed in terms of attainment or non-attainment and are found under "Status" on the Threshold Matrix. These results are discussed in greater detail under Section III below for each threshold.

V-1: COMMON VEGETATION

Threshold Standards	V-1 Indicator	1996 Interim Targets	Threshold Attainment Status		
			1991 Attain Status	1996 Attain Status	2001 Attain Status
<p>Increase plant and structural diversity of forest communities through appropriate management practices as measured by diversity indices of species richness, relative abundance, and pattern.</p> <p>Species Richness: Maintain the existing species richness of the Region by providing for the perpetuation of the following plant associations: Yellow pine forest; Red fir forest; Subalpine forest; Shrub association; Sagebrush Scrub association; Deciduous riparian; Meadow associations (wet and dry meadow); Wetland associations (marsh vegetation); and Cushion plant association (alpine scrub).</p> <p><u>Relative Abundance:</u> Of the total amount of undisturbed vegetation in the Tahoe Region:</p> <p>Maintain at least four percent meadow and wetland vegetation.</p> <p>Maintain at least four percent deciduous riparian vegetation.</p> <p>Maintain no more than 25 percent dominant shrub association vegetation.</p> <p>Maintain 15-25 percent of the yellow pine forest in seral stages other than mature.</p> <p>5. Maintain 15-25 percent of the red fir forest in seral stages other than mature.</p> <p>Pattern: Provide for the proper juxtaposition of vegetation communities and age classes by:</p> <ol style="list-style-type: none"> 1. Limiting acreage size of new forest openings to no more than eight acres; and 2. Adjacent openings shall not be of the same relative age class or successional stage to avoid uniformity in stand composition and age. 	<p>For species richness and relative abundance, the area of plant associations as determined by the Forest Service vegetation inventory. For pattern, the size and location of forest openings as described in federal forest management plans (acres).</p>	<p>By June 30, 1997, December 31, 1997 TRPA will adopt Vegetation Goals and Policies and amend Chapter 71 of the Code to reflect an ecosystem/forest health approach to resource management.</p>	<p>Species Richness</p> <p>Unknown</p>	<p>Attainment</p>	<p>Non-Attainment</p>
			<p>Relative Abundance</p> <p>Non-Attainment</p>	<p>Non-Attainment</p>	<p>Non-Attainment</p>
			<p>Pattern</p> <p>Attainment</p>	<p>Attainment</p>	<p>Attainment</p>
<p>V-1 2001 Monitoring Status</p>					
<p>Information for the V-1 threshold will come from ongoing forest monitoring efforts by the US Forest Service.</p>					
<p>V-1 2001 Recommendations</p>					
<ol style="list-style-type: none"> 1. Amend the code to provide greater protection for vegetation during construction activities. (02/02) 2. Develop wildland fire protection code sections. (10/02) 3. Develop an aspen conservation plan. (1/04) 4. Create a forest pathology working group. (6/02) 5. Develop native deciduous tree protection code sections. (02/02) 6. Amend the code to provide greater protection for SEZ vegetation during construction activities. (07/02) 7. Develop a draft new common vegetation threshold. (12/04) 					
<p>V-1 2006 Attainment Schedule</p>					
<p>8% of the yellow pine forests will be in seral stages other than mature by 2010, and 7% of red fir forests will be in seral stages other than mature by 2010</p>					

V-2: UNCOMMON PLANT COMMUNITIES

Threshold Standards	V-2 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
Provide for the nondegradation of the natural qualities of any plant community that is uncommon to the Region or of exceptional scientific, ecological, or scenic values. This threshold shall apply but not be limited to (1) the deep water plants of Lake Tahoe, (2) Grass Lake (sphagnum bog), (3) Osgood swamp, and (4) the Freel Peak Cushion Plant community	Presence of the individual species that comprise the community. Natural qualities of uncommon plant communities as determined by inspection by qualified experts (unitless).	None proposed at this time.	Deep water plants	Unknown	Unknown	Unknown
			Grass Lake	Attainment	Attainment	Attainment
			Osgood swamp	Attainment	Attainment	Attainment
			Freel Peak Cushion Plant	Attainment	Attainment	Attainment
V-2 2001 Monitoring Status						
Information for the V-2 threshold came from site visits by TRPA staff or US Forest Service.						
V-2 2001 Recommendations						
<ol style="list-style-type: none"> 1. Amend the code to provide greater protection for vegetation during construction activities. (02/02) 2. Develop invasive weed control program. (12/02) 3. Include four more communities as threshold locations. (02/02) 4. Freel Peak should be protected from visitor harm. (10/04) 5. Develop native deciduous tree protection code sections. (02/02) 6. Amend the code to provide greater protection for SEZ vegetation during construction activities. (07/02) 7. Change snow cover restrictions for winter Off-Highway Vehicle use. (04/03) 8. Revise list of threshold unique plant communities' list. (06/04) 9. Increase training and education of MOU compliance inspectors. (12/03) 						
V-2 2006 Attainment Schedule						
In Attainment						

V3: SENSITIVE PLANTS

Threshold Standards	V-3 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
Maintain a minimum number of population sites for each of five sensitive plant species.	The number of population sites depicted on TRPA official maps that are maintained as suitable habitat for sensitive plant species as determined by field inspection by a qualified expert (unitless).	By March December 31, 1997, TRPA will prepare a study and recommendation regarding adding Arabis rigidissima v. demota and Silene invisa to the list of sensitive plant species included in the threshold. See discussion below. By July 1, 1997 1998, the California State Lands Commission, in cooperation with affected public and private entities, should implement the Stewardship Plan for Rorippa. By June 30, 2001, TRPA should seek to remove Carex paucifructus from the list of sensitive plants protected by the threshold.				
Number of Population <u>Species</u> <u>Sites</u>						
<i>Carex paucifructus</i> 1			<i>Carex paucifructus</i>	Non- Attainment	Non-Attainment	Non-Attainment
<i>Lewisia pygmaea logipetala</i> 2			<i>Lewisia pygmaea logipetala</i>	Attainment	Attainment	Attainment
<i>Draba asterophora v. macrocarpa</i> 2			<i>Draba asterophora v. macrocarpa</i>	Attainment	Attainment	Attainment
<i>Draba asterophora v. asterophora</i> 5			<i>Draba asterophora v. asterophora</i>	Attainment	Attainment	Attainment
<i>Rorippa subumbellata</i> 26	<i>Rorippa subumbellata</i>	Non- Attainment	Non-Attainment	Non-Attainment		
V-3 2001 Monitoring Status						
Information for the V-3 threshold came from site visits by TRPA staff or US Forest Service.						
V-3 2001 Recommendations						
<ol style="list-style-type: none"> 1. TRPA should amend the code to provide greater protection for vegetation during construction activities. (01/02) 2. TRPA should develop invasive weed control program. (12/02) 3. TRPA should include one species and remove one species as threshold species. (02/02) 4. Revise list of rare threshold plants. (05/04) 5. Finish and participation in the Tahoe yellow cress conservation strategy. (03/02) 6. Conduct further research on Tahoe yellow cress management issues. (01/03) 						
V-3 2006 Attainment Schedule						
This threshold could be in attainment by 2006 if the Tahoe yellow cress is adopted and implemented. In addition, management based research will be needed to effectively manage this species.						

V-4: LATE SERAL/OLD GROWTH ECOSYSTEMS

Threshold Standards	V-4 Indicator	996 Interir Targets	Threshold Attainment Status			
<p>Attain and maintain a minimum percentage of 55% by area of forested lands within the Tahoe Region in a late seral or old growth condition, and distributed across elevation zones. To achieve the 55%, the elevation zones shall contribute as follows: The Subalpine zone (greater than 8,500 feet elevation) will contribute 5% (7,600 acres) of the forested lands; The Upper Montane zone (between 7,000 and 8,500 feet elevation) will contribute 30% (45,900 acres) of forested lands; The Montane zone (lower than 7,000 feet elevation) will contribute 20% (30,600 acres) of forested lands. Forested lands within TRPA designated urban areas are excluded in the calculation for threshold attainment. Areas of the montane zone within 1,250 feet of urban areas may be included in the calculation for threshold attainment if the area is actively being managed for late seral and old growth conditions and has been mapped by TRPA. A maximum value of 40% of the lands within 1,250 feet of urban areas may be included in the calculation. Because of these restrictions the following percentage of each elevation zone must be attained to achieve this threshold: 61% of the Subalpine zone must be in a late seral or old growth condition; 60% of the Upper Montane zone must be in a late seral or old growth condition; 48% of the Montane zone must be in a late seral or old growth condition.</p>	<p>The number of acres of forest mapped in late seral or old growth condition.</p>	<p>None</p>	1991 Attain Status	1996 Attain Status	2001 Attain Status	
			Subalpine	Non- Attainment	Non- Attainment	Non- Attainment
			Upper Montane	Attainment	Attainment	Attainment
			Montane	Non- Attainment	Non- Attainment	Non- Attainment
V-4 2001 Monitoring Status						
Information for the V-4 threshold came from forest classification by the US Forest Service.						
V-4 2001 Recommendations						
1. TRPA should amend the code to provide greater protection for vegetation during construction activities. (01/02)						
V-4 2006 Attainment Schedule						
By 2011 8% of the forested lands will be in late seral or old growth condition.						

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

The vegetation element is comprised of three thresholds: common vegetation, uncommon vegetation communities, and rare plants. These thresholds, while focusing on an aspect of the region's biology, also help in attainment of other thresholds. The conclusion of this year's evaluation is that none of the vegetation thresholds are in attainment. However, this statement in itself should not be considered alarming. All three of the vegetation thresholds have multiple parts and "attainment" status can only be concluded when all parts are achieved. With that said there are four critical aspects that should be noted for vegetation conservation (and the related threshold issues).

1. The composition, in both age and species, of the general forest is not desirable, and needs management action;
2. Tahoe Yellow Cress is endangered, and needs management action;
3. The vegetation of the region continues to be vulnerable to diseases and pest outbreak, which includes invasive weeds and forest pathologies;
4. Additional plant communities should be added to the unique plant communities' list (second vegetation indicator) and other communities should be studied further for inclusion.

A. V-1: COMMON VEGETATION

Conifers dominate the common vegetation of the Tahoe Region, and this is visually evident from any location. However, the USFS has mapped six types of conifer vegetation types and nine non-conifer vegetation types. Sufficient time has passed since the logging of the Comstock Era to allow for regeneration of the conifer forest of the region. Because most of the region was logged at the roughly the same time, most of the conifer forest is of the same age, and in many places it is assumed that a different vegetation community, such as shrubs, has replaced the pre-logging vegetation. The threshold standards for common vegetation address these conditions by focusing on species richness, relative abundance, and pattern.

1. Evaluation Criteria

The common vegetation threshold is a management standard with three indices and one nondegradation standard. The three indices are species richness, relative abundance, and pattern. There is a nondegradation standard for native deciduous trees, wetlands, and meadows. The indicator to evaluate the first vegetation threshold (common vegetation) is area of vegetation coverage. Both relative abundance of different vegetation types and the pattern of vegetation can be evaluated using this indicator. The data used in this evaluation is based on USFS data.

The thresholds for common vegetation are as follows:

Increase plant and structural diversity of forest communities through appropriate management practices as measured by diversity indices of species richness, relative abundance and pattern.

Species Richness: Maintain the existing species richness of the Basin by providing for the perpetuation of the following plant associations: yellow pine forest, red fir forest, subalpine forest, shrub association, sagebrush scrub association, deciduous riparian, meadow association, wetland association, cushion plant association.

Relative Abundance: Of the total amount of undisturbed vegetation in the Tahoe Basin;

1. Maintain at least 4 percent meadow and wetland vegetation.
2. Maintain at least 4 percent deciduous riparian vegetation.
3. Maintain no more than 25 percent dominant shrub association vegetation.
4. Maintain 15-25 percent of the Yellow Pine Forest in seral stages other than mature.
5. Maintain 15-25 percent of the Red Fir Forest in seral stages other than mature.

Pattern: Provide for the proper juxtaposition of vegetation communities and age classes by:

1. Limiting acreage size of new forest openings to no more than eight acres.
2. Adjacent openings shall not be of the same relative age class or successional stage to avoid uniformity in stand composition and age.

A nondegradation standard to preserve plant communities shall apply to native deciduous trees, wetlands, and meadow while providing for opportunities to increase the acreage of such riparian associations to be consistent with the SEZ threshold.

2. Measurement and Monitoring

Within the Tahoe Basin the U.S. Forest Service has classified the vegetation based on 1997 aerial photographs. These maps have been placed within a Geographic Information System (GIS) and form the basis of the monitoring for this threshold. In addition, public agency records and documented personal communication have also been used to evaluate this threshold. TRPA's Project Review Division records shall be used to assess if there have been impacts to native deciduous trees, wetlands, and meadows.

There is sufficient information to evaluate most of the indices for this threshold, primarily because of the USDA's watershed assessment. However, a classification of the age structure of the general forest has not been completed. It cannot be accurately determined what percentage of the yellow pine and red fir forest is in the mature age class. Supplemental information in the form of size class of yellow pine and red fir will be presented. A determination of the status of these indices can be made with size class information, in combination with the observation of staff.

3. Results of Measurement and Monitoring Efforts

None of the vegetation types noted in the first index have been removed from the Region and, as such, the species richness index is being attained.

The second vegetation index is not in attainment. Table 5-1 lists the values of specified vegetation types. The meadow, deciduous riparian vegetation, and the shrub vegetation types are in attainment. The mature age class dominates both yellow pine and red fir. This determination is not based on direct measurement of the age structure but on supplemental observation and the tree size data. The USFS has mapped the average tree size in the forest stands. This information lends support to the observation that mature trees dominate the forests.

The third index, pattern, is in attainment because the TRPA Code of Ordinances controls the level and size of type of forest openings, and has not allowed any large openings or adjacent type conversion.

It is not completely clear if degradation is occurring to wetlands, or meadows. However, TRPA does not allow new projects to occur in wetland or meadow areas. Indeed, TRPA encourages wetland restoration, and there has been a total of 155.05 acres of SEZ restored from 1996 to 2000. There are provisions in TRPA's Code that can allow public work projects to occur in wetlands, but complete and additional mitigation is required.

Degradation of native deciduous trees does occur and has been observed by TRPA staff. However, the total amount of native deciduous tree removal is not known. Impact to deciduous trees is not completely prohibited in TRPA's Code.

Vegetation Type	Acres	Percent
Meadow ¹	1,660	9% of basin total lands
Deciduous Riparian Vegetation ²	8,818	4.4% of basin total lands
Shrub ²	8,800	17% of basin total lands
Yellow Pine –small size classes ^{2, 3}	6,223	6% of yellow pine forest
Yellow Pine –large size classes ^{2, 3}	93,723	94% of yellow pine forest
Red Fir—small size classes ^{2, 3}	2,467	5% of red fir forest
Red Fir—large size classes ^{2, 3}	49,329	95% of red fir forest
1. Value from the USDA's <i>Watershed Assessment</i> (2000) 2. From 1997 aerial photography; size class is not the standard for this threshold. 3. This information is presented as supplemental information.		

4. Trends

The first index, species richness, will be maintained in attainment, as it is unlikely that any of the named plant associations will be eradicated from the Region. For the second of the indices, relative abundance, there is insufficient data to assess quantitatively the trend towards attainment. However, the USFS has been actively managing the forest landscape, and this management increases the distribution of forest age classes. These activities are producing a trend towards attainment of this index. The third index, pattern, will be maintained in attainment because the cutting of trees and forest openings is controlled by the TRPA Code. The non-degradation standard for wetlands, and meadows will continue to be attained because TRPA Code controls impacts to these communities. The non-degradation standard for native deciduous trees will be in attainment by 2002 if the recommendation to alter the code language to protect these species is adopted.

5. Threshold Attainment Status

Overall, this threshold is not in attainment, because the pattern of vegetation is not diverse enough to meet the threshold indices and is still dominated by 80-120 year old trees. There have not been significant areas cleared greater than two acres within the basin, and as such this index is in attainment. There has been no permitted degradation of these standards for native deciduous trees, wetlands and meadows; however, TRPA staff have observed that non-permitted violations do continue.

This threshold could be in full attainment by 2020 if active ecosystem management is used to alter the composition and diversity of the vegetation communities. The new USFS forest plan, due for adoption in 2007, will reevaluate the existing conditions and develop a new management focus. This plan, if implemented, will likely help achieve this threshold.

6. Effectiveness of Measures in Place

Compliance measures in place are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development. The measures serve to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region, or to promote attainment or maintenance of any threshold or standard. In the case of vegetation, these measures would be aimed at protecting uncommon plant communities or sensitive plants. Supplemental measures are programs, regulations or other measures, which are not currently enacted but, if they were, would assist threshold maintenance and attainment (see Table 5-5, Effectiveness of Compliance Measures). The measures in place are not wholly sufficient to assure threshold attainment. However, with greater enforcement and the recommendations for new programs and regulations this threshold should become in attainment as scheduled.

Category: vegetation protection

Parameter: common vegetation

1. STANDARD: Increase plant and structural diversity of forest communities through appropriate management practices as measured by diversity indices of species richness, relative abundance, and pattern.

Species Richness: Maintain the existing species richness of the Region by providing for the perpetuation of the following plant associations: Yellow pine forest; Red fir forest; Subalpine forest; Shrub association; Sagebrush Scrub association; Deciduous riparian; Meadow associations (wet and dry meadow); Wetland associations (marsh vegetation); and Cushion plant association (alpine scrub).

Relative Abundance: Of the total amount of undisturbed vegetation in the Tahoe Region:

 1. Maintain at least four percent meadow and wetland vegetation.
 2. Maintain at least four percent deciduous riparian vegetation.
 3. Maintain no more than 25 percent dominant shrub association vegetation.
 4. Maintain 15-25 percent of the yellow pine forest in seral stages other than mature.
 5. Maintain 15-25 percent of the red fir forest in seral stages other than mature.

Pattern: Provide for the proper juxtaposition of vegetation communities and age classes by:

 1. Limiting acreage size of new forest openings to no more than eight acres; and
 2. Adjacent openings shall not be of the same relative age class or successional stage to avoid uniformity in stand composition and age.

2. INDICATOR (UNITS): For species richness and relative abundance, the area of plant associations as determined by the Forest Service vegetation inventory. For pattern, the size and location of forest openings as described in federal forest management plans (acres).

3. MONITORING SUMMARY: Within the Tahoe Basin the U.S. Forest Service has classified the vegetation based on 1997 aerial photographs. These maps have been placed within a Geographic Information System (GIS) and form the basis of the monitoring for this threshold. In addition, public agency records and documented personal communication have also been used to evaluate this threshold. TRPA's Project Review Division records shall be used to assess if there have been impacts to native deciduous trees, wetlands, and meadows. ~~Monitoring of forest pattern and~~

~~preservation of plant communities has been completed simultaneously with review of harvest plans and other resource management efforts. Updated LandSat data, compatible with the TEGIS, have been integrated into the TRPA data base. Utilizing LandSat/GIS, common vegetation inventories have been made by species, size class, location and acreage. Mortality in the mixed conifer and east side pine zones have been mapped and inventoried by Boston University Remote Sensing Lab for the years 1988 through 1994. Monitoring has indicated a need to provide additional protections for single old-growth trees in urban areas under pressure from development. The extreme mortality in the white fir and Jeffery pine forests has produced many large forest openings in excess of eight acres and thinned other stands.~~

4. ATTAINMENT STATUS:

Species Richness: Attainment

Relative Abundance: Non-attainment for ~~deciduous riparian (low acreage)~~, yellow pine forest (high acreage) and red fir forest (high acreage)

Pattern: Attainment

5. TARGET DATE: ~~2006~~2020

6. EVALUATION INTERVAL: Five years

- ~~7.~~ 7.—INTERIM TARGETS: 6% of the yellow pine forests will be in seral stages other than mature by 2005, and 6% of red fir forests will be in seral stages other than mature by 2005. ~~By June 30, 1997, December 31, 1997 TRPA will adopt Vegetation Goals and Policies and amend Chapter 71 of the Code to reflect an ecosystem/forest health approach to resource management.~~

8. COMPLIANCE MEASURES: (See Section II for inventory)
 - a. MEASURES IN PLACE: VEGETATION-~~01, 02, 03, 05, 06, 07, 08, 10, 13, 14, 16, and 19~~ 13, 14, 15, 37, 127, 128, 129, 130, 132, 133, 134, 136, 137, 139, 140, 141, 142, 143, 151
 - b. EFFECTIVENESS OF MEASURES IN PLACE: ~~(02) Memoranda of understanding have been completed with the Forest Service, California State Parks, Nevada State Parks, CA~~

~~Department of Forestry, Nevada
Division of Forestry and Caltrans and
Nevada Department of Transportation,
for dead and diseased tree removal.
Chapter 4 has been amended to exempt
all dead tree removals and dying tree
removals, on parcels 20 acres or less.
Filing fees have been eliminated for
resource management activities. The
Forest Health Consensus Group was
formed to educate the public and to
review and streamline the resource
management aspects of the Code.
(03) Broader use of prescribed burning
has occurred in conformance with
Chapter 72. Staff has reviewed
prescribed burning plans from state and
local agencies. Large Forest Service
salvage operations have encompassed
pile and broadcast burning as a means
of achieving desirable fuel loadings.
(05) See (02) above.
(07) Public utility districts have
advanced their water conservation
programs through direct mailings,
rebates for purchase of water
conservation fixtures, support of
demonstration gardens and regulation of
watering days.
(08) Cooperation and involvement of
TRPA in groups such as the Forest
Health Consensus Group have assisted
land management agencies in
managing forest vegetation. Priority
areas for treatment have been identified
using LandSat data and implementation
of treatment prescriptions has begun.
The measures in place are generally
effective, but not wholly effective (see
Table 5-5 for discussion).
Recommendations and additional
programs will be needed to assure the
attainment of this threshold.~~

- c. SUPPLEMENTAL MEASURES:
VEGETATION -- ~~146 01 and 02~~
 - d. EFFECTIVENESS OF SUPPLEMENTAL
MEASURES: Supplemental measures are
expected to be ~~highly~~-effective.
9. ADEQUACY OF COMPLIANCE
MEASURES: The compliance measures
have not provided for a pro-active approach
to forest management and attainment of a
healthy forest situation in attainment with
desired future conditions. The measures
have been a reaction to events in the

resources of the Region brought about by
fire exclusion and past logging practices.
Revisions to the compliance measures in
place are recommended to provide
management strategies and direction for
land managers to restore the health of the
Region's forests. Implementation of
supplemental measures is recommended.
Forest restoration projects, with the goal of
attaining desired future conditions, must be
supported to achieve the thresholds and the
recommended old-growth threshold.

B. V-2: UNCOMMON PLANT COMMUNITIES

The second vegetation threshold focuses on important and uncommon plant communities within the Tahoe Region. The initial environmental threshold study (TRPA, 1982) noted that the protection of uncommon plant communities was an important step in maintaining and increasing the diversity of vegetation within the Tahoe Region. These areas are to be protected for the scientific, ecological or scenic values they provide.

1. Evaluation Criteria

The uncommon plant communities' threshold is a numerical standard. Four communities have been identified, and these communities are not to be degraded. The indicator to evaluate the second vegetation threshold (uncommon plant communities) is unitless, meaning that there is no single methodology or value to ascertain if the threshold is in attainment (i.e. non-degradation). Agency staff will evaluate the status of each uncommon plant community. If reliable reports of negative impacts are confirmed, the community in question will not be counted towards the numerical standard and the threshold will not be in attainment.

The threshold for uncommon plant communities is as follows:

Provide for the nondegradation of the natural qualities of any plant community that is uncommon to the Basin or of exceptional scientific, ecological, or scenic value. This threshold shall apply but not be limited to (1) the deep-water plants of Lake Tahoe, (2) Grass Lake (sphagnum bog), (3) Osgood Swamp, and (4) the Freel Peak Cushion Plant Community.

Additional effort has been focused on ascertaining if other uncommon plant communities exist within the Tahoe Region and if these communities deserve consideration as a threshold community. The U.S. Forest Service and other local experts have been surveyed to address this issue.

2. Measurement and Monitoring

The plant communities of Grass Lake, Osgood Swamp, and Freel Peak Cushion Plant are protected under the jurisdiction of the USFS, and have been monitored by agency staff. Staff at various times have visited the sites and noted any problems with the communities. These site visits have resulted in a qualitative assessment of the quality and the impacts to the communities.

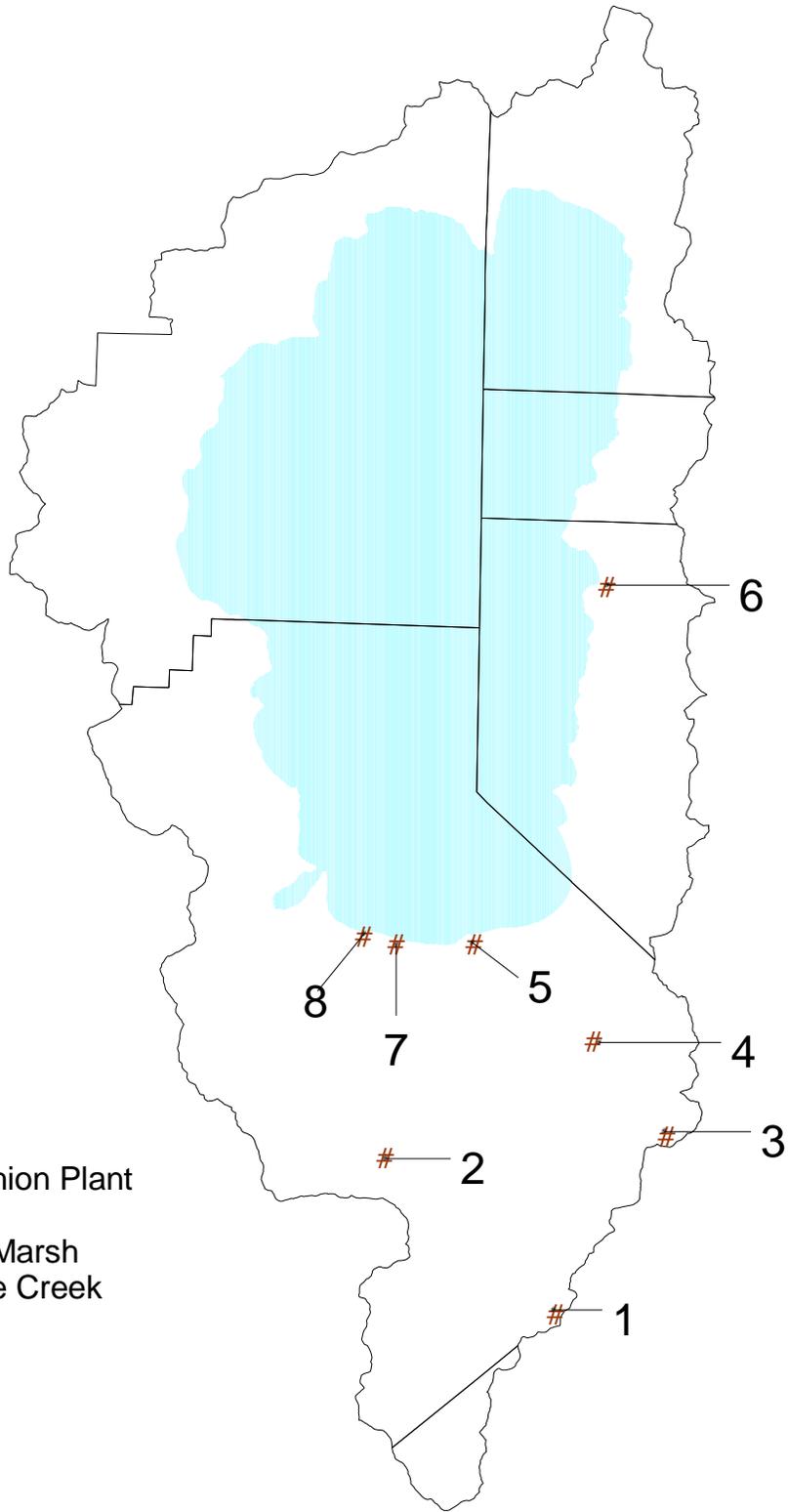
The deep-water plants of Lake Tahoe have not been surveyed. No assessment of the health, trends or impacts has been conducted. The status of deep-water plants will not be assessed for the 2001 Threshold Evaluation. In the TRPA Code, subsection 32.3.D states that if there is insufficient information available to make a determination, the status will not be assessed. Subsection 32.3.E states that additional factors may be used in assessing the status of a threshold, however there is not enough information to help assess the deep-water plant communities.

3. Results of Measurement and Monitoring Efforts

The status of the uncommon plant communities is described in Table 5-2. The location of these communities is show in Figure 5-1.

Table 5-2. Status of Uncommon Plant Communities

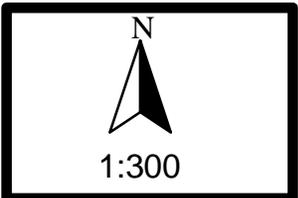
Plant Community	Status
Grass Lake	Grass Lake is designated as a "Research Natural Area" by the USFS. This designation affords the area with the fullest protection the USFS provides. Although there are small minor impacts to the area, there is no serious threat to the community. However, impacts by visitors can harm this area.
Osgood Swamp	There are few negative impacts to Osgood Swamp. The area is infrequently visited, except by local neighbors. The area is frequently used by dog walkers, however the impact of these dogs is unknown. Snowmobiles have been observed traversing the area. During times of shallow snow cover these snowmobiles could drastically harm the community.
Freel Peak Cushion Plant Community	In recent times more and more visitors are hiking and biking to the top of Freel Peak and have become a problem. There is no single route or path to the top of the peak, thus many new trails are constantly being created. The USFS has observed that the creation of these new trails is clearly harming the cushion plant community by increasing the trampling.
Deep Water Plants	Not evaluated
Additional Communities Evaluated	
Hell Hole	Hell Hole is a boreal bog that is roughly 10-15 acres in size. The immediate landscape has never been logged, but has been grazed. As a bog this area is a unique community. Hell Hole also supports the only know location of mountain yellow-legged frogs (<i>Rana mucosa</i>) in the Tahoe basin. This area is recommended as a threshold location as an uncommon plant community. In addition it is recommended that grazing be removed from this area.
Upper Truckee Marsh	Upper Truckee Marsh is the largest riparian wetland complex in the region, and one of the largest in the Sierras. This area is already a wildlife (waterfowl) threshold location. The complex also contains Tahoe Yellow Cress on the beach next to the marsh. The Lake Tahoe Watershed Assessment (USDA, 2000) identifies nine types of Significant Ecological Areas in the Region; marshes such as Upper Truckee Marsh and Taylor Creek Marsh were specifically identified as examples of this rare community type (page 499). It should also be noted that both Taylor Creek Marsh and Upper Truckee Marsh were ranked as "hotspots of two or more species groups" in terms of species diversity (page 518). This area is recommended as a threshold location as an uncommon plant community.
Aspen Stands	Aspen stands in the Region are an important vegetation type, however, it is difficult to identify any one stand as unique. Aspen stands should be protected by the non-degradation standard of the first threshold. Specific protection should be identified to aspen stands in the thresholds of the next Regional Plan.
Taylor Creek Marsh	Taylor Creek is important habitat of bald eagles and other waterfowl. The Lake Tahoe Watershed Assessment (USDA, 2000) identifies nine types of Significant Ecological Areas in the Region; marshes such as Upper Truckee Marsh and Taylor Creek Marsh were specifically identified as examples of this rare community type (page 499). It should also be noted that both Taylor Creek Marsh and Upper Truckee Marsh were ranked as "hotspots of two or more species groups" in terms of species diversity (page 518). This area is recommended as a threshold location as an uncommon plant community.
Pope Marsh	Pope Marsh is one of five named Significant Ecological Areas identified in the Lake Tahoe Watershed Assessment (USDA, 2000). In addition, Pope Marsh is an area identified by in the <i>Lake Tahoe Watershed Assessment</i> with four adjacent communities (page 519-520). This illustrates that Pope Marsh occupies an important position in the landscape to increasing diversity of communities within the Region. This area is recommended as a threshold location as an uncommon plant community.
Meeks Meadow and Page Meadows	All meadows, including Meeks and Page, are important, and are protected by the non-degradation standard of the first vegetation threshold. Specific protection should be identified for meadows in the thresholds of the next Regional Plan.
Slaughterhouse Canyon	While this canyon does provide a good diversity of habitats, it is not evident that this area is unique.



1. Grass Lake
2. Osgood Swamp
3. Freel Peek Cushion Plant
4. Hell Hole
5. Upper Truckee Marsh
6. Slaughter House Creek
7. Pope Marsh
8. Taylor Creek



Figure 5-1
Locations of Plant Communities
Considered in this Evaluation



4. Trends

Grass Lake and Osgood Swamp are protected and are not threatened at the present. The Freel Peak cushion plant community is being degraded, and the degradation is likely to continue and possibly increase. With the projected increase in visitors to the Tahoe Region and the increase in backcountry recreation it is reasonable to assume that more and more people will attempt to summit Freel Peak. This increase in summit attempts of Freel Peak is the basis of predicting an increase in degradation of the cushion plant community. USFS staff has confirmed these impacts and trends.

The deep-water plant communities have not been assessed. However, it is likely that the reduction in lake clarity and the projected reduction in clarity will reduce the area available as habitat for this community. While this light attenuation is a fact of losing lake clarity, it is not clear what impact this may have on the deep-water plant community. More research and information is needed to understand this community.

5. Threshold Attainment Status

The second vegetation threshold, uncommon plant communities, is in attainment. The status of the deep-water plant community is unknown.

6. Effectiveness of Measures in Place

Compliance measures in place are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development. The measures serve to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region, or to promote attainment or maintenance of any threshold or standard. In the case of vegetation, these measures would be aimed at protecting uncommon plant communities or sensitive plants. Supplemental measures are programs, regulations or other measures, which are not currently enacted but, if they were, would assist threshold maintenance and attainment (see Table 5-5). The measures in place are not wholly sufficient to assure threshold attainment. However, with greater enforcement and the recommendations for new programs and regulations this threshold should become in attainment as scheduled.

Category: vegetation protection

Parameter: uncommon plant communities

1. STANDARD: Provide for the nondegradation of the natural qualities of any plant community that is uncommon to the Region or of exceptional scientific, ecological, or scenic values. This threshold shall apply but not be limited to (1) the deep water plants of Lake Tahoe, (2) Grass Lake (sphagnum bog), (3) Osgood swamp, ~~and~~ (4) the Freel Peak Cushion Plant community, ~~(5) Hell Hole, (6) Upper Truckee Marsh, (7) Taylor Creek Marsh, and (8) Pope Marsh.~~
2. INDICATOR (UNITS): Presence of the individual species which comprise the community. Natural qualities of uncommon plant communities as determined by inspection by qualified experts (unitless).
3. MONITORING SUMMARY: The monitoring program consists of periodic inspection of the mapped communities at Grass Lake, Osgood Swamp, and Freel Peak, ~~and observation of the deep water plants by a remote operated vehicle (ROV). For details, see the 1996 Evaluation.~~
~~Since the 1991 Evaluation, a literature search has been conducted through the University of Nevada, but few papers or research exist on deepwater plants. The continued existence of deepwater plants has been documented. TRPA has coordinated with others interested in completing underwater surveys of Lake Tahoe with a ROV. The mapping of possible habitat sites may be accomplished by integrating mapped lake bottom substrate types with other limiting environmental factors affecting deepwater plant species.~~
4. ATTAINMENT STATUS: Attainment. With respect to deepwater plant beds, their status is unknown. ~~continued existence has been documented by an ROV. There is no evidence that the plant species are threatened; however, it~~ It is speculated that the very deepest plant beds may have ceased to exist, due to the gradual loss of Lake Tahoe's clarity. Inshore populations could be affected by invasion of Eurasian water milfoil. The dragging of anchors from fishing boats has disturbed some plant beds.
5. TARGET DATE: Not applicable

6. EVALUATION INTERVAL: Five years
7. INTERIM TARGETS: By January 2003, TRPA will fund a research program to assess deepwater plants and develop monitoring program. ~~None proposed at this time.~~
8. COMPLIANCE MEASURES: (See Section II for inventory)
 - a. MEASURES IN PLACE: VEGETATION - ~~02, 04, 06, and 18~~ 37, 127, 129, 130, 131, 133, 135, 136, 137, 140, 141,
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The measures in place are generally effective, but not wholly effective (see Table 5-5 for discussion). Recommendations and additional programs will be needed to assure the continued attainment of this threshold. Measures which control or avoid vegetation disturbance are the most effective. Projects which enhance water quality are effective at mitigating impact of reduced light transmittance to deep water plants. Mitigation or remedial actions are less desirable than avoidance. Since the 1994 Evaluation, Grass Lake has been designated as a Research Natural Area by the Forest Service.
 - c. SUPPLEMENTAL MEASURES: VEGETATION - ~~03, 04, and 05~~ 147 and 148
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Supplemental measures are generally expected to be highly effective.
9. ADEQUACY OF COMPLIANCE MEASURES: Compliance measures in place have been adequate to prevent the degradation of the uncommon plant communities, although there is concern for the long-term health of the deepwater plant community and the Freel Peak Cushion Plant community. At this point in time, the greatest measure of protection is due to the remoteness of habitat for the uncommon plants, including the deepwater plants, although the in-shore limits of deepwater plants could be out-competed by Eurasian water milfoil. Plants found at the South Shore sea mounds at a depth of approximately 100 feet have been greatly impacted by dragging of anchors from fishing boats. Should future monitoring indicate that any uncommon plant community is, or is likely to be, adversely affected, supplemental measures will be implemented. Funding needs to be obtained to map and further

define the deepwater plant community. If it is determined that the spread of Eurasian water milfoil is impacting inshore limits of deepwater plant populations, implementation of water milfoil control or eradication measures should be considered. [An increase in use of the Free! Peak area could result in more trails which could result in impacting the cushion plant community.](#)

C. V-3: SENSITIVE PLANTS

The third vegetation threshold focuses on rare and sensitive plants within the Tahoe Region. The initial environmental threshold study (TRPA, 1982) noted that the protection of sensitive plants was an important step in maintaining and increasing the diversity of vegetation within the Tahoe Region. These plants are to be protected for the scientific, ecological or scenic values they provide.

1 Evaluation Criteria

The sensitive plants threshold is a numerical standard. Five sensitive plants have been considered in the past threshold evaluations and are specifically noted in the threshold language. A minimum number of populations of these species must be maintained to attain this threshold. The indicator to evaluate the third vegetation threshold (sensitive plants) is unitless, meaning there is no single methodology or value to ascertain if the threshold is in attainment. The status of each sensitive plant species will be the number of known population sites identified by agency staff or credible and reliable reports.

The thresholds for sensitive plants are as follows:

Maintain a minimum number of population sites for each of five sensitive plant species.

Species	Number of Population Sites
<i>Carex paucifructus</i>	1
<i>Lewisia pygmaea v. longipetala</i>	2
<i>Draba asterophora v. macrocarpa</i>	2
<i>Draba asterophora v. asterophora</i>	5
<i>Rorippa subumbellata</i>	26

The 1991 and 1996 threshold evaluations both recommended that *Carex paucifructus* be removed from the list of thresholds. The removal of this species is a recommendation to be completed within the next six months; therefore it is not considered further in this evaluation. TRPA staff has conferred with USFS botanists and local experts to confirm that this species has not been found in the region.

2. Measurement and Monitoring

The population sites for *Draba asterophora v. macrocarpa*, and *Draba asterophora v. asterophora* are protected under the jurisdiction of the U.S. Forest Service. These sites have been monitored both informally and with periodic surveys by agency staff. Staff at various times have visited the sites and noted any problems with the species. These site visits have resulted in a qualitative assessment of the quality and impacts to the species.

The population site for *Lewisia pygmaea v. longipetala*, is protected under the jurisdiction of the USFS, and has been monitored by agency staff. Staff, at various times, have visited the sites and noted any problems with the species. These site visits have resulted in a qualitative assessment of the quality and impacts to the species.

Annual surveys have been done for Tahoe Yellow Cress each year from 1993 until the present. Figure 5-2 is a map for the annual surveys, and Table 5-3 depicts the number of populations found from 1990 to 2000.

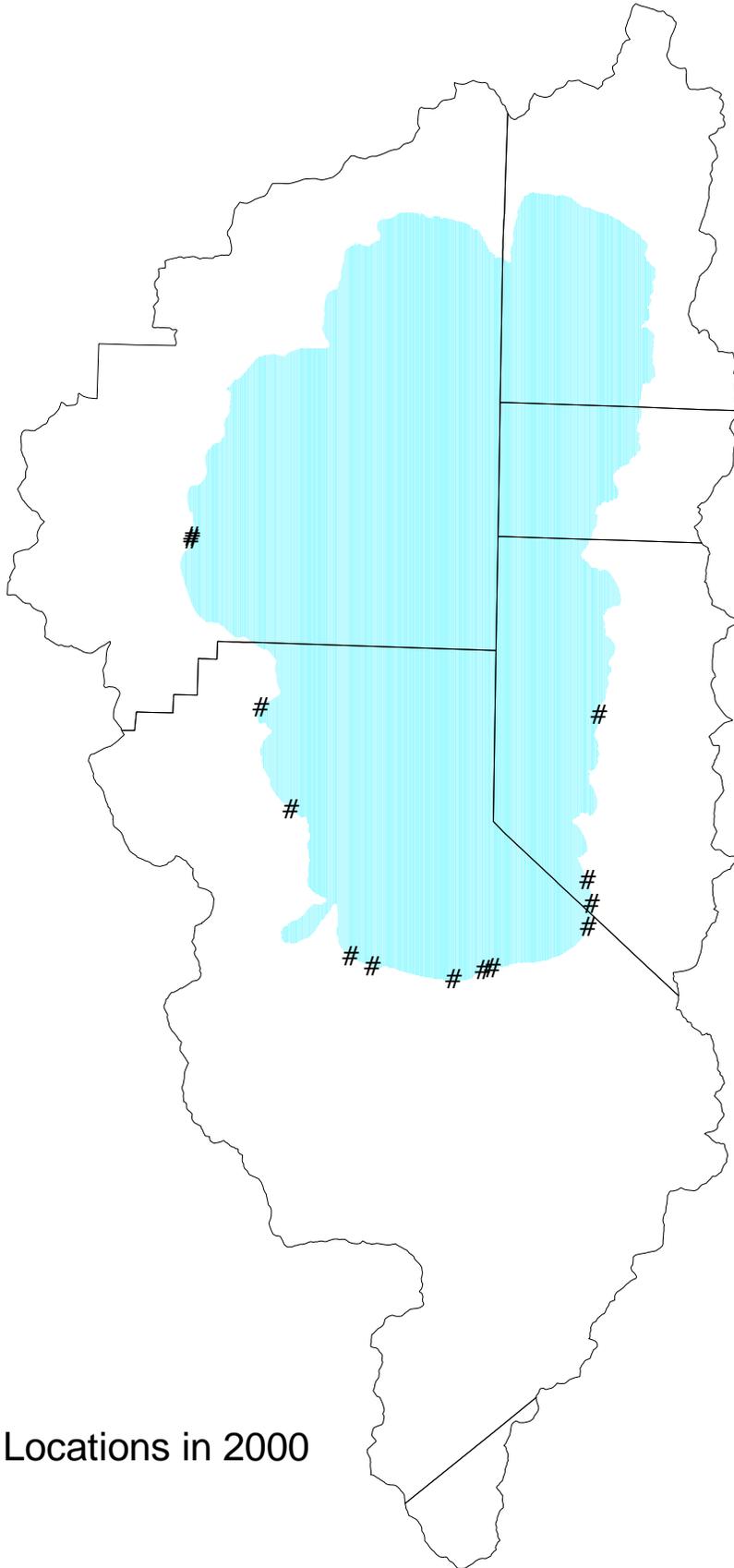
3. Results of Measurement and Monitoring Efforts

The U.S Forest Service reports that there has been no significant degradation of *Lewisia pygmaea v. longipetala*, *Draba asterophora v. macrocarpa*, and *Draba asterophora v. asterophora*. The status of these species is shown in Table 5-4.

The number of population sites where Tahoe Yellow Cress has been found ranges from a high of 32 sites in 1993 to a low of eight sites in 1995-96. During the most recent survey (2000), 14 population sites were found.

Year	Number of Population Sites
1993	32
1994	30
1995	8
1996	8
1997	10
1998	10
1999	12
2000	14

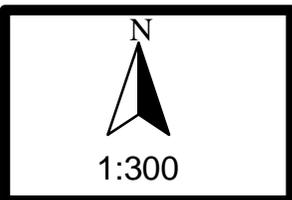
Sensitive Plant	Threshold Sites	Known Sites	Status
<i>Lewisia pygmaea longipetala</i> (Long-petaled Lewisia)	2	4	There have been no formal studies of this plant, and given its remote location, impacts to this plant are unlikely. This plant is in attainment.
<i>Draba asterophora v. macrocarpa</i> (Cup Lake Draba)	2	2	There have been no formal studies of this plant, and given its remote location, impacts to this plant are unlikely. This plant is in attainment.
<i>Draba asterophora v. asterophora</i> (Lake Tahoe Draba)	5	8	There have been no formal studies of this plant, and given its remote location, impacts to this plant are unlikely. This plant is in attainment.
<i>Rorippa subumbellata</i> (Tahoe yellow-cress)	26	14	This species is the subject of an intensive effort to develop a conservation strategy, and a great deal more is known about this plant. There is a greater appreciation of the biology of this species and the risk of extinction. This species is not in attainment.
Additional Species Evaluated			
<i>Arabis rigidissima v. demota</i> (Galena Creek rockcress)	--	7	It is not completely clear at how many locations this species has been found, but USFS has mapped this species in 7 locations. This plant is identified as a focal species in the <i>Lake Tahoe Watershed Assessment</i> , and is listed as a species of concern by USFS. This plant is proposed as a threshold species.
<i>Epilobium howellii</i> (Subalpine fireweed)	--	0	This species has not been found in the Region.
<i>Silene invisa</i> (Short-petaled campion)		3	The USFS has mapped three locations for this species in the southern part of the region. Until more information is known about this species it is not proposed as a threshold species.



TYC Locations in 2000



Figure 5-2
Locations of Tahoe Yellow Cress
From 2000 Survey Data



4. Trends

There has been no significant change in the number of population sites for *Lewisia pygmaea logipetala*, *Draba asterophora v. macrocarpa*, and *Draba asterophora v. asterophora*. On the other hand, despite variation from year to year, Tahoe Yellow Cress is declining, and without the adoption of a conservation strategy that coordinates conservation efforts, the species will likely continue to decline.

5. Threshold Attainment Status

Overall, this threshold is not in attainment, because the numbers of Tahoe Yellow Cress population sites have declined to below the threshold standard, and the trend for Tahoe Yellow Cress is to continue to decline. The other sensitive plant species are in attainment because there are sufficient population sites to meeting the threshold standards.

This threshold could be in full attainment by 2006 if the conservation strategy for Tahoe Yellow Cress is approved and fully implemented, and no unforeseen impacts occur to the population sites of *Lewisia pygmaea logipetala*, *Draba asterophora v. macrocarpa*, and *Draba asterophora v. asterophora*.

6. Effectiveness of Measures in Place

Compliance measures in place are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development. The measures serve to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region, or to promote attainment or maintenance of any threshold or standard. In the case of vegetation, these measures would be aimed at protecting uncommon plant communities or sensitive plants. Supplemental measures are programs, regulations or other measures, which are not currently enacted but, if they were, would assist threshold maintenance and attainment (see Table 5-5). The measures in place are not wholly sufficient to assure threshold attainment. However, with greater enforcement and the recommendations for new programs and regulations this threshold should become in attainment as scheduled.

Category: vegetation protection
Parameter: sensitive plants

~~only six sites. Only four of 19 threshold sites inspected supported Rorippa.~~

1. STANDARD: Maintain a minimum number of population sites for each of five sensitive plant species.

Species	Number of Population Sites
Carex paucifructus	4
Lewisia pygmaea logipetala	2
Draba asterophora v. macrocarpa	2
Draba asterophora v. asterophora	5
Rorippa subumbellata	26
<u>Arabis rigidissima</u>	<u>7</u>

2. INDICATOR (UNITS): The number of population sites depicted on TRPA official maps that are maintained as suitable habitat for sensitive plant species as determined by field inspection by a qualified expert (unitless).

3. MONITORING SUMMARY: Monitoring consists of ongoing inspections by TRPA, the Forest Service, and California State Lands Commission and case-by-case inspection by TRPA in project review site visits, of *Rorippa subumbellata* population sites for evidence of disturbance, and annual inspection of sites not otherwise visited. Higher Lake levels since 1995 have impacted some of the mapped *Rorippa* populations and possibly allowed other dormant populations to emerge.

~~The Forest Service inventories of sensitive plant communities, and TRPA review and inspection of resource management activities which have occurred during this evaluation period, have identified sensitive plant populations. Identification of populations required the introduction of sensitive plant exclusion zones. Project monitoring which results in any discovery of a TRPA sensitive species or species of interest requires immediate reporting and implementation of protection measures in accordance with the Code.~~

~~All threshold *Rorippa subumbellata* populations were surveyed by TRPA staff during 1993 and 1994, and the condition of each population was verified. Those surveys found the threshold to be in attainment; however, in 1994, of the of the 28 population sites found, only 17 of the original 26 threshold population sites supported *Rorippa subumbellata*.~~

~~During 1995, a portion of previously known and threshold population sites were inspected. Of the 29 sites inspected, *Rorippa* was found at~~

4. ATTAINMENT STATUS: Non-attainment for *Rorippa* based upon limited surveys of *Rorippa subumbellata* during 1995. Attainment for *Lewisia* and *Draba* based upon Forest Service inventories and TRPA project monitoring. ~~Non-attainment for *Carex paucifructus* is~~ recommended to be removed as a threshold species. This plant has not been observed in the Tahoe Region since early this century and it is now thought that the identification and description may have been in error.

5. TARGET DATE: 2006

6. EVALUATION INTERVAL: Five years

7. INTERIM TARGETS: By September 2002 TRPA will consider for adoption the Tahoe yellow cress conservation strategy. By August 2003 the TYC technical advisory group will facilitate the planting of 4,000 seedlings of Tahoe yellow cress. ~~By March December 31, 1997, TRPA will prepare a study and recommendation regarding adding *Arabis rigidissima* v. *demota* and *Silene invisa* to the list of sensitive plant species included in the threshold. See discussion below. By July 1, 1997-1998, the California State Lands Commission, in cooperation with affected public and private entities, should implement the Stewardship Plan for *Rorippa*. By June 30, 2001, TRPA should seek to remove *Carex paucifructus* from the list of sensitive plants protected by the threshold.~~

8. COMPLIANCE MEASURES: (See Section II for inventory)

- a. MEASURES IN PLACE: VEGETATION - ~~04, 07, 08, 09, 11, 12, 13, 14, and 15~~ 13, 15, 37, 127, 129, 130, 131, 133, 134, 135, 136, 137, 138, 141, 142, 145

- b. EFFECTIVENESS OF MEASURES IN PLACE: The measures in place are generally effective, but not wholly effective (see Table 5-5 for discussion). Recommendations and additional programs will be needed to assure the attainment of this threshold. Measures which prevent disturbance of sensitive plants and their habitat are most effective. Mitigation and remedial actions are less desirable. Compliance actions have been successfully

~~pursued in some cases. Compliance measure (13) states that the use of lawns or ornamental vegetation in the shorezone is discouraged. This policy language should be strengthened, and possibly replaced with language which requires the use of native plants in the shorezone.~~

- c. SUPPLEMENTAL MEASURES: VEGETATION - [None proposed at this time.](#)~~06 and 07~~
- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: [None proposed at this time.](#)~~Supplemental measures are generally expected to be highly effective.~~

9. ADEQUACY OF COMPLIANCE MEASURES:

Compliance measures to date have been [partially](#) effective in preserving habitats of sensitive plant species. These species occur only in the backdrop country not subject to development, except for *Rorippa subumbellata* which grows only along the lakeshore.

~~While the 1991 Evaluation recommended listing *Arabis rigidissima v. demota* and *Silene invisa* as sensitive plants, the Forest Service has already classified them both as sensitive, and they are listed as such within the Tahoe Region. Listing with the Forest Service requires that sensitive plant species must receive special management emphasis to insure their viability and that species do not become threatened or endangered because of Forest Service actions. The Forest Service has six plants classified sensitive by the Regional Forester, and the list includes all five species identified by TRPA as being sensitive.~~

While many of the sensitive species occur in remote and normally inaccessible areas, an increase in resource management projects potentially affects sensitive plant sites. TRPA listing and Forest Service staff cooperation on remotely located resource management projects enhances preservation of obscure population sites.

~~*Rorippa* plants were abundant in 1989, probably due to the low Lake level and the expanse of available habitat. The "Lake Tahoe Shorezone Development Cumulative Impact Analysis Draft Environmental Impact Statement" notes that future development of shorezone structures may occur in marginal fish habitat. This habitat is also shared by *Rorippa subumbellata*. Should future monitoring indicate that any sensitive plant species or habitat is, or is likely to be adversely affected, supplemental measures will be identified.~~

~~The 1991 Evaluation recommended that additional *Rorippa subumbellata* habitat sites be added to the threshold. The addition of sites suggests that the threshold may be less likely to be met during high Lake levels, however, greater protection of the species may be afforded.~~

TRPA staff awareness and ability to identify sensitive species is essential for non-degradation of existing sites as well as identification of new population sites. Staff training should be conducted.

D. V-4: LATE SERAL/OLD GROWTH ECOSYSTEMS

The fourth vegetation threshold focuses on late seral/old growth forests within the Tahoe Region. The Governing Board adopted this threshold in May 2001. Larger trees, complex structure, and down-woody material characterize these forest types. In addition these areas are critical habitat for a number of sensitive wildlife species.

1. Evaluation Criteria

The late seral/old growth threshold is a numerical standard. The threshold language articulates acreages for three elevation zones. The indicator to evaluate the fourth vegetation threshold (late seral/old growth) is the acreage of forest types within the Region. In specific, 7,600 acres in the subalpine zone, 45,900 acres in the upper montane zone, and 30,600 acres in the montane zone shall be in late seral/old growth. This assessment shall be based on the USFS' vegetation classification. This classification is scheduled to occur every five years.

The thresholds for late seral/ old growth ecosystems are as follows:

Attain and maintain a minimum percentage of 55 percent by area of forested lands within the Tahoe Region in a late seral or old growth condition, and distributed across elevation zones. To achieve the 55 percent, the elevation zones shall contribute as follows:

- *The Subalpine zone (greater than 8,500 feet elevation) will contribute 5 percent (7,600 acres) of the forested lands;*
- *The Upper Montane zone (between 7,000 and 8,500 feet elevation) will contribute 30 percent (45,900 acres) of forested lands;*
- *The Montane zone (lower than 7,000 feet elevation) will contribute 20 percent (30,600 acres) of forested lands.*

Forested lands within TRPA designated urban areas are excluded in the calculation for threshold attainment. Areas of the montane zone within 1,250 feet of urban areas may be included in the calculation for threshold attainment if the area is actively being managed for late seral and old growth conditions and has been mapped by TRPA. A maximum value of 40 percent of the lands within 1,250 feet of urban areas may be included in the calculation.

Because of these restrictions the following percentage of each elevation zone must be attained to achieve this threshold:

- *61 percent of the Subalpine zone must be in a late seral or old growth condition;*
- *60 percent of the Upper Montane zone must be in a late seral or old growth condition;*
- *48 percent of the Montane zone must be in a late seral or old growth condition.*

2. Measurement and Monitoring

The *Watershed Assessment* (2000) specifically addressed the amount and condition of late seral/old growth forests within the Tahoe Region. The USFS plans to reclassify the region every five years from aerial photographs. This data will be used to analyze the amount of late seral/old growth forests in the future.

3. Results of Measurement and Monitoring Efforts

According to the *Watershed Assessment* (2000), roughly 5 percent of the region's forests are in a late seral/old growth condition. This estimate is most likely accurate within 1 percent, given the variation and limitations of aerial photograph classification.

4. Trends

As this is a new threshold, previous data was not collected for this threshold. However, given that the USFS and both states manage the vast majority of the forest lands and that they have not been removing significant amounts of large trees, it can be assumed that there has been little change in the last 20 years in the amount of late seral/old growth forests. As the forest stands age, an increasing percentage will be classified as late seral/old growth.

5. Threshold Attainment Status

This threshold is not in attainment because the amount of acres of late seral/old growth forests is too small. It is estimated that only 5 percent of forests are in a late seral/old growth condition, far below the 55 percent threshold standard.

This threshold could be in full attainment by 2060 if an effort is made by the land managing agencies to plan and manage for late seral/old growth conditions.

6. Effectiveness of Measures in Place

Compliance measures in place are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development. The measures serve to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region, or to promote attainment or maintenance of any threshold or standard. In the case of vegetation, these measures would be aimed at protecting uncommon plant communities or sensitive plants. Supplemental measures are programs, regulations or other measures, which are not currently enacted but, if they were, would assist threshold maintenance and attainment (see Table 5-5).

Category: vegetation protection
Parameter: late seral/old growth forests ecosystems

1. **STANDARD:** Attain and maintain a minimum percentage of 55% by area of forested lands within the Tahoe Region in a late seral or old growth condition, and distributed across elevation zones. To achieve the 55%, the elevation zones shall contribute as follows:
- The Subalpine zone (greater than 8,500 feet elevation) will contribute 5% (7,600 acres) of the forested lands;
 - The Upper Montane zone (between 7,000 and 8,500 feet elevation) will contribute 30% (45,900 acres) of forested lands;
 - The Montane zone (lower than 7,000 feet elevation) will contribute 20% (30,600 acres) of forested lands.

Forested lands within TRPA designated urban areas are excluded in the calculation for threshold attainment. Areas of the montane zone within 1,250 feet of urban areas may be included in the calculation for threshold attainment if the area is actively being managed for late seral and old growth conditions and has been mapped by TRPA. A maximum value of 40% of the lands within 1,250 feet of urban areas may be included in the calculation.

Because of these restrictions the following percentage of each elevation zone must be attained to achieve this threshold:

- 61% of the Subalpine zone must be in a late seral or old growth condition;
- 60% of the Upper Montane zone must be in a late seral or old growth condition;
- 48% of the Montane zone must be in a late seral or old growth condition;

2. **INDICATOR (UNITS):** The number of acres of forest mapped in late seral or old growth condition.

3. **MONITORING SUMMARY:** The USFS classified the forested communities in 1998 and will do so every five years.

4. **ATTAINMENT STATUS:** This threshold is not in attainment because of the small amount of forest in late seral or old growth condition

5. **TARGET DATE:** 2060

6. **EVALUATION INTERVAL:** 10 years

7. **INTERIM TARGETS:** By 2005, 6% of the forested lands will be in late seral or old growth condition.

8. **COMPLIANCE MEASURES:** (See Section II for inventory)

- a. MEASURES IN PLACE: VEGETATION – 128, 129, 141, 142
- b. EFFECTIVENESS OF MEASURES IN PLACE: See Table 5-5 for discussion.
- c. SUPPLEMENTAL MEASURES: VEGETATION - None proposed at this time.
- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: None proposed at this time.

9. **ADEQUACY OF COMPLIANCE MEASURES:** This threshold was adopted in May 2001; there has not been adequate time to evaluate the adequacy of the compliance measures.

Table 5-5. Effectiveness of Measures in Place for the Vegetation Threshold

Compliance Measure	Effectiveness				Explanation	Recommendation
	CV ¹	UPC ²	SP ³	LS/OG ⁴		
(13) Restrictions on SEZ encroachment and vegetation alteration: No new land coverage or other permanent disturbance is permitted in SEZs except for certain public outdoor recreation facilities, public service facilities, projects which require access across SEZs, new development in man-modified SEZs, and SEZ restoration and erosion control projects, provided the TRPA makes required findings and offsetting restoration is provided. See Chapter 20 of the Code.	Yes		Yes			
(14) SEZ restoration program: The SEZ restoration program is set forth in Volume III of the 208 Plan and Volumes I-IV of the updated EIP.	Yes					
(15) SEZ setbacks: All new development must be set back from the edge of SEZs to preserve the integrity of the SEZ and the important values of the edge zone created by the SEZ and surrounding vegetation types. Required setbacks are identified in Chapter 37 of the Code.	Yes		Yes			
(37) BMP implementation program--livestock confinement and grazing: Farm and ranch structures, grazing, range pasture management, and range improvement are primary resource management uses and are permissible as set forth in the Plan Area Statements (Code Chapter 18). TRPA approval is required for a new grazing or confinement project. (Code Chapter 73). Application of BMPs is required of owners and operators of livestock confinement (corrals) and grazing uses. The implementation program is set forth in Chapter 25 of the Code. The required practices are described in the BMP Handbook and the Landscape Guide.	Yes	Yes	Yes			
(127) Chapter 64, Vegetation Protection During Construction: Limits disturbance of vegetation at project sites and provides for protection and revegetation of areas disturbed by construction.	Partial	Partial	Partial		Currently, most of the protection for vegetation during construction is defined under guidelines and not in the TRPA Code of Ordinances. Both Project Review and Compliance issues are more difficult with permitting based on guidelines.	A

Table 5-5. Effectiveness of Measures in Place for the Vegetation Threshold (continued)

Compliance Measure	Effectiveness				Explanation	Recommendation
	CV ¹	UPC ²	SP ³	LS/OG ⁴		
(128) Chapter 71, Tree Removal: Specific standards for tree removal, tree-cutting practices, logging in SEZs, and yarding. Specifies permissible reasons for tree removal and minimum acceptable stocking levels. Limits the size of patch cuts.	Partial			Yes	Currently, most of the protection for vegetation during construction is defined under guidelines and not in the TRPA Code of Ordinances. Both Project Review and Compliance issues are more difficult with permitting based on guidelines.	A
(129) Chapter 72, Prescribed Burning and Chapter 75, Sensitive and Uncommon Plant Protection and Fire Hazard Reduction: Regulates the use of prescribed burning, limiting it to seral stage management, fuels management, wildlife habitat management, silviculture, or pest control.	Partial	Yes	Yes	Partial	Currently the Code section on wildfire is reserved and not yet written. This issue is critical, because a large amount of vegetation manipulation is undertaken for fuel reduction. TRPA is recommending that this section be developed to identify fuel protection strategies.	B
(130) Chapter 74, Remedial Vegetation Management: Provides for remedial management of vegetation to achieve environmental thresholds for species, structural diversity in vegetation, and to maintain the health of vegetation.	Yes	Yes	Yes			
(131) Chapter 75, Sensitive and Uncommon Plant Protection and Fire Hazard Reduction: Specifies standards for all sensitive plants and uncommon plant communities. Prohibits all projects or activities likely to jeopardize sensitive plants or their habitats. Provides for measures to protect sensitive plants and their habitats such as fencing, restrictions on use, project modification to avoid adverse impacts, dedication of open space, and habitat restoration. Requires that uncommon plant communities be managed and protected to preserve their values; and prohibits projects and activities that would create significant adverse impacts.		Yes	Yes			C

Table 5-5. Effectiveness of Measures in Place for the Vegetation Threshold (continued)

Compliance Measure	Effectiveness				Explanation	Recommendation
	CV ¹	UPC ²	SP ³	LS/OG ⁴		
(132) Chapter 77, Revegetation: Provides for revegetation for soils stabilization, replacement of removed vegetation, or rehabilitation where runoff or soil erosion needs to be controlled. Sets forth standards for revegetation plans, requires compliance with BMPs in using native and adapted plants.	Yes					
(133) Chapter 9, Remedial Action Plans: Provides for TRPA to request or require a problem assessment to identify situations which adversely impact attainment or maintenance of a threshold and provides for implementation of a remedial action plan to abate the problem.	Yes	Yes	Yes			
(134) Handbook of Best Management Practices: Shorezone BMPs require protection of existing vegetation, erosion control, and protection from other disturbances which could adversely affect Tahoe Yellow Cress (<i>Rorippa subumbellata</i>) plants and their habitats as set forth in Volume II of the 208 Plan.			Yes			
(135) Shorezone protection: Prohibits vehicular access to the shorezone except where TRPA finds that such access will not cause environmental harm.		Yes	Yes			
(136) Project Review: Reviews project plans for conformance with the Code and sets forth conditions for approval including provisions related to vegetation.	Partial	Yes	Partial		The current code language for vegetation protection and guidelines is not clear and therefore, difficult to permit and enforce. TRPA proposes to clarify the code language to reflect current guidelines.	A E O
(137) Compliance inspections: Provides for inspections to enforce compliance with the law or conditions of project approval or complaints.	Partial	Yes	Yes		Not all compliance inspections are completed by TRPA. Most local jurisdictions have an MOU with TRPA that allows them to conduct inspections. Vegetation protection permit conditions are not being enforced as strongly as other conditions.	N

Table 5-5. Effectiveness of Measures in Place for the Vegetation Threshold (continued)

Compliance Measure	Effectiveness				Explanation	Recommendation
	CV ¹	UPC ²	SP ³	LS/OG ⁴		
(138) Development Standards in the Backshore		No			The current standards are under revision. The standards to protect Tahoe Yellow Cress should be modified to reflect the TYC conservation strategy.	A
(139) Chapter 20, Land Coverage Standards: Restricts land coverage and pertains to SEZs, wetlands, and sensitive lands.	Yes					
(140) Grass Lake, Research Natural Area: The USFS listed Grass Lake as a research natural area. It is protected from further degradation and will now be managed with an individualized set of standards and guidelines that recognize its unique ecosystem.		Yes				
(141) Regional Plan, Goals and Policies, Conservation Element, Vegetation Subelement: Provides policy direction regarding threshold attainment achieved through vegetation management.	Yes	Yes	Yes	Yes		
(142) Late Seral/Old Growth (LSOG) threshold language, Goals and Policies, and Code of Ordinances language, Chapters 71 & 78	Yes			Yes		
(143) Comply with Chapters 71 and 55 to provide protection to stream environment zone vegetation	Partial				The TRPA code is not clear about the full protection of SEZ vegetation.	Q
(145) Implementation of Tahoe Yellow Cress Conservation Strategy			Yes			
(151) Stream Restoration Program: The USFS, CTC, NTRT and others have an ongoing program for stream restoration which provides food and cover for stream-oriented wildlife.	Yes					

Table 5-5. Effectiveness of Measures in Place for the Vegetation Threshold (continued)

Compliance Measure	Effectiveness				Explanation	Recommendation
	CV ¹	UPC ²	SP ³	LS/OG ⁴		
(Supplemental Measure 146) Develop new code section to control and/or eliminate noxious weeds					Not in Place	
(Supplemental Measure 147) Map deepwater plant communities of Lake Tahoe and develop ordinance to provide for Deepwater Plant Protection: Require placement of "No Anchoring" marker buoys at locations where disturbance to deepwater plant communities is a problem.					Not in Place	
(Supplemental Measure 148) Freel Peak Cushion Plant Community Protection: Develop protection measures for Freel Peak Cushion Plant Community. Measures may include interpretive signage exclusion areas, and trail re-routing.					Not in Place	
¹ Common Vegetation ² Uncommon Plant Communities ³ Sensitive Plants ⁴ Late Seral/Old Growth						

IV. STATUS OF 1996 RECOMMENDATIONS

Eight recommendations were made in the 1996 Threshold Evaluation. Four of the recommendations were completed, two of the recommendations have been partially implemented, and no action has been taken for two of the recommendations. Following, in italics, is a brief discussion on the status of the 1996 recommendations.

1. Adopt Vegetation Goals and Policies to reflect ecosystems/forest health approach to resource management. (B List) *This recommendation has not been acted upon by TRPA. The Forest Health Consensus Group has developed a "Desired Future Condition" document for forests, but this document has not been translated into the Goals and Policies.*
2. Adopt Old Growth/Late Successional Stage Threshold to protect and perpetuate old growth stands in the urban and non-urban areas and single trees of significance in the urban areas. (A List) *This recommendation was completed in 1997. The following language was added to the vegetation threshold: "Provide for promotion and perpetuation of late successional/old growth forests. The goal is to increase late successional/old growth conditions across elevational ranges of the Lake Tahoe Basin forest cover types. Individual trees greater than 30" dbh shall also be favored for retention because of their late seral attributes." A new threshold was developed and adopted in 2001. This new threshold was a numerical threshold that indicates that 55 percent of the forested lands within the basin should be in a late seral/old growth condition.*
3. Amend Chapter 74 of the Code of Ordinances to provide additional protections to stream environment zone vegetation. (A List) *These code amendments were completed in 1997 and focused on increasing the mitigation ratios for projects permitted within backshore areas.*
4. Amend Chapter 71 of the Code of Ordinances to reflect ecosystem/ forest health approach to resource management. (B List) *In 1997 TRPA adopted a new threshold for old growth, and in 1998 TRPA adopted amendments to Code Chapter 71 for the protection of large trees. In spring 2001, a new threshold, Goals and Policies, and Code language were adopted focused on forest health, including snags and down woody material.*
5. Develop and implement high priority vegetation EIP projects. (B List) *A partial list of vegetation EIP projects has been developed. This list will continue to grow and change as funding and new information is developed. A number of the recommendations for the 2001 Threshold Evaluation will be EIP projects. It should be noted that TRPA does not implement most EIP projects, but does attempt to facilitate EIP project implementation.*
6. For *Rorippa*, develop and implement California State Lands Commission's Stewardship Program. Continue population inventory surveys. Conduct biological study of *Rorippa*'s genetic makeup, the effects of inundation, reproductive biology, population viability, root morphology and habitat. (C List) *A new conservation planning effort has been undertaken by the agencies within the basin. A conservation strategy is being developed to*

protect Rorippa based on the development of an adaptive management strategy and early implementation actions. TRPA is leading this effort, and the conservation strategy should be completed by late summer.

7. Complete an underwater survey of Lake Tahoe deep-water plant communities by remote operated vehicle. (C List) *The plant communities have not been surveyed using a methodology that would allow for the assessment of the abundance or health of these communities. However, a side-scan sonar study of the shallow waters of the lake has been conducted. The study mapped out areas of likely occupied habitat for deep-water plants. This study can be used as the basis for future studies.*
8. Provide for annual protection measures for Freel Peak Community. (C List) *The USFS has been informally monitoring and protecting the cushion plant communities along Freel Peak. There has been a proposal to formalize the trails leading to the peak. A trail structure would minimize the random disturbance of people hiking on sensitive habitat.*

V. 2001 RECOMMENDATIONS

In addition to the existing Compliance Measures and Supplemental Measures recommended to be put in place, the following additional recommendations are proposed for maintenance and/or attainment of the vegetation thresholds. Where costs to implement the recommendations are known or can be estimated, they are given. If no costs are given, costs are either unknown or the recommendation may be completed by existing staff resources.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~A. Code changes for construction related vegetation protection~~

~~Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: February 2002
Threshold Indicator: V-1, V-2 and V-3~~

~~**Recommendation:** The current vegetation protection measures exist mainly as guidelines and not specified within the Code. The codification of these protection measures, such as protective fencing, will likely facilitate Project Review and allow for a clear basis for action from the Compliance Division.~~

~~**Product:** Code amendment will be presented to the Governing Board for consideration.~~

~~B. Develop wildlands fire protection section of code.~~

~~Responsible Entity: TRPA, GDF, USFS, NDF, and local fire protection agencies
Funding/Cost: Staff time
Completion Date: October 2002
Threshold Indicator: V-1, V-2~~

~~**Recommendation:** Currently, the Code section on wildfire protection is “reserved” and is unwritten. There is a great deal of confusion regarding what actions can be taken to improve fire protection and how those actions should be balanced with resource protection.~~

~~**Product:** Code amendment will be presented to the Governing Board for consideration, and presentation to the Governing Board to codify fuel defensible profile zones.~~

~~C. Develop an invasive weed control program.~~

~~Responsible Entity: All land managing agencies
Funding/Cost: Staff time
Completion Date: December 2002
Threshold Indicator: V-1, V-2 and V-3~~

~~**Recommendation:** The Lake Tahoe Watershed Assessment lists twelve exotic plants as focal species to be actively managed; yet there is no coordinated effort to control these plants. There are a number of model projects already developed in the west to address invasive weed issues. The first step should be to develop an invasive weed council that would coordinate monitoring and eradication efforts. The Natural Resource Conservation Service will be an important partner in this effort.~~

~~**Product:** Formation of an exotic pest plant council (USDA program), rank weed species in terms of threat to the region, and possible Code amendments on weed control.~~

~~**D. Finish and participation in the Tahoe Yellow Cress conservation strategy.**~~

~~Responsible Entity: TRPA and other agencies within the Technical Advisory Group
Funding/Cost: Staff time and up to \$80,000 for three years for a collection and propagation program
Completion Date: March 2002
Threshold Indicator: V-3~~

~~**Recommendation:** The Tahoe Yellow Cress Conservation Strategy is scheduled to be completed by Winter 2002. This strategy will outline three years worth of conservation projects and commitment to the proposed adaptive management scheme. There will be annual surveys and data analysis by the Technical Advisory Group members.~~

~~**Product:** TRPA will take the lead on finalizing the conservation strategy, and take the lead on producing the first annual report.~~

~~**E. Conduct further research on Tahoe Yellow Cress management issues.**~~

~~Responsible Entity: Other agencies or research institutions
Funding/Cost: Grants as a funding source, but the amount is unknown
Completion Date: January 2003
Threshold Indicator: V-3~~

~~**Recommendation:** In order to implement the Tahoe Yellow Cress Conservation Strategy, more scientific knowledge needs to be gained. Indeed, the continual increase in the knowledge base of this species is critical to implementing the adaptive management strategy.~~

~~**Product:** Work to secure funding for research and support all priority research.~~

~~**F. Include galena creek rockcress specie on the third threshold list, and remove carex paucifructus from the list.**~~

~~Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: February 2002
Threshold Indicator: V-3~~

~~**Recommendation:** The Galena Creek rockcress is proposed for inclusion on the third threshold list of sensitive plants, and one species shall be proposed for removal.~~

~~**Product:** Present resolution to the Governing Board amending the third vegetation threshold.~~

~~**G. Include Taylor Creek Marsh, Upper Truckee Marsh, Pope Marsh, and Hell Hole as threshold communities under the second vegetation threshold**~~

~~Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: February 2002
Threshold Indicator: V-2~~

~~**Recommendation:** The language of the second vegetation threshold, uncommon plant communities, is very clear that any unique community should be considered for threshold protection if it provides significant scientific, ecological, or scenic value (see above). Taylor Creek Marsh, Upper Truckee Marsh and Hell Hole provide sufficient value to be specifically named within the second vegetation threshold.~~

~~**Product:** Present resolution to the Governing Board amending the second vegetation threshold.~~

~~**H. Change snow cover restrictions for winter Off Highway Vehicle (OHV) use**~~

~~Responsible Entity: TRPA, USFS, and NDF~~

~~Funding/Cost: Staff time~~

~~Completion Date: April 2003~~

~~Threshold Indicator: V-1~~

~~**Recommendation:** Currently, winter OHV use is restricted when the snow cover is less than six inches in depth. In most national parks and forest service lands winter OHV use is restricted when the snow cover is less than one foot in depth. Currently the restriction for over snow logging is two feet in depth of snow.~~

~~**Product:** Working with the USFS, present Code amendments to the Governing Board changing the minimum snow depth to one foot for winter OHV use.~~

~~**I. Develop a draft new common vegetation threshold**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: \$120,000~~

~~Completion Date: December 2004~~

~~Threshold Indicator: V-1 and V-4~~

~~**Recommendation:** The existing threshold for common vegetation is complicated and difficult to attain. A new threshold, focused more on the concepts of landscape ecology that incorporates fire as an element of the system, is required.~~

~~**Product:** A draft of new threshold language for common vegetation.~~

~~**J. Aspen conservation plan**~~

~~Responsible Entity: All land managing agencies and/or the Forest Health Consensus Group.~~

~~Funding/Cost: Staff time~~

~~Completion Date: January 2004~~

~~Threshold Indicator: V-1~~

~~**Recommendation:** Aspens are a valuable resource within the Tahoe Region. The management of these aspen stands lacks a coordinated effort. An 'aspen working group' would help all land management agencies share information and develop better techniques of management.~~

~~**Product:** A conservation plan for aspen in the region.~~

K. Forest pathology working group

Responsible Entity: ~~All land managing agencies and/or a subgroup of the Forest Health Consensus Group.~~

Funding/Cost: ~~Staff time~~

Completion Date: ~~June 2002~~

Threshold Indicator: ~~V-1 and V-4~~

Recommendation: ~~Currently, there is no formal coordination with land management agencies regarding forest pathology. A technical working group could review current forest pathology load and make region-wide recommendations if problems need management action.~~

Product: ~~Annual report of the forest pathology status of the Region.~~

L. Update and encourage vegetation related projects in the EIP list

Responsible Entity: ~~TRPA~~

Funding/Cost: ~~Staff time~~

Completion Date: ~~On-going~~

Threshold Indicator: ~~V-1, V-2, V-3, and V-4~~

Recommendation: ~~The EIP list for vegetation-related projects does not contain enough projects to ensure attainment of the vegetation thresholds. Staff should increase efforts to identify EIP projects that will help to attain the vegetation thresholds.~~

Product: ~~Fifteen projects on the EIP list.~~

M. Amend TRPA's Code of Ordinances to include the protection of native deciduous trees

Responsible Entity: ~~TRPA~~

Funding/Cost: ~~Staff time~~

Completion Date: ~~February 2004~~

Threshold Indicator: ~~V-4~~

Recommendation: ~~TRPA has a non-degradation standard for native deciduous trees, yet does not have language in its Code of Ordinances to clearly protect these species. The proposed amendment will likely regulate all removal of native deciduous trees in the Conservation and Recreation Plan Area Statements, and develop a mitigation policy for removal of native deciduous trees within the urban areas.~~

Product: ~~Present a Code amendment to the Governing Board~~

N. Increase training and education of MOU compliance inspectors

Responsible Entity: ~~TRPA~~

Funding/Cost: ~~Staff time~~

Completion Date: ~~December 2003~~

Threshold Indicator: ~~V-1, V-2 and V-3~~

Recommendation: ~~Much of the compliance inspections in the region are done by other agencies under MOUs with TRPA. Education of these enforcement efforts and issues will improve compliance for threshold attainment.~~

Product: ~~Staff will produce a handout and workshop.~~

O. Amend TRPA Code of Ordinances to clarify protection of SEZ vegetation

Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: July 2002
Threshold Indicator: V-1

Recommendation: The current Code language for SEZ vegetation protection should be clarified to increase protection. The codification of these protection measures will likely facilitate Project Review and allow for a clear basis for compliance action.

Product: Code amendment presented to the Governing Board for consideration

P. Revise list of threshold unique plant communities list

Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: June 2004
Threshold Indicator: V-2

Recommendation: More information has been gained about unique plant communities within the region. Field surveys are required to improve the threshold for plant communities in order to protect this resource.

Product: A draft revised list of unique plant communities.

Q. Revise list of sensitive plants

Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: May 2004
Threshold Indicator: V-3

Recommendation: More information has been gained about sensitive plants within the region and the surrounding areas. Field surveys are required to improve the threshold for sensitive plants in order to protect this resource.

Product: A draft revised list of sensitive plants.

VI. EIP INTEGRATION

The Presidential Forum in 1997 and the adoption of the EIP did speed the development and completion of programs and construction of projects. In some cases more than one EIP Threshold project was identified in an implementer's project area (e.g. Air Quality/Transportation and Water Quality projects in the same general area). Although projects may be integrated when constructed, the vegetation benefits of a project may be difficult to separate when included under thresholds other than vegetation. For example, project costs need to be assigned to the appropriate threshold area on a line item or funding source basis, to the extent possible. In some cases separation of costs between EIP projects and thresholds may not be entirely possible based on the available data, and the project costs are counted under mainly one of two EIP projects.

Another area of need is for benefit unit tracking within EIP Projects. Units of benefit are intended to be quantifiable measures of project value in relation to particular TRPA Environmental Threshold indicators. The benefit units are derived from or contribute to the indicator, which is measurable in relation to the threshold in question. Indicators have a direct quantifiable relationship to attainment or maintenance of that threshold or local, state, or federal air or water quality standards. Thus, the units of benefit are intended to evaluate how the EIP is performing in terms of contributions toward attaining or maintaining thresholds and applicable standards. The units of benefit for projects and programs are based on the specific threshold standards under each environmental threshold program. Some benefit units have existed under the historic Capital Improvement Program (CIP) for water quality projects such as pounds per dollar for sediment source control within projects, or miles of roadway treated, and miles of fish habitat improved in stream ratings for fisheries projects. Not all CIP benefit units have been converted to threshold benefit units.

While it will be possible, and is a recommendation, to encourage vegetation-related EIP projects, there is a more fundamental issue with the current structure of the EIP list and the lack of prioritization. Without prioritization or some other method of encouraging that the most needed projects will occur first, there is no guarantee that thresholds will be attained as a result of the EIP list of projects.

EIP projects currently on the EIP list and those likely to be proposed in the near future will be critical to the attainment and maintenance of the Vegetation thresholds. Vegetation is continually changing and it will be only through an on-going commitment to management that the vegetation thresholds, indeed any vegetation standards, will be attained. The EIP is the embodiment of the commitment required.

EIP PROJECTS

Forest Health Projects

The following EIP projects are forest related projects. Most of these projects focus on fuels management, however these projects represent an opportunity to conduct forest health related activities. These projects are: 655, 662, 924, 915, 918, 925, 917, 926, 579, 929, 1014, and 930.

Sensitive Plants and Plant Communities Protection

The following EIP projects (Table 5-6) are related to the protection of sensitive Plants and Communities. These projects focus protection measures and projects.

Table 5-6. EIP Projects Related Plant Protection	
EIP #	Description
979	Tahoe Yellow Cress Protection
981	Tahoe Yellow Cress Protection
976	Tahoe Yellow Cress Protection
980	Tahoe Yellow Cress Protection
975	Tahoe Yellow Cress Protection
978	Tahoe Yellow Cress Protection
10152	Deep Water Plants Conservation Strategy
10136	Tahoe Yellow Cress Reintroductions
	Freel Peak Community Protection

Research Related to Threshold Attainment

The following EIP projects (Table 5-7) are related to necessary research to better manage the vegetation resources of the Region.

Table 5-7. EIP Research Needs for Vegetation	
EIP #	Description
524	LSOG Computer Model
65	Deep Water Plant Mapping
10135	Survey of Cushion Plant Community
379	Tahoe Yellow Cress Genetic Study
10159	Tahoe Yellow Cress Conservation Implementation

EIP UNITS OF BENEFIT

Another area of need is for benefit unit tracking within EIP Projects. Units of benefit (Table 5-8) are intended to be quantifiable measures of project value in relation to particular TRPA Environmental Threshold indicators. The benefit units are derived from or contribute to the indicator, which is measurable in relation to the threshold in question. Indicators have a direct quantifiable relationship to attainment or maintenance of that threshold or local, state, or federal air or water quality standards. Thus the units of benefit are intended to evaluate how the EIP is performing in terms of contributions toward attaining or maintaining thresholds and applicable standards. The units of benefit for projects and programs are based on the specific threshold standards under each environmental threshold program. The following table summarizes the Unit of Benefit from EIP Projects as they contribute to air quality thresholds.

EIP Units of Benefit		
TH Index	TH Indicator	TH Unit of Benefit
V1	Relative Abundance and Patter	* Area, Location
V1-A	Prescribed Burns	Acres Treated
V1-B	Forests	Acres Mechanically Treated
V1-C	revegetation	Acres Revegated
V2	Uncommon Plant Communities	Species, Cover, Area
V3	Sensitive Species	Number of Populations Sites
V3-A	Sensitive Species	Acres Protected

nutrients. New development increases the volume of surface runoff that, without proper controls, will negatively affect the quality of the surface runoff water. The 208 planning effort includes the following remedial programs for water quality:

1. Region-wide application of Best Management Practices (BMPs);
2. Erosion and runoff control Capital Improvements Program (CIP); and,
3. Stream Environment Zone Protection and Restoration Program.

In addition, current water quality policies, standards, and management strategies are introduced to the reader, thereby fully describing the current physical and political climate that determines the fate of Lake Tahoe's water quality. This evaluation focuses on optimal management factors that will result in the attainment of water quality thresholds and improvement of water quality in general.

Stream Environment Zones

Stream Environment Zone (SEZ) is a term used to denote the perennial, intermittent and ephemeral streams, meadows and marshes, and other areas of near surface water influence within the Lake Tahoe Region. The term applies equally to areas where surface and subsurface waters are involved. SEZs are capable of rapid nutrient uptake and incorporation into their vegetation. The seasonally inundated soils associated with SEZs are also conducive to denitrification.

SEZs are the most effective natural settings for providing nutrient removal and energy dissipation for surface water conveyance from upland areas into Lake Tahoe and its tributaries. Encroachment on SEZs tends to concentrate surface flow, which causes accelerated channel erosion and damage to riparian soils and vegetation. Encroachment into SEZs by development activities drastically disturbs those soils that are the most productive. This is particularly true for vegetative growth and nutrient storage. Channelization of sheet flow is often a consequence of development. This results in increased erosional energy being concentrated in susceptible areas during periods of peak surface runoff. The erosion of these unique soils creates a problem whereby the detached sediments are then easily entrained and translocated to surface waters.

To protect water quality and maintain natural hydrology in the Tahoe Basin, TRPA adopted the following threshold for soil conservation in 1982:

Preserve existing naturally functioning SEZ lands in their natural hydrologic condition, restore all disturbed SEZ lands in undeveloped, unsubdivided lands, and restore 25 percent of the SEZ lands that have been identified as disturbed, developed or subdivided to attain a 5 percent increase in the area of naturally functioning SEZ lands.

"Disturbance" is defined as incorporating one or more of the following:

1. Impervious surface or compaction,
2. Fill or debris in a natural floodplain or other SEZ area,
3. Hydrologic blockages or artificial drainage of a SEZ,

4. Functional reduction of the floodplain or other SEZ areas adjacent to lake tributaries. Increased flows or runoff, whether through diversion of flows, incising, unnatural alignment or gradient of channels,
5. Removal and/or degradation of riparian vegetation appropriate to the SEZ area; or
6. Other restoration activities.

Disturbance of SEZs can reduce their capability to attenuate and convey spring snowmelt, storm water, and other forms of surface runoff from the watersheds of the Tahoe Basin to Lake Tahoe. Disturbance also reduces the natural water cleansing processes of these areas. Maintaining these areas in as natural a state as possible ensures their capability to convey and treat water, which is necessary for attaining environmental thresholds for water quality.

In the 208 Plan, it was estimated there were approximately 17,700 acres of SEZ in the Tahoe Region, with 45 percent on public lands. This estimate of total SEZ area represented about 8 percent of the total land area in the Basin. The U.S. Forest Service has completed mapping riparian areas and TRPA has been updating its maps using SEZ criteria from the 1987 Regional Plan. TRPA has estimated that as of 1996 there is a total of 21,944 acres of SEZ in the Tahoe Region, representing approximately 11 percent of the total land area in the Basin.

The threshold established back in 1982 called for the protection and restoration of 25 percent of the SEZ lands that have been disturbed, developed, or subdivided. At that time, it was estimated that 4,400 acres of SEZ lands had been disturbed, developed, or subdivided. This set a target of 1,100 acres of SEZ restoration.

TRPA did establish an interim target to increase the area of naturally functioning SEZ by 400 acres by the end of 1991; however, since this target was not met, no interim target was adopted for the 1996 Threshold Evaluation.

INDICATORS

SC-1 Impervious Coverage

There are two components to the Impervious Coverage Threshold. One is based on controlling the amount of new impervious ground surface cover (e.g., pavement and building footprint) and the other is bringing all land coverage into compliance with the coefficients identified in the Bailey Land Capability Classification of the Tahoe Basin. as transportation / air quality, water quality, fish habitat, wildlife, and vegetation.

SC-2 Naturally Functioning SEZ

There are two components to the Naturally Functioning SEZ Threshold. The first component is the preservation of existing naturally functioning Stream Environment Zones and the second is the restoration of disturbed Stream Environment Zones. The success of the Soil Conservation/SEZ program is integrally linked to the attainment of other thresholds such as transportation / air quality, water quality, fish habitat, wildlife, and vegetation.

II. THRESHOLD SUMMARY

The thresholds for the management, protection, and restoration of SEZs are essential for improving and maintaining the unique environmental attributes of the Lake Tahoe Basin.

A. THRESHOLD MATRIX

The threshold matrix serves as a summary of the trends, status, and recommendations for individual indicators. It displays trends toward attainment from 1991 to present. It also provides the current status of the threshold, progress on the 1996 recommendations, future threshold recommendations and an attainment schedule that will outline a course for the individual indicator to achieve attainment over a period of time.

B. MEASUREMENT AND MONITORING ACTIVITIES

Soil Conservation/SEZ measurement and monitoring activities are important for effective long-range planning and adaptive management. Monitoring impervious coverage and SEZ restoration can provide information on the distribution and trends of these programs including the success or failure of SEZ restoration techniques. An effective monitoring program improves TRPA's ability to adjust and implement appropriate corrections to the Soil Conservation/SEZ Program.

Measurement and Monitoring activities include:

The Tahoe Environmental Geographic Information System (TEGIS):TEGIS has been in place to track impervious cover in the Basin since 1987. As the system is being redesigned and updated, TEGIS will continue to be a powerful tool for tracking impervious coverage in the Tahoe Basin in the future.

Exploring technological opportunities for identifying and tracking impervious coverage using advanced satellite imagery has been a recent priority for the Soil Conservation/SEZ program. TRPA is working in conjunction with the Desert Research Institute (DRI) in using advanced remote sensing techniques for tracking impervious coverage in the Tahoe Basin. This activity has been employed in the City of South Lake Tahoe as a pilot project and was successful in its ability to detect and model coverage accurately. It is the intention of this program to employ this technological strategy for the remaining jurisdictions in the Tahoe Basin. The use of advanced satellite imagery for identifying and tracking impervious coverage will be augmented with low elevation, high-resolution aerial photography.

Periodically, there is a programmatic need to update SEZ maps. SEZ maps are adjusted as more information from land capability verifications and IPES evaluations are collected. The updated and TRPA Governing Board-adopted maps are transferred into GIS layers for ready access and analysis.

IPES Program Evaluation: "A Statistical Evaluation of the Effectiveness of the IPES Program in Relation to Suspended Sediment Loads in Lake Tahoe's Tributaries" by John Tracey, Ph.D. of DRI was released in 1999. The results from this analysis, while not definitive, suggest that there has been no detectable increase in suspended sediment loads in nine of the ten streams evaluated. In fact, the analysis also indicates that there has been a decrease in the suspended sediment loads in all but one of the tributaries since the implementation of the IPES program in 1989.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

Impervious cover can now be accurately mapped with satellite imagery. The method developed in the DRI study involves multiple image processing steps. The success of recent satellite technology to derive digital imagery to a fine spatial resolution (one meter) makes this option both plausible and desirable. Given this, staff suggests that this method be applied to the other remaining jurisdictions within the Tahoe Basin but with emphasis on acquiring more evenly distributed ground control points. To accurately report impervious cover percentage by zone or parcel, an accurate parcel map must be in place. The existing Assessor Parcel maps are inaccurate both thematically in terms of parcel attributes, and spatially in terms of accurate parcel boundaries. TRPA is pursuing the solution to this problem by partnering with Sierra Pacific Power to geo-rectify the Assessor Maps of El Dorado County. Washoe County has accurate maps, and Placer and Douglas counties are working with their parcel databases.

A new set of SEZ maps is in the final draft stage of development. Maps were created with updated information of new SEZ delineations by TRPA staff and digitized by Jones and Stokes Associates. Soil Conservation/SEZ staff are currently editing these maps for future adoption by the Governing Board.

The analysis of the effectiveness of the IPES program (Tracey, 1999) concluded that Trout Creek, Upper Truckee River and Ward Creek have all experienced a decrease in sediment load movement to Lake Tahoe since Water Year 1989. This conclusion suggests that the IPES program has been an effective mechanism for the Trout Creek, Upper Truckee and Ward Creek watersheds in meeting water quality thresholds. It was also found in the analysis that the Third Creek watershed had a detectable increase in sediment load. While this increase may not be directly attributable to the failure of the IPES program, a reevaluation of the environmental strategies within Third Creek should be undertaken to help determine what factors may be contributing to this watershed's inability to meet water quality thresholds.

SC-1 IMPERVIOUS COVERAGE

Threshold Standards	SC-1 Indicator	1996 Interim Targets	Threshold Attainment Status		
			1991 Attain Status	1996 Attain Status	2001 Attain Status
STANDARD: TRPA: impervious coverage shall comply with Land Capability Classification of the Lake Tahoe Basin, California-Nevada, a Guide for Planning (Bailey, 1974)	Additional land coverage, by project, (sq. ft.)	<p>INTERIM TARGETS:</p> <p>a. Spend 80% of the excess coverage mitigation funds on land purchases <u>By December 31, 1993 and every year thereafter, outlays from the excess coverage mitigation funds for land coverage retirement were to be not less than 80 percent of the funds collected. TRPA must work diligently with the Nevada Division of State Lands, a limited Nevada-side land bank, to identify and acquire excess land coverage, so that the 2006 interim target can be achieved.</u></p> <p>b. By December 2003 have an accurate impervious coverage database linked to land capability <u>By October 15, 2001, a minimum of 100 acres of land coverage should be removed and land restored on public and private lands in the Region. Eighty percent of land coverage removed through obliteration of unpaved roads and other sites on U.S. Forest Service and state parks lands should be permanently retired.</u></p> <p>c. By March 2004 update the TRPA GIS to reflect the changes that have occurred at the parcel scale through the land capability challenge process and new data attained from the IPES program will help with future tracking and land capability work <u>By March 30, August 31, 1997, TRPA shall have an accurate impervious coverage database linked to land capability.</u></p> <p>d. <u>By September 30, 1997, TRPA shall amend Chapter 20 to make adjustments to the excess land coverage mitigation fees</u></p>	Non-Attainment	Non-Attainment	Non-Attainment
SC-1 2001 Monitoring Status					
Approved projects from 1972 to present are in compliance with Bailey coefficients and pre 1972 excess land coverage is being mitigated gradually over time. Impervious coverage identification and tracking using satellite imagery will be complete by 9/03.					

SC-1 2001 Recommendations

1. Impervious coverage tracking through the use of advanced satellite imagery. (09/03)
2. Tahoe Environmental Geographic System (TEGIS) database updating and recompilation. (03/03)
3. Augment impervious coverage tracking through analysis of aerial photography. (11/02).
4. Individual Parcel Evaluation System (IPES) effectiveness study. (08/03)
5. Increase the accuracy of tracking and inventory of soft coverage (10/03)
6. GIS Update (6/03)
7. Soil Survey Update (10/05)
8. Amend Excess Coverage Mitigation Program to focus on the retirement of Hard Coverage (12/04)

SC-1 2006 Attainment Schedule

All new projects since 1972 are in attainment. Pre 1972 excess land coverage will not be in attainment by 2006 but will continue to be mitigated over time.

SC-2 NATURALLY FUNCTIONING SEZ

Threshold Standards	SC-2 Indicator	996 Interim Targets	Threshold Attainment Status		
TRPA: Preserve naturally-functioning SEZs in their natural condition; restore 25 percent of SEZ lands identified as disturbed, developed, or subdivided, to obtain a 5 percent total increase in the area of naturally-functioning SEZ lands.	Area of naturally-functioning SEZs (acres).	a. Restore 624 <u>400</u> acres of SEZ <u>should be restored over the next 5 years. by October 2006.</u> b. Create an SEZ classification system that categorizes SEZ type by function in terms of wildlife, fisheries and hydrology by December 2003.	1991 Attain Status	1996 Attain Status	2001 Attain Status
			Non-Attainment	Non-Attainment	Non-Attainment
SC-2 2001 Monitoring Status					
Approximately 475 acres (approximately 200 acres on National Forest lands) of SEZ restoration work have been completed. 625 acres of additional SEZ restoration are needed by 2006 to meet the threshold target of 1,100 acres of disturbed, developed or subdivided SEZ restored. EIP integration is integral to the success of this threshold.					
SC-2 2001 Recommendations					
1. EIP Participation. (4/07) 2. Amend Code of Ordinances to reflect and incorporate into the SEZ criteria the most current developments in the identification of pedologic and hydrologic indicators. (06/04). 3. Assess ability to create properly functioning man-made SEZ's (8/03) 4. Continue development of a bio-assessment inventory of benthic invertebrates to evaluate water quality (10/03). 5. Continue development of SEZ Classification System (10/04)					
SC-2 2006 Attainment Schedule					
Restore 625 acres (approximately 125 acres per year for next five years) of SEZ by October 2006.					

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

The following sections identify the methodology and evaluation criteria used during the 2001 Evaluation, as well as the areas of change and threshold status for each of the threshold indicators.

A. **SC-1: IMPERVIOUS COVERAGE**

1. Evaluation Criteria

Impervious coverage shall comply with the *Land Capability Classification of the Lake Tahoe Basin, California-Nevada, a Guide for Planning* (Bailey, 1974). Impervious coverage is measured in additional land coverage by project in square feet.

2. Measurement and Monitoring

TRPA monitors land coverage (new and existing) in the region through project review and compliance records and files. Some of this information has been entered into TEGIS. However, additional work is required to bring this database up to date. Chapter 32 of TRPA's Code requires TRPA to maintain cumulative accounts of additional land coverage.

Due to the incomplete nature of information contained in the TEGIS database, new (approved) impervious land coverage was determined by using the water quality mitigation fees paid from 1996 to 2001. Any new land coverage approved is subject to a water quality mitigation fee every time allowable potential coverage is utilized for a project. It is important to note that the water quality mitigation fee was assessed at \$1.25 per square foot until July 1997. After July 1, 1997, the water quality mitigation fee was assessed at \$1.34 per square foot. What is missed by using the water quality fee as an indicator of new coverage is transferred potential coverage. When potential coverage is transferred to a project area that proposes to utilize that coverage, no water quality mitigation fee is assessed against that specific transferred coverage. However, the number of projects transferring potential coverage and the amount of potential coverage being transferred is such a small amount, it's omission from the determination of approved new coverage is not expected to skew the data analyzed in this Chapter.

Excess land coverage is tracked on a project by project basis in the TEGIS database. The Excess Coverage Mitigation Program was intended to address and mitigate land coverage established before 1972 that is out of compliance with Bailey coefficients. The program offers five options to mitigate excess land coverage:

1. Reduce coverage onsite,
2. Reduce coverage offsite,
3. Coverage mitigation fee,
4. Parcel consolidation or parcel line adjustment,
5. Projects within community plans (see Code Section 20-5).

Most projects mitigating excess coverage use the Coverage Mitigation Fee option; however, the fee for this option remained at \$5.00 per square foot since the program began. As land prices increased over the years the Coverage Mitigation Fee option ceased to meet a 1:1 mitigation for excess coverage. In May 2001 the Governing Board approved an amendment to Chapter 20 of the TRPA Code that increased the excess mitigation fee from \$5.00/sq. ft. in all Tahoe Basin counties to \$6.50/sq. ft. in El Dorado and Placer counties (California), and \$12.00/sq. ft. in Douglas and Washoe counties (Nevada). These adjustments were the result of an analysis of land costs in each of the counties. Land costs will be monitored and adjusted annually to insure a 1 sq. ft. to 1 sq. ft. retirement ratio.

3. Results of Measurement and Monitoring Efforts

Since July 1987, TRPA approvals of projects have resulted in the creation of 334.3 acres (91.87 acres from 1996 to 2000) of additional land coverage (Table 4-1); the restoration of 273.66 acres (138.26 acres from 1996 to 2000) (Table 4-2) of land coverage; and the mitigation (by fee) of greater than 16.9 acres (4.79 acres from 1996 to 2000) of existing land coverage (Table 4-4).

Table 4-1. Approved New Coverage						
County	1987-1991		1992-1995		1996-2000	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
Douglas	993,436	22.80	306,396	7.03	264,116	6.06
Washoe	2,165,109	49.70	1,295,005	29.73	739,791	16.98
El Dorado	1,916,872	44.00	1,399,704	32.13	1,758,560	40.37
Placer	1,375,059	31.57	1,109,462	25.47	1,250,049	28.70
TOTAL	6,450,476	148.07	4,110,567	94.36	4,002,017	91.87

In 1987, TRPA adopted a program for excess coverage retirement called the Excess Coverage Mitigation Fund (ECMF). The ECMF has collected a total of \$6,982,386.28 since its inception. A total of \$5,610,674.21 has been disbursed from the fund: \$2,958,220.00 to the California Tahoe Conservancy (CTC); and \$2,652,454.21 to Nevada State Lands (Table 4-3). This level of disbursement represents 80.4 percent of the funds collected.

Table 4-2. Completed Land Coverage Reduction Projects (1996-2000)	
USFS – North Shore Ecosystem Mgmt. Project	55.27 Acres
USFS – East Shore Land Coverage Restoration	27.2 Acres
USFS – Heavenly CWE Implementation – Phase 2	40.6 Acres
USFS – Heavenly CWE Implementation – Phase 3	5.24 Acres
Redevelopment Project No. 1 (Embassy Vacation Resort/Ski Run)	9.95 Acres
TOTAL	138.26 Acres

The retirement of excess coverage through the ECMF was identified as an interim target for the Soil Conservation Coverage (SC-1) Threshold. The 1991 interim target called for disbursement of 80 percent of the ECMF funds collected. This interim target was met with 80.4 percent of ECMF funds disbursed.

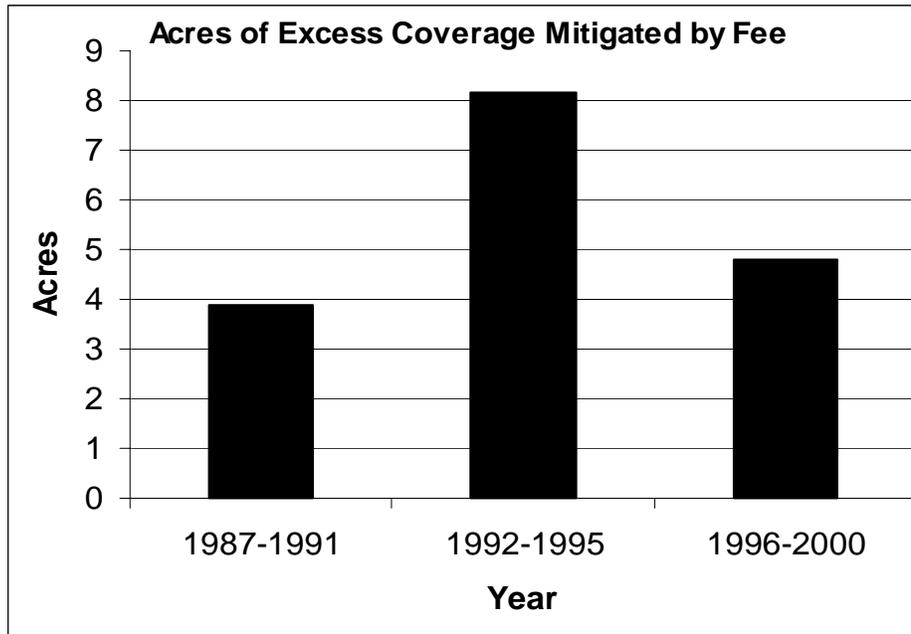
Table 4-3. EMCF Disbursement (1996 – 2000)			
Year	California	Nevada	Total Disbursed
1996	\$118,00.00	\$0.00	\$188,000.00
1997	\$572,000.00	\$400.00	\$572,400.00
1998	\$2,355.00	\$0.00	\$2,355.00
1999	\$1,615.00	\$1,373,368.00	\$1,374,983.00
2000	\$1,057,250.00	\$355,250.00	\$1,412,500.00
<i>Total (1996-2000)</i>	<i>\$1,821,220.00</i>	<i>\$1,729,018.00</i>	<i>\$3,550,238.00</i>
<i>Total (1987-95)</i>	<i>\$1,137,000.00</i>	<i>\$923,436.21</i>	<i>\$2,060,436.21</i>
Grand Total (1987 – 2000)	\$2,958,220.00	\$2,652,454.21	\$5,610,674.21

4. Trends

In the period from 1996 to 2000, a 41 percent decrease in excess coverage mitigated by fee is seen as compared to the period from 1992 to 1995 (Figure 4-1). This decrease is primarily due to the many large redevelopment projects that occurred in South Lake Tahoe (El Dorado County) requiring large fees to mitigate excess coverage during 1992 to 1995 (Table 4-4). However, the period of the current evaluation, 1996 to 2000, shows an increase of 19 percent when compared to the number of acres of excess coverage mitigated by fee from 1987 to 1991. It is difficult to infer a trend from only three data sets representing 12 years of the ECMF program. In addition, not knowing what effect the new excess coverage mitigation fees being applied in Nevada and California will have on the program increases the difficulty of projecting a trend with an acceptable level of confidence.

Table 4-4. Excess Coverage Mitigation with a Fee						
County	1987-1991		1992-1995		1996-2000	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
Douglas	14,407	0.33	51,017	1.17	35,445	0.81
Washoe	17,373	0.40	36,188	0.83	33,006	0.76
El Dorado	83,397	1.91	163,918	3.76	58,693	1.35
Placer	53,335	1.22	105,112	2.41	81,365	1.87
Totals	168,512	3.87	356,235	8.18	208,509	4.79

Figure 4-1. Excess Coverage Mitigated by Fee Since 1987.



5. Threshold Attainment Status

The Tahoe Region is not in attainment of the threshold standard for impervious land coverage. Implementation of the policies of the Regional Plan requires all new projects to attain the threshold standard, and gradually reduces potential and/or existing land coverage on parcels where coverage exceeds the amount allowed by the threshold.

TRPA will continue to implement the threshold for impervious coverage through the policies of the Regional Plan. The creation of unauthorized land coverage, despite TPRA and other agencies' ongoing efforts to enforce the Regional Plan, are still a problem. Consideration of additional opportunities for transferring land coverage for minor rehabilitation projects and residential upgrades should be contingent on the future success of implementing an accurate, working coverage database.

The California-side land bank (California Tahoe Conservancy) serves as an effective clearinghouse for land coverage transfers. Privately brokered transactions also occur in both the California and Nevada portions of the Region. TRPA will continue to encourage and partner with public agencies in Nevada (Nevada State Lands) to continue the land bank.

6. Effectiveness of Measures in Place

TRPA utilizes 59 control measures and 10 supplemental compliance measures to meet the Soil Conservation/SEZ threshold standards. As many of these measures have multi-threshold benefits and most of the Soil Conservation/SEZ thresholds are in alignment with Water Quality thresholds see Table 3-6 in the Water Quality section of this document for Soil Conservation/SEZ compliance measures.

Category: water quality/soil conservation
Parameter: impervious coverage

1. STANDARD: TRPA: impervious coverage shall comply with Land Capability Classification of the Lake Tahoe Basin, California-Nevada, a Guide for Planning (Bailey, 1974)
2. INDICATOR (UNITS): Additional land coverage, by project, (sq. ft.)
3. MONITORING SUMMARY: Additional land coverage is monitored by TRPA as part of the project review process, and recorded in the Tahoe Environmental Geographic Information System (TEGIS) on a parcel-by-parcel basis, in accordance with Chapter 38 of the TRPA Code.
4. ATTAINMENT STATUS: Non-attainment. The TRPA Code (Chapter 20) limits all additional land coverage to the Bailey coefficients, either directly or by coverage transfers within a related hydrologic area. However, the 1991, 1996 and 2001 Evaluation concluded the threshold is not in attainment. Excess land coverage mitigation programs contribute to gradual reduction of existing and/or potential land coverage. Based on financial records, the amount of disbursements since 1991 from excess coverage mitigation funds amounted to ~~\$2,060,436.24~~ \$5,610,674.21. This amounted to ~~56~~ 80 percent of the ~~\$3,689,496.72~~ \$6,982,386.28 collected over this same period. ~~The interim target for this threshold was not met.~~ The interim target of dispersing 80% of the funds was met. Adjustment to the excess coverage mitigation fees (Chapter 20 of the TRPA Code) was adopted by the Governing Board and went into affect 7/1/01.
5. TARGET DATE: ~~Not applicable~~ 2030
6. EVALUATION INTERVAL: Annual
7. INTERIM TARGETS:
 - a. By December 31, 1993, and every year thereafter, outlays from the excess coverage mitigation funds for land coverage retirement were to be not less than 80 percent of the funds collected. TRPA must work diligently with the Nevada Division of State Lands, a limited Nevada-side land bank, to identify and acquire excess land coverage, so that the ~~1991-2006~~ interim target can be achieved.
 - ~~b. By October 15, 2001, a minimum of 100 acres of land coverage should be removed and land restored on public and private lands in the Region. Eighty percent of land coverage removed through obliteration of unpaved roads and other sites on U.S. Forest Service and state parks lands should be permanently retired.~~
 - ~~c. By March 30, August 31, 1997, TRPA shall have an accurate impervious coverage database linked to land capability.~~
 - ~~d. By September 30, 1997, TRPA shall amend Chapter 20 to make adjustments to the excess land coverage mitigation fees.~~
 - b. By October 15, 2006, a minimum of 60 acres of land coverage removed and restored and 5 acres of coverage mitigated by fee.
 - c. By June 2004 amend the Excess Coverage Mitigation Program to emphasize the retirement of Hard Coverage.
8. COMPLIANCE MEASURES: (See Section II for inventory)
 - a. MEASURES IN PLACE: Urban Runoff and Erosion: 06, 11, and 13
Natural Area Management: 46
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The Goals and Policies and Code limit additional land coverage to the Bailey coefficients, either directly or by transfer within the related hydrologic area. The excess land coverage mitigation program gradually reduces existing and/or potential land coverage on parcels that exceed the Bailey coefficients. In order to evaluate the effectiveness of these measures in bringing about attainment and maintenance of the threshold, a complete coverage database is required. Consideration of additional opportunities for land coverage transfer is also dependent on the completion of this database.
 - c. SUPPLEMENTAL MEASURES: Urban Runoff and Erosion: 01, 03 and 05
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: The 1996 Evaluation

recommended~~s~~ implementation of supplemental measures 03 and 05 specifically with regard to the permanent retirement of coverage removed from U.S. Forest Service and State Parks lands and a performance audit of the IPES program to determine if further restrictions or safeguards on the movement of the IPES line are needed to attain and maintain this threshold standard. [These supplemental measures were not implemented, however this evaluation again recommends there implementation.](#)

9. ADEQUACY OF COMPLIANCE
MEASURES: The compliance measures will gradually bring about attainment and maintenance of the threshold.

B. SC-2: NATURALLY-FUNCTIONING SEZ

1. Evaluation Criteria

Preserve existing naturally-functioning SEZ lands in their natural hydrologic condition; restore all disturbed SEZ lands in undeveloped, unsubdivided lands, and restore 25 percent of the SEZ lands that have been identified as disturbed, developed, or subdivided in order to attain a 5 percent increase in the area of naturally-functioning SEZ lands.

2. Measurement and Monitoring

In the 208 Plan (1988), TRPA estimated there were about 17,700 acres of SEZ in the Tahoe Region, with 45 percent on public lands and about 55 percent on private lands. The 1996 Threshold Evaluation revised this estimate by updating TRPA's SEZ maps. TRPA now estimates that there is a total of 21,944 acres of SEZ (or approximately 11 percent of the land) in the Tahoe Region.

TRPA monitors disturbance in SEZs as part of the project review process, with tracking in TEGIS on a parcel-by-parcel basis, in accordance with Chapter 38 of the Code.

3. Results of Measurement and Monitoring Efforts

At least 79 SEZ restoration projects have been constructed in the Tahoe Region since 1980, restoring approximately 474.7 acres of SEZ. From 1996 to 2000 there have been 17 SEZ restoration projects constructed in the Tahoe Region, totaling 153.55 acres (Table 4-5).

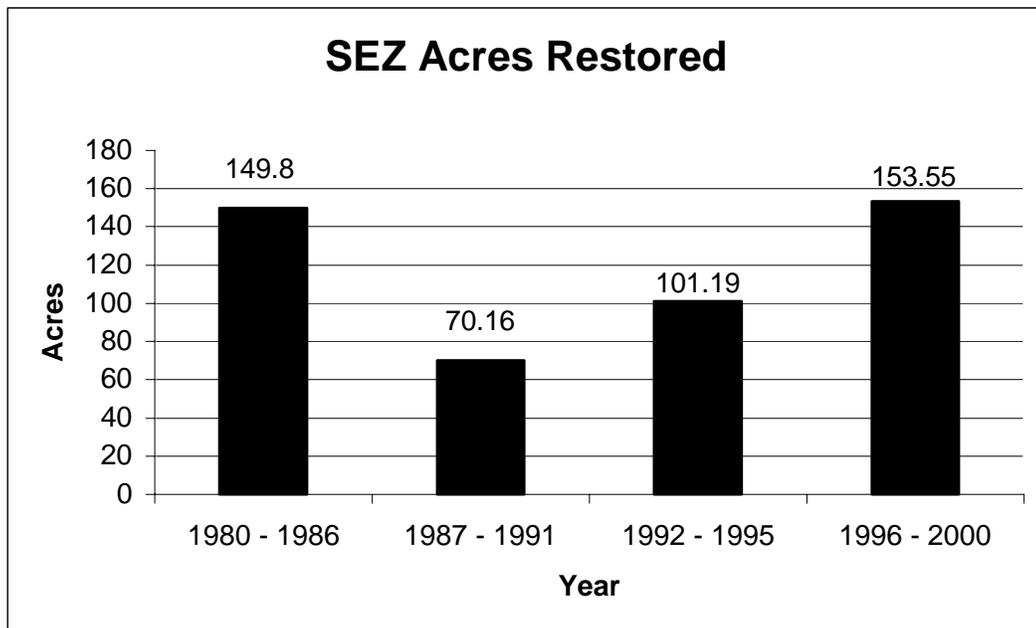
Table 4-5. Completed SEZ Restoration Projects 1996 - 2000				
Project	Completed	Cost	Acres	Lead Agency
Placer County				
Carnelian Bay Access Phase II & III	2000	\$1,666,650	4	CTC
Snow Creek	2000	\$3,429,189	6	Placer Co./CTC
Tahoe Vista Beach	2000	\$20,000	1	NTPUD
Carnelian Creek – Phase III	2000	\$2,458,490	8	CTC
Tahoe City Urban Improvements	2000	\$4,714,000	3	Placer Co.
Snow Creek Wildlife Habitat Restoration	2000	\$750,000	4	CTC
City of South Lake Tahoe				
Trout Creek – Pioneer to Black Bart – Phase I & II & III	2001	\$2,175,808	99	CSLT
Wildwood (Between Ski Run and Pine Grove)	1998	\$500,000	1	CSLT
Osgood Avenue	1998	\$150,000	0.5	CSLT
Redevelopment Project No. 1 (Embassy Vacation Resort)	1998	NA	2.39	CSLT
El Dorado County				
Angora Creek	1997	\$350,000	10	C-Parks
Sky Meadows Stream Bank Stabilization	1998	\$25,000	0.15	USFS
Arapahoe	1996	\$27,468	.5	
Heavenly CWE Phase 2	1999	\$230,000	5.77	USFS
Heavenly CWE Phase 3	2000	\$205,000	5.24	USFS
Washoe County				
Incline Creek (Hyatt)	1999	\$939,098	1.5	IVGID
Lake Country Estates	1997	NA	1.5	Private
<i>TOTAL (1996 to 2000)</i>			<i>153.55 Acres</i>	
<i>TOTAL (1981 to 1995)</i>			<i>321.15 Acres</i>	
GRAND TOTAL (1981 to 2000)			474.7 Acres	

4. Trends

The number and acreage of SEZ restoration projects can vary greatly from year to year depending on many factors. For example, from 1987 to 1991 a total of 32 SEZ restoration projects took place in the Tahoe Region that only totaled 70.16 acres, while from 1996 to 2000, 18 SEZ restoration projects were constructed that accounted for 153.55 acres of restored SEZ. The best that can be said about any trend in SEZ restoration is that, on average, about 24 acres are restored annually, though the last five years saw the most acres of restored SEZ than any previous period (Figure 4-2).

The number of acres of SEZ restored should continue to increase in the upcoming five years, as one of the main focuses of the TRPA will be EIP implementation.

Figure 4-2. Number of acres of SEZ restored since 1980.



5. Threshold Attainment Status

There are approximately 21,944 acres of SEZ in the Tahoe Region with approximately 4,400 acres of SEZ lands that are disturbed, developed, or subdivided. These 4,400 acres represent about 50 percent of the SEZ lands in private ownership. The threshold calls for restoration of 25 percent of the 4,400 acres, or about 1,100 acres of disturbed, developed, and subdivided SEZs. TRPA estimates that over 1,100 acres will be restored by a combination of:

1. Completed projects,
2. Restoration projects on TRPA's EIP list,
3. Large development projects, and
4. Small projects on the California Tahoe Conservancy, Forest Service, and Nevada Division of State Lands acquired parcels.

For additional detail, see the Water Quality Management Plan for the Lake Tahoe Region, Volume III (TRPA, 1988).

TRPA established an interim target to increase the area of naturally functioning SEZ by 400 acres by the end of 1994⁶. This target was not met, however the number of acres restored from 1992 to 1995 increased from by 44% over the previous evaluation period from 1987 to 1991 evaluation period. ~~No interim target was adopted for the period ending in 1996.~~

Adequate regulatory and program compliance measures are in place. It is implementation of these measures that is the challenge. The recommendations made in this evaluation, coupled with an improved fiscal situation for the program, will improve overall implementation.

Currently, 474.7 acres of SEZ have been restored since 1981. This leaves a balance of 625.3 acres of SEZ restoration needed to attain the 1,100 acre threshold. However, as noted in the last Threshold Evaluation 600 acres of this target were to come from publicly acquired lots, and while substantially more than 600 acres have been acquired, it is doubtful that 600 acres need to be restored. That determination has not been substantially made. Therefore, the question of the 600 acres must be resolved and it is part of the interim target. SEZs in any watershed of the Basin, either within the urban plan areas or outside of them, need to be restored to a respective function reflecting the system context in which they exist. The interim target is 125 acres per year and may be accomplished through the public acquisition component, local government, state and federal projects. ~~In order to meet this threshold it will require an average of approximately 125 acres of restored SEZ per year for the next five years. Since 1980, Before 1995, SEZ restoration in the Tahoe Region has averaged 20 acres per year, and since the introduction of the EIP that rate has increased to 30.7 acres per year. It is clear a much stronger effort, including identification and implementation of additional EIP projects is required to make attainment of this threshold possible.~~

Since 1996, work toward threshold attainment has been aided by the completion of two wetland grants that created a draft SEZ Classification Handbook and SEZ Watershed Level Assessment Design Guidelines. The integration of Water Quality/SEZ planning for restoration of SEZs within Water Quality projects has been another step toward attaining SEZ thresholds.

6. Effectiveness of Measures in Place

The control measures intended to attain and maintain the naturally functioning SEZ threshold are identified and assessed in Chapter 3, Water Quality, Table 3-6.

Category: water quality/soil conservation
Parameter: naturally-functioning SEZ

1. STANDARD: TRPA: Preserve naturally-functioning SEZs in their natural condition; restore 25 percent of SEZ lands identified as disturbed, developed, or subdivided, to obtain a 5 percent total increase in the area of naturally-functioning SEZ lands.
2. INDICATOR (UNITS): Area of naturally-functioning SEZs (acres).
3. MONITORING SUMMARY: Disturbance in SEZs is monitored by TRPA as part of the project review process, and recorded in the Tahoe Environmental Geographic Information System (TEGIS) on a parcel-by-parcel basis, in accordance with Chapter 38 of the Code. (See Section III, Cumulative Account). Approximately 475 acres (approximately 200 acres on National Forest lands) of SEZ restoration work have been completed. The threshold calls for restoration of 5 percent of the 4,400 disturbed, developed or subdivided acres, or about 1,100 acres of disturbed, developed, and subdivided SEZs.
4. ATTAINMENT STATUS: Improving but not in attainment. Over 300 474 acres of SEZ have been restored, leaving 625 acres (an average of 125 acres/year) of SEZ restoration to meet the threshold of 1,100 acres of SEZ restored by 2006. Interim targets were not established as called for in the 1994 6 Evaluation. TRPA Goals and Policies and the Code implement prohibitions on SEZ disturbance in accordance with the threshold. ~~While more SEZ has been restored since 1990, it will take at least ten years to reach the target of 25 percent restoration in developed, disturbed, and subdivided (i.e., urbanized) portions of the Region.~~
5. TARGET DATE: 2006~~8~~
6. EVALUATION INTERVAL: Semi-Annual
7. INTERIM TARGETS: ~~400 acres (an average of 80 acres per year) is needed over the next five years to achieve the threshold target date. In order to accomplish the interim target average of 80 acres per year, several actions are required. First, half of the restoration goal will be targeted to public~~

~~lands within the subdivided, developed, and disturbed areas. These lands must be evaluated and inventoried for their restoration potential. TRPA, CTC, USFS, and Nevada Division of State Lands must work together to accomplish this task. Second, a classification system for SEZ type and function must be made to identify critical SEZ types, improve restoration criteria, and SEZ evaluations. Both of the above shall be made EIP projects. Third, local governments and land management agencies, including state transportation departments, must schedule more SEZ restoration projects per year into their CIPs, for a total of forty acres over five years in each of El Dorado, Washoe, Douglas, Placer Counties, and GSLT. TRPA will work with these agencies to make SEZ restoration projects part of TRPA's five-year capital improvement program and part of TRPA's Capital Finance Committee's short list. Impediments to the above are financing and lack of staff. All affected groups in the Region will need to work together to remove this impediment.~~

- a. Restore 624 acres of SEZ by October 2006.
- b. Continue creation of a SEZ classification system that categorizes SEZ type by function in terms of wildlife, fisheries and hydrology by December 2003.

8. COMPLIANCE MEASURES: (See Section II for inventory)
 - a. MEASURES IN PLACE: Urban Runoff and Erosion: 13, 14, 15, 21, 22, 23, and 24
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The restoration threshold was based on the feasibility of restoring SEZs in the urbanized portions of the Tahoe Region. Disturbance in the urbanized areas includes filling, grading, draining, encroaching, displacing vegetation, altering drainage, blocking channels, and channelizing. TRPA (1977) and Morris (1981) showed that SEZs are effective for removing sediment and nutrients from surface runoff. Natural treatment capability is reduced where development causes channelized flows. Channelized SEZs may actually increase sediment and nutrient loads through concentration of surface runoff. Artificial and restored SEZs will provide many of the same benefits as natural SEZs, but may be less effective at treating surface runoff,

especially during the first few years of operation. For additional discussion, see the Water Quality Management Plan for the Lake Tahoe Region, Volume III (TRPA, 1988).

Measures in-place, for the most part, are successful at protecting SEZs and limiting development of them. Additional restoration is needed. A Code amendment to strengthen the protection of SEZ vegetation, and improved financing and planning of projects are needed.

c. SUPPLEMENTAL MEASURES: None.

9. ADEQUACY OF COMPLIANCE

MEASURES: There are approximately 21,944 acres of SEZ in the Tahoe Region. ~~Approximately 200 acres of SEZ restoration work have been completed on National Forest lands. There are about 4,400 acres of SEZ lands that have been disturbed, developed, or subdivided, representing about 50 percent of the SEZ lands in private ownership. The threshold calls for restoration of 5 percent of the 4,400 acres, or about 1,100 acres of disturbed, developed, and subdivided SEZs.~~ TRPA estimates that over 1,100 acres will be restored by a combination of: (1) completed projects; (2) restoration projects on TRPA's [EIP 208](#) list; (3) large development projects; and (4) small projects of the California Tahoe Conservancy, Forest Service, and Nevada Division of State Lands. For additional detail, see the Water Quality Management Plan for the Lake Tahoe Region, Volume III (TRPA, 1988). Adequate regulatory and program compliance measures are in place. It is implementation of these measures that is the challenge. The recommendations made in this evaluation, coupled with an improved fiscal situation for the program, will improve overall implementation.

IV. STATUS OF 1996 RECOMMENDATIONS

Below is a list of recommendations made in the 1996 Threshold Evaluation. Following, in italics, is a summary of the status of that recommendation.

1. By December 31, 1993, and every year thereafter, outlays from the excess coverage mitigation funds for land coverage retirement were to be not less than 80 percent of the funds collected. TRPA must work diligently with Nevada State Lands to identify and retire land coverage, so that the 1991 interim target can be achieved. *On the Nevada side, a large balance of excess coverage mitigation fees have accumulated from projects approved since the adoption of the 1987 Regional Plan and a large area of coverage retirement obligation has accumulated in Nevada. Since the excess coverage mitigation program was initiated, the cost of coverage in Nevada has escalated substantially to \$12.00-\$21.00 per square foot; substantially more than the TRPA coverage cost of \$5 per square foot. The TRPA Governing Board approved an adjustment to the excess coverage mitigation fee in Nevada to \$12.00/sq. ft. and in California to \$6.50/sq. ft. This Code adjustment went into effect in July 2001.*
2. By October 15, 2001, a minimum of 100 acres of land coverage should be removed and restored on public and private lands in the Basin. Eighty percent (80%) of land coverage removed through obliteration of unpaved roads and other sites on Forest Service and State Parks lands should be permanently retired. *From January 1996 through December 31, 2000, a total of 138.62 acres of land coverage have been retired in the Basin. A total of 125.41 acres of land were retired in the period from 1991-1995 for a total of 264.03 acres of land coverage retired since 1991. This exceeds the requirement for a minimum reduction of 100 acres of land coverage.*

Based on estimates contained in the USFS – Lake Tahoe Basin Management Unit (LTBMU) Access and Travel Management Program, it appears that 80 percent of the land coverage removed through obliteration of unpaved lands on Forest Service property is being permanently retired. The LTBMU estimate was that of the roads to be decommissioned, 51.01 acres in the Tahoe Basin would be completely decommissioned while 10.49 acres would be converted to trails. This estimate implies that more than 80 percent of the roads are being permanently decommissioned.

3. By March 30, 1997 TRPA shall have an accurate impervious surface coverage database linked to land capability classification. *While preparing this threshold report, it became apparent that TRPA does not have an accurate impervious surface coverage database linked to land capability classification. The existing database is not set up to easily input land coverage data based on land capability. Work is currently in progress for using satellite imagery to determine the amount of impervious coverage in the Tahoe Basin.*

4. Amend excess coverage mitigation fees to ensure the ability of the program to retire at a 1:1 (sq. ft.) ratio. *The Governing Board approved an amendment to Chapter 20 of the TRPA Code of Ordinances in May of 2001. The amendment increased the excess mitigation fee from \$5.00/sq. ft. in all Tahoe Basin counties to \$6.50/sq. ft. in El Dorado and Placer counties, \$12.00/sq. ft. in Douglas and Washoe counties. These adjustments are the result of an analysis of land costs in each of the Tahoe Basin counties. Land costs will be monitored and adjusted annually to insure a 1 square foot to 1 square foot retirement ratio.*
5. Four hundred acres (an average of 80 acres per year) of SEZ restoration should be included in the Environment Improvement Program (EIP) as a priority for over the next 5 years. *551 acres of SEZ restoration projects were identified for EIP inclusion. More than 153 acres of SEZ were restored in the five-year period between 1996 and 2000. Currently there are a total of 474.7 acres of restored SEZ in the Tahoe Region since 1980. To meet the 1,100 acre threshold by 2005, 625.3 acres of additional SEZ restoration is needed. This equals approximately 125 acres/year of SEZ restoration in the next five years. The average number of acres of SEZ restoration per year from 1980 to 2000 has been 20 acres/year. The ability to increase the yearly acreage of SEZ restoration will rely heavily on the implementation of the EIP. TRPA will need to increase its efforts of cooperation with participating agencies to meet this goal.*
6. Amend the Code of Ordinances to install language that clearly protects SEZs from disturbance, vegetation removal or conversion except under approved management plans. *Chapter 74 amendment completed by TRPA Staff in 1997 provides more comprehensive protection for SEZs.*
7. Qualified personnel need to be consulted and retained in partnership to evaluate all the SEZ lands that exist within the subdivided, developed or disturbed parts of the Tahoe Basin. These lands exist under the acquisition programs of the USDA Forest Service, California Tahoe Conservancy and Nevada State Lands. *SEZ identification has expanded to a limited extent through the establishment and monitoring of 10 ground water wells in the Tahoe Basin. Two completed wetlands grants have provided tools and approaches to such evaluations.*
8. Local Governments should help fund the evaluation of publicly acquired SEZ lands for their restoration potential and inclusion in the Environmental Improvement Program (EIP). *City of South Lake Tahoe (CSLT) funded and assisted with the industrial tract restoration assessment that occurred on CTC lands. (6 ground water wells installed).*
9. A classification system of SEZ type by function in terms of wildlife, fisheries and hydrology needs to be created. *Phase I of an EPA wetlands grant sponsored the creation of a classification system to establish wetland soil benchmarks (ground water well monitoring and the development of wetland soil characteristics).*

10. An assessment and determination of the value of man-made SEZs should be made for purposes of both water quality and wildlife habitat. *HydroScience and Watershed Restoration Associates have outlined an approach for assessing the water quality benefits associated with man-made wetlands and treatment basins.*
11. Develop a bio-assessment baseline that relies on an inventory of benthic invertebrates to evaluate system health for reaches within eight tributaries of the Tahoe Basin. *Work completed in 1999. Additional baseline data collected in 2000 and 2001.*

V. 2001 RECOMMENDATIONS

The 1996 Threshold Evaluation recommendations have been revisited, revised and new needs identified. The following represents the current list of recommendations identified as integral to the success of meeting threshold goals. These recommendations will help the TRPA in developing the 2007 Regional Plan, which will direct the Soil Conservation/SEZ program for the next 20 years.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

SC-1 IMPERVIOUS COVERAGE

A. Impervious coverage tracking through the use of advanced satellite imagery

Responsible Entity: ~~—DRI/TRPA~~
Funding/Cost: ~~—\$40,000 contract with DRI & Staff time~~
Completion Date: ~~—September 2003~~
Threshold Indicator: ~~—SC-1~~

~~**Recommendation:** TRPA has been in cooperation with the Desert Research Institute (DRI) to utilize advanced satellite technology and remote sensing techniques to identify the total human-induced impervious coverage in the Tahoe Basin.~~

~~**Product:** This process will yield up to date inventory data on the existing impervious coverage in the Tahoe Basin.~~

B. Parcel Tracking System (PTS) (formerly Tahoe Environmental Geographic System (TEGIS)) database updating and recompilation

Responsible Entity: ~~—TRPA~~
Funding/Cost: ~~—Staff time~~
Completion Date: ~~—March 2003~~
Threshold Indicator: ~~—SC-1~~

~~**Recommendation:** TRPA has identified the need to update the Parcel Tracking System (PTS) database tracking of coverage that has been permitted through the project application process administered by the agency.~~

~~**Product:** A properly functioning parcel tracking database.~~

C. Augment impervious coverage tracking through analysis of aerial photography

Responsible Entity: ~~—TRPA~~
Funding/Cost: ~~—\$10,000 DRI contract /Staff time~~
Completion Date: ~~—November 2002~~
Threshold Indicator: ~~—SC-1~~

~~**Recommendation:** The acquisition of new sets of basin wide, low elevation / high resolution aerial photographs will augment the analysis and tracking of impervious coverage.~~

~~**Product:** Better tools for identifying and tracking impervious coverage, especially soft coverage.~~

D. Individual Parcel Evaluation System (IPES) effectiveness study

Responsible Entity: TRPA
Funding/Cost: \$10,000 DRI Contract/Staff time
Completion Date: August 2003
Threshold Indicator: SC-1

Recommendation: TRPA has identified a need to continue analyzing the effectiveness of the IPES. In order to continue this effort, TRPA, in cooperation with DRI, needs to develop a more comprehensive experimental design to correlate with higher certainty the relationship between parcels developed under IPES and suspended sediment loads as revealed through tributary monitoring. There also is a need to reconvene the IPES technical advisory group to reevaluate the system as to whether it is accurately assessing the sensitivity of individual parcels to development.

Product: A report on the effectiveness of the IPES. With this report we can make adjustments to system if needed.

E. Increase the accuracy of tracking and inventory of soft coverage

Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: October 2003
Threshold Indicator: SC-1

Recommendation: The identification and tracking of compacted soils (soft coverage) has demonstrated to be a chronic problem. However, there are opportunities to track this coverage type through the site assessment process and the use of low elevation, high resolution aerial photographs.

Product: TRPA will have a more complete database for tracking soft coverage.

F. GIS update

Responsible Entity: TRPA
Funding/Cost: \$10,000 & Staff time
Completion Date: June 2004
Threshold Indicator: SC-1

Recommendation: Updating TRPA's Geographic Information System (GIS) to reflect the changes that have occurred at the parcel scale through the land capability challenge process and new data attained from the IPES program will help with future tracking and land capability work. TRPA's GIS will also be updated with new soil survey data from the Natural Resources Conservation District when those data become available in 2004.

Product: This will make the GIS a more effective tool for daily and long-term planning. It will also bring TRPA closer to having Governing Board approved electronic maps.

G. Soil survey update

Responsible Entity: ~~NRCS\TRPA~~
Funding/Cost: ~~\$10,000 & Staff time~~
Completion Date: ~~October 2005~~
Threshold Indicator: ~~SC-1~~

~~**Recommendation:** The NRCS is currently updating the soil survey for the Tahoe Basin with a projected completion date of late 2004. TRPA will need to update soil maps and land capability maps to reflect these new data. The completion date for TRPA updating data is dependent on the NRCS completing the soil survey. It is anticipated that there will be many changes to the soil survey, changes that will require technical committee review and modification to the current Bailey Land Capability System. The TRPA update of soil data will likely take a year after the NRCS completion date.~~

~~**Product:** The soil survey update will give the Tahoe Basin more detailed soils data to be used to make better management decisions.~~

H. Amend excess coverage mitigation program to increase the retirement of hard coverage.

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~Staff time~~
Completion Date: ~~December 2004~~
Threshold Indicator: ~~SC-1~~

~~**Recommendation:** Develop additional programs to remove non-conforming land coverage. Amend Chapter 20 of the TRPA Code of Ordinances to put more emphasis on the reduction of hard coverage and less emphasis on mitigation through the use of potential coverage.~~

~~**Product:** Accelerate the rate of excess land coverage coming into conformance with the Bailey coefficients.~~

SC-2 Stream Environment Zones

A. EIP participation

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~EIP Funding/Staff time~~
Completion Date: ~~April 2007~~
Threshold Indicator: ~~SC-2~~

~~**Recommendation:** The Soil Conservation/SEZ Program must cooperate with, but also needs to assert a leadership role in actualizing the full potential of the benefits that can be derived through participation in the EIP Program. There is a target of achieving 125 acres of SEZ restoration per year; this implies 625 acres of SEZ should be included in the EIP as a priority over the next five years. Currently there is approximately 406 acres included in upcoming EIP projects.~~

~~In order to accomplish the interim target average of 125 acres per year, several actions are required. First, half of the restoration goal will be targeted to public lands within the subdivided, developed, and disturbed areas. These lands must be evaluated and inventoried for their restoration potential. TRPA, CTC, USFS, and Nevada Division of State Lands must work together to accomplish this task. Second, a classification system~~

~~for SEZ type and function must be made to identify critical SEZ types, improve restoration criteria, and SEZ evaluations. Both of the above shall be made EIP projects. Third, local governments and land management agencies, including state transportation departments, must schedule more SEZ restoration projects per year into their CIPs, for a total of forty acres over five years in each of El Dorado, Washoe, Douglas, and Placer Counties, and the City of South Lake Tahoe. TRPA will work with these agencies to make SEZ restoration projects part of TRPA's five-year capital improvement program and part of TRPA's Capital Finance Committee's short list. Impediments to the above are financing and lack of staff. All affected groups in the Region will need to work together to remove this impediment.~~

~~**Product:** EIP Participation will help achieve SEZ thresholds through restoration of disturbed SEZ's.~~

~~**B. Amend Code of Ordinances to reflect and incorporate into the SEZ criteria the most current developments in the identification of pedologic and hydrologic indicators**~~

~~Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: 5/2004
Threshold Indicator: SC-2~~

~~**Recommendation:** Develop a calibrated guide for identifying and delineating hydric soils specific to the Lake Tahoe Basin. There is a need to characterize the soil related morphological features associated with wetland soils in the Tahoe Basin. Achieving this will enhance the ability to identify, protect and restore properly functioning SEZs. Development of this type of guide could provide a useful short term indicator for how soil can be evaluated for its ability to condition water and promote water quality.~~

~~**Product:** Amending the Code Ordinances with up to date and Tahoe Basin specific SEZ criteria will aid in the proper identification and delineation of SEZs.~~

~~**C. Assess ability to create properly functioning man-made SEZs**~~

~~Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: 8/2003
Threshold Indicator: SC-2~~

~~**Recommendation:** An expanded assessment and determination of the value of man-made SEZs should be made for purposes of both water quality and wildlife habitat. To achieve this goal TRPA will need to partner with other agencies in the basin to implement a monitoring program in man-made SEZs.~~

~~**Product:** This will produce valuable information on SEZ function and how to recreate functioning SEZs through appropriate restoration activities.~~

~~D. Continue development of a bio-assessment inventory of benthic invertebrates to evaluate water quality~~

~~Responsible Entity: TRPA
Funding/Cost: Staff time
Completion Date: 10/2003
Threshold Indicator: SC-2~~

~~**Recommendation:** Develop a bio-assessment baseline that relies on the inventory of benthic invertebrates to evaluate stream system health for reaches within eight tributaries of the Tahoe Basin. This inventory could be modeled in a similar format to the Integrated Benthic Index (IBI) developed by the University of Washington. The courts have validated the IBI system as an accurate tool for assessing water quality within stream environments.~~

~~**Product:** This will create baseline data and methodologies to monitor the health of Tahoe Basin tributaries.~~

~~E. Continue development of SEZ classification system~~

~~Responsible Entity: TRPA
Funding/Cost: EPA Wetlands Grant/Staff time
Completion Date: October 2004
Threshold Indicator: SC-2~~

~~**Recommendation:** Continue the development of a classification system of SEZ type by function in terms of wildlife, fisheries and hydrology.~~

~~**Product:** A classification system for SEZs that can be used for prioritization of EIP restoration projects.~~

VI. EIP INTEGRATION

There is a need for tracking the Benefit Units associated with Environmental Improvement Program (EIP) projects. Benefit Units are designed to be quantifiable measures of value as applied to a particular Environmental Threshold indicator. The Benefit Units are defined as capitol improvements that contribute positively to the indicator. This is intended to be a quantifiable measure of attainment or maintenance of that threshold. These units are expected to evaluate how the EIP is performing in terms of contributions to attaining thresholds. The Benefit Units for projects and programs are based on specific threshold standards.

In an effort to continue achieving the Soil Conservation/SEZ goals, several programs have been employed including the limitation of new development related coverage to the coefficients established under Bailey and IPES and the retirement of land coverage through the mechanisms of the Excess Coverage Mitigation Program. In the Soil Conservation and Stream Environment Zone program, Benefit Units can be defined as: acres of SEZ restoration achieved, acres of excess coverage brought into conformance with the Bailey Coefficients or miles of road obliterated or decommissioned. These program thresholds are known to have direct quantifiable relationships to water quality and lake clarity.

The key objective of the majority of the soil conservation projects in the EIP is to reduce the sources of sediment and nutrients that contribute to lake eutrophication and degradation of water quality. It is the intent of this program to design and implement projects that mitigate the presence of impervious coverage through on-site infiltration and the proper conveyance and treatment of runoff. Urbanization and road networks have negatively impacted the soil qualities that are responsible for these processes. Criteria for new project inclusion relates to the ability of these proposed efforts to meet TRPA soil conservation goals, policies and objectives.

The implementation of Soil Conservation and Stream Environment Zone (SEZ) thresholds is based on projects in the EIP that were initially described in the Volume 3 of the 1988 Water Quality Management Plan for the Lake Tahoe Region (prepared under section 208 of the Clean Water Act). The success of this program will require a close public private partnership, especially within the Community Plan areas (urbanized commercial areas) where a coordinated plan is required to achieve Community design goals.

EIP integration is essential to the future success of the Soil Conservation/SEZ program.

SC-1 Impervious Coverage

There are currently 16 EIP Projects scheduled that affect impervious coverage.

EIP Project Numbers: 23, 250, 268, 319, 321, 373, 560, 640, 938, 944, 945, 948, 963, 964, 991, 10162. See the *Environmental Improvement Program Volume 2 Master List of Threshold Needs – Adopted* for details regarding these SEZ restoration projects.

SC-2 Naturally Functioning SEZ

There are currently 39 EIP SEZ restoration projects totaling 406.15 acres scheduled from 2002 to 2007.

EIP Project Numbers: 23, 24, 27, 118, 161, 250, 262, 266, 319, 321, 351, 352, 373, 385, 391, 412, 414, 421, 556, 562, 640, 651, 652, 935, 936, 938, 940, 944, 945, 948, 950, 952, 953, 985, 986, 988, 989, 990, 991. See the *Environmental Improvement Program Volume 2 Master List of Threshold Needs – Adopted* for details regarding these SEZ restoration projects.

Example: EIP project with direct enhancement to Stream Environment Zones (EIP project Number 27, Blackwood Creek SEZ/ Fisheries Restoration) include:

Restoring hydrologic regimes to riparian communities where appropriate through:

- 1) Removal of stream diversions and man-made obstructions that dewater SEZs.
- 2) Re-establishment of appropriate beneficial native vegetation at disturbed sites.
- 3) Implementation of appropriate vegetation management that is consistent with SEZ preservation and maintenance.

Chapter 6

FISHERIES

I. INTRODUCTION

There are two key aquatic environments that support fish in the Lake Tahoe basin, lakes and streams. These two ecosystems are dynamic and characteristically change in space and time. Combined, attributes of lakes and streams provide necessary elements such as water, cover, and spawning and nursery habitat to support fish. Both environments play an important role in sustaining desirable fish populations and cannot be viewed independently because some fish species use both lake and stream environments to fulfill their life cycles. The combination of chemical, biological, temperature, and physical characteristics of lakes and streams influence the suitability of these environments to sustain different fish populations. Accordingly, degradation of the necessary characteristics of lakes or streams can reduce the sustainability of Tahoe's fishery.

The composition of Lake Tahoe's fish community has changed considerably since the arrival of Euro-americans to the Lake Tahoe basin. Prior to the influence of Euro-american activities, seven species of fish occurred in the lakes and streams of the Lake Tahoe Region (Murphy and Knopp 2000). Of the native fish species, Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*) and the mountain whitefish (*Prosopium williamsoni*) were abundant and revered by Native Americans because they provided ample food for their people. Today, Lahontan cutthroat trout have been extirpated from Lake Tahoe, and the population of mountain whitefish is believed to occur in very low numbers (Murphy and Knopp 2000). Several fisheries biologists assume that several factors have contributed to the decline or extinction of native fish and the degradation of fish habitat in the Lake Tahoe Region. Extensive logging, water diversions, intense grazing, commercial harvest, road building, and the introduction of non-native fish and other aquatic organisms are believed to have cumulatively contributed to the change in Lake Tahoe's fish composition and degradation of fish habitat (SNEP 1996, Murphy and Knopp 2000). Consequently, since the Comstock Era (circa 1860), 20 additional species of fish have been introduced into Lake Tahoe's aquatic communities (see Appendix 1).

BACKGROUND

In recognition of the contribution of natural resources (including fish resources) to the environmental quality of the Lake Tahoe basin, the Tahoe Regional Planning Compact established the framework from which the TRPA Regional Plan was created and adoption of environmental threshold carrying capacities ("thresholds" or "threshold standards") for fish. The Regional Plan, including the Goals and Policies (TRPA 1986) and the Code of Ordinances and Rules of Procedure (TRPA 1987), provide relevant policy statements for the maintenance of fisheries threshold standards.

According to the Goals and Policies, there is one goal and nine policies statements relative to maintaining fisheries resources. The goal is to improve aquatic habitat essential for the growth, reproduction and perpetuation of existing and threatened fish resources in the Lake Tahoe basin. The nine policies are

- 1) TRPA must consider and mitigate project impacts to fish habitat in streams and lakes;
- 2) Prohibit the development of blockages and other impediment to fish movement in streams;
- 3) Develop an in-stream maintenance program to inventory and remove stream blockages;
- 4) Establish boating standards to reduce associated disturbance in the shallow zone of the lake;
- 5) Encourage habitat improvement projects in streams and lakes;
- 6) Maintain and enhance in-stream flows;
- 7) Existing points of water diversion from streams shall be transferred to the lake, whenever feasible;
- 8) Support state and federal efforts to reintroduce Lahontan cutthroat trout; and
- 9) Control the level of Lake Tahoe to reflect season weather and runoff patterns.

The core of TRPA's fisheries regulations that are designed to achieve threshold standards is detailed in TRPA Code Chapter 79; however, applicable regulations for the management of fish habitats can be found throughout the document (TRPA 1987). Chapter 79 includes provisions for the protection of fish habitat and the enhancement of degraded lake and stream habitat. For lake environments, all projects and activities conducted in the shorezone may be prohibited, limited, or otherwise regulated in prime habitat areas; or in situations that TRPA found to be vulnerable or critical to the needs of fish. Special conditions of project approval, such as restoring physically altered substrate, limiting construction to designated periods, or implementing shoreline protective measures may be required for development in the shorezone in order to mitigate or avoid significant adverse impacts to habitat or normal fish activities. Certain activities, such as boat beaching may be restricted temporarily in areas where spawning activity occurs. To support the non-degradation standard that applies to lake fish habitat, TRPA's Code prohibits the alteration of substrate in areas of prime fish habitat unless approved by TRPA. The protection provision for in-stream habitats is similar: prohibit stream channel alterations, stream crossings shall be designed to facilitate fish movement, barriers to fish movement are permitted to be removed, development shall fully mitigate impacts to fish habitat, maintain in-stream flows, prevent sediment entry into stream, and provide vegetative cover.

THRESHOLD STANDARDS AND INDICATORS

The Fisheries section of the Conservation Element of the Goals and Policies identifies fisheries threshold standards and presents a general policy direction for the maintenance and enhancement of fisheries resources. The 1996 Threshold Evaluation (TRPA 1996) adopted three threshold standards and associated indicators for fisheries:

F-1 Lake Habitat

Standard: Achieve the equivalent of 5,948 total acres of excellent lake fish habitat

Indicator: Physical disturbance of rocky substrate (acres).

F-2 Stream Habitat

Standard: Maintain 75 miles of excellent, 105 miles of good, and 38 miles of marginal stream habitat as indicated by the Stream Habitat Quality Overlay map (1997).

Indicator: Miles of stream habitat in the various categories based on field investigations of habitat.

F-3 In-stream Flow

Standard: Until instream flow standards are established in the Regional Plan to protect fisheries values, a non-degradation standard shall apply to instream flows.

Indicator: Instream flows evaluated by use of an instream beneficial use assessment, such as the type established by Title 23, Section 670.6 of the California Administrative Code.

Although the 1991 and 1996 Threshold Evaluations (TRPA 1991 and 1996) acknowledged a threshold policy standard for the reintroduction of Lahontan Cutthroat Trout, the Governing Board did not adopt it as an official threshold standard. For this evaluation, it is recommended that the TRPA Governing Board adopt the following threshold standard and indicator.

F-4 Lahontan Cutthroat Trout

Standard: It shall be the policy of the TRPA Governing Board to support, in response to justifiable evidence, state and federal efforts to reintroduce Lahontan cutthroat trout.

Indicator: (TRPA 1982a): Threshold would be achieved with the successful establishment of a Lahontan cutthroat trout population.

II. THRESHOLD SUMMARY

A. THRESHOLD MATRIX

The fisheries threshold matrix serves as a status summary of the four fisheries threshold standards. It displays the trend towards attainment from 1987 to present, the status of each fisheries threshold standard (i.e., F-1, F-2, F-3, and F-4), recommendations, interim targets, and an attainment schedule. The following narrative expands on the fisheries threshold matrix summary.

B. MEASUREMENT AND MONITORING ACTIVITIES

There is a need to increase monitoring efforts and to standardize monitoring protocols in order to improve TRPA's ability to objectively, consistently, and accurately report on the fisheries threshold status every five years. Since 1988 no consistent monitoring of indicators of lake fish habitat conditions has occurred (F-1, disturbance to substrate from shoreline to 30 feet deep). Since 1996, limited data has been collected for assessing stream habitat conditions. TRPA Project Review personnel have tracked water diversions and changes in points of water diversion as part of TRPA permitting procedures to account for compliance with in-stream flow standards. California Department of Fish and Game (Stafford Lehr, Associate Fisheries Biologist) and the US Forest Service, Lake Tahoe Basin Management Unit (Jeff Reiner, Fisheries Biologist) monitored Lahontan cutthroat trout (LCT) population numbers and have collaborated on the restocking of a recreational population of LCT into alpine lakes in the Lake Tahoe Region.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

Limited measurement and monitoring data were available for 1996 through 2000 with respect to fish threshold indicators. In lieu of monitoring data, a group of Lake Tahoe fisheries biologists and fish habitat managers representing UC Davis-Tahoe Research Group, UNR-Desert Research Institute, private fisheries consultants, and state and federal agencies was assembled in February 2001 and their professional opinions were queried with respect to the status of TRPA's fisheries threshold standards. This group is referred to as the Lake Tahoe Fisheries Technical Advisory Group or FTAG (see Acknowledgements for list of group members).

For lake habitat (F-1), no monitoring of lake bottom substrate has occurred since 1988, although additional research related to Lake Tahoe's fisheries has occurred up to 1996 (Byron et al. 1989; Beauchamp et al. 1990, 1991; Allen and Reuter 1996). The conclusion of the FTAG was that Lake Tahoe's fish habitat has been unchanged since the last threshold evaluation in 1996. Additionally, FTAG concluded that research conducted between 1989 and 1996 supported a significant change to TRPA's policy of prohibiting the development of shorezone structures in fish habitat. Research indicated that shorezone structures and the physical activities associated with them had no effect on the survivorship and sustainability of fish populations or habitat quality. Therefore, according to TRG's research, the prohibition of shorezone development in 'prime' fish habitat solely for the sake of preserving habitat quality for fish was unsupported.

Limited habitat information has been collected on threshold indicators of stream conditions in the basin since the 1996 Threshold Evaluation. It was the professional opinion of FTAG that no significant changes have occurred to the condition of stream

habitats and that conclusions reported in the 1996 Threshold Evaluation were still valid as of 2001. The FTAG, therefore, concluded that TRPA was not in compliance with the threshold standards for streams. Some progress has been made towards stream habitat restoration. However, most stream habitat restoration projects were not fully completed at the time of this evaluation, and the functional value of restoration projects for stream fisheries still needs to be validated. Although not directly linked to physical stream habitat indicators, TRPA has initiated an inventory of stream habitat restoration needs. The FTAG agreed that a 'stream habitat restoration needs inventory' would be valuable for identifying and better directing EIP fisheries projects to improve stream habitat.

According to TRPA records, no applications for diverting stream flows have been submitted and no existing stream diversions have been transferred to Lake Tahoe between 1996 through 2001. Thus, per TRPA records, the threshold standard for stream flow standards is in attainment because stream flow manipulations have not been approved by TRPA.

According to FTAG, TRPA is in compliance with the threshold goal of establishing a Lahontan cutthroat trout population. In the late 1980's and early 1990's, a cutthroat trout population was established outside of TRPA's jurisdictional boundaries, because TRPA was not supportive of the original reintroduction plan to use a piscicide (fish poison) to eliminate competing fish species according to the 1991 Threshold Evaluation (TRPA 1991). This population has eventually moved downstream into TRPA jurisdictional boundaries. More recently, a previously undocumented cutthroat trout population was reported to occur in the Cascade Creek watershed (S. Chandra, TRG-UC Davis, personal communication, 2001)

F-1: LAKE HABITAT

Threshold Standards	F-1 Indicator	1996 Interim Target	Threshold Attainment Status			
Non-degradation standard shall apply to fish habitat in Lake Tahoe. Achieve the equivalent of 5,948 total acres of 'excellent' habitat (which consist of undisturbed rocky substrate from shoreline to a depth of 30 feet).	Acreage of rocky substrate for spawning and feed and cover.	Develop a restoration program for Lake Fisheries by September 1997 (Target was identified in the 1996 Threshold Evaluation). Interim Target Attainment Status Attainment with 1996 interim target – List of restoration projects has been identified in the EIP for Lake Habitat.	Lake-bed Substrate	1991 Attain Status	1996 Attain Status	2001 Attain Status
				Non-attainment	Non-attainment	Non-attainment
F-1 2001 Monitoring Status						
No standardized monitoring of lake habitat has occurred between 1996 and 2000. Project review procedures require that a lake habitat assessment is conducted as part of any application that occurs within the shorezone. Additionally, habitat verifications occurred in 1997, which were subsequently input into TRPA GIS. Combined, project review and habitat verifications have been effective in avoiding impact to physical lake habitat. Other surveys have found evidence of increases in non-native and predatory fish. An increase in non-native fish population is suspected to have negatively impacted native littoral associated fish populations.						
F-1 2001 Recommendations						
<ol style="list-style-type: none"> 1. Align shorezone ordinances with TRG fisheries research findings (1989 – 1996). 2. Identify and adopt a desired future composition of Lake Tahoe's fishery. 3. Review and revise (if necessary) threshold standards and indicators for Lake Tahoe fishery. Develop and adopt a monitoring protocol and schedule to measure the condition of lake fish habitat. 4. Conduct fine-scale fish habitat mapping to determine the distribution and extent of different fisheries habitat types in Lake Tahoe. Assess the effect of rock clearing in the shorezone on the survivorship and sustainability of desired littoral fish species. 5. Identify effect of undesirable non-native fish species and aquatic vegetation on desirable fish species in Lake Tahoe. 6. Identify the distribution, concentrations and effects of gasoline constituents and Polycyclic Aromatic Hydrocarbons on desired Lake Tahoe fish community. 7. Identify the historic distribution and extent of lagoon habitats in Lake Tahoe; identify opportunities for lagoon restoration. 						
F-1 2001 Attainment Schedule						
Interim target is to achieve 5,948 acres of 'prime' fish habitat (spawning and feed/cover) by 2006. An assessment to document of activities that degrade fish habitat shall be prepared prior to assessing acreage of prime fish habitat.						

F-2: STREAM HABITAT

Threshold Standards	F-2 Indicator	1996 Interim Target		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
Maintain 75 miles of excellent, 105 miles of good, and 38 miles of marginal stream habitat as indicated by the map on page 76 of the EIS for the Establishment of Environmental Thresholds (TRPA, 1983).	Miles of stream habitat in the various categories based on field inspections of habitat.	25 stream habitat miles from good to excellent, 45 miles from marginal to good, provided that TRPA adopts a new rating system, substitute targets will be adopted simultaneously. Interim Target Attainment Status Attainment based on the adoption of a new stream habitat rating system. New System has not been developed, therefore, did not achieve interim target.	Stream Habitat	Non-attainment	Non-attainment	Non-attainment
F-2 2001 Monitoring Status						
Limited stream habitat sampling has occurred since the conclusion of USFS-LTBMU effort in 1996. Because limited stream habitat data were available for this evaluation, TRPA relied on the expert opinion of the Lake Tahoe Fisheries Technical Advisory Group (FTAG) to make conclusions on the condition of basin streams. Their conclusions were based on the role of precipitation effects on habitat and progress made on restoration. In 2000, TRPA initiated a stream habitat restoration needs inventory.						
F-2 2001 Recommendations						
<ol style="list-style-type: none"> 1. Identify and adopt a desired future composition of fisheries in stream habitats in the Lake Tahoe basin. 2. Review and revise threshold standard and indicator for stream habitat. Develop and adopt a standardized monitoring protocol and schedule to measure the condition of in-stream fish habitats for the region. Develop and adopt an analysis protocol for reporting on the condition of stream habitat. 3. Identify effects of non-native fish and aquatic vegetation on native fish in stream habitats. 						
F-2 2001 Attainment Schedule						
Achieve the equivalent of 50 miles of 'excellent' stream habitat quality for salmon species by 2006 (a result in 8 miles of stream habitat improvement since 1996) and the equivalent of 50 miles of 'good' stream habitat quality for trout species by 2006 (a result of 9 miles of stream habitat improvement since 1996) on TRPA designated threshold streams. A qualified fisheries biologist using empirical data should make determinations of stream quality.						

F-3: INSTREAM FLOW

Threshold Standards	F-2 Indicator	1996 Interim Target		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
Until In-stream flow standards are established in the Regional Plan to protect fishery values; non-degradation standard shall apply to in-stream flows.	Instream flows evaluated by use of an instream beneficial use assessment, such as the type established by Title 23, Section 670.6 of the California Administrative Code.	Adopt numerical in-stream flow standards for studied streams by 1997. Interim Target Attainment Status Non-attainment -Have not established instream flow standards, however, as of 2001, research was underway.	In-stream Flow	Attainment	Unknown	Attainment
F-3 Monitoring Status						
Since 1996, the TRPA permit database revealed that TRPA has not issued any permits that would contribute to reduced stream flows, nor are there records of permits allowing for the exchange of water diversion from stream to lake in-take lines. Starting in 2000, Desert Research Institute initiated research to identify seasonal stream flow fluctuation on basin streams. Upon completion in 2002, recommendation resulting from this work will be used to establish minimum stream flow standards.						
F-3 2001 Recommendations						
1. Review and revise (if necessary) threshold standard and indicator for stream flow; adopt recommendations for updated standards consistent with desired future conditions by 2006.						
F-3 Attainment Schedule						
Complete Desert Research Institute's research on in-stream flow characteristics and adopt minimum flow standard recommendations.						

F-4: LAHONTAN CUTTHROAT TROUT REINTRODUCTION

Threshold Standards	F-2 Indicator	1996 Interim Target		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
It shall be the policy of the TRPA Governing Board to support, in response to justifiable evidence, state and federal efforts to reintroduce Lahontan cutthroat trout.	The successful establishment of a Lahontan cutthroat trout population in the Lake Tahoe Region.	None Reported Interim Target Attainment Status N/A – threshold standard status has not been evaluated in past evaluation.	Lahontan Cutthroat Trout	Not Reported	Not Reported	Attainment
F-4 2001 Monitoring Status						
Since the initial reintroduction of LCT in 1990 to the headwaters of the Upper Truckee River, the USFS-LTBMU and Cal. Dept. of Fish and Game annually monitor the status of the population. More recently (2001), UC Davis - TRG has documented the occurrence of LCT in the Cascade Creek watershed.						
F-4 2001 Recommendations						
1. Review and revise (if necessary) threshold standard and indicator for LCT consistent with desired future condition by 2006.						
F-4 2001 Attainment Schedule						
Currently in attainment with threshold standard.						

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

A. F-1: LAKE TAHOE FISH HABITAT

The threshold standard for the Lake Tahoe fish habitat reads:

A non-degradation standard shall apply to fish habitat in Lake Tahoe. Achieve the equivalent of 5,948 total acres of excellent habitat as indicated by the Prime Fish Habitat Overlay Map dated 5/19/97 as may be amended from time to time.

The “Study Report for the Establishment of Environmental Threshold Capacities” (TRPA 1982a) reported that, “existing conditions are currently in compliance with the threshold” (equaling 5,948 acres of spawning and feed and cover habitat combined).

1. Evaluation Criteria

According to TRPA (1982a), “The quality of the lake can be evaluated and tested against the threshold using measures of habitat disturbance and substrate conditions.” The indicator for the F-1 threshold standard was identified in TRPA (1996) as “Physical disturbance of rocky substrate (acres)”. TRPA (1982a) considered moderate to heavy boat traffic as disturbance that significantly contributed to the decline of lake fish habitat quality, while TRPA (1996) further considered the rearrangement or clearing of near shore substrate to accommodate beach use during low water as disturbance to fish habitat and thus a degradation to fish habitat conditions.

2. Measurement and Monitoring

No standardized approach to lake monitoring of physical habitat has occurred since 1988. Additionally, no lake habitat enhancement projects have been initiated since 1996. In 1993 and 1994, TRPA staff conducted an inventory of Lake Tahoe’s shoreline at low water in an effort to characterize the condition of the shorezone. This effort resulted an estimate of the amount of cobble and rock (spawning, feed and cover habitat) that had been moved aside to accommodate beach use. In 1997, TRPA staff conducted a limited survey to verify mapped habitat types (C. Shade, personal communication., 2001). Both data sets were incorporated into TRPA’s GIS fish habitat database (C. Shade, personal communication, TRPA, 2001). According to the FTAG it was unknown whether areas where substrate had been moved aside or cleared during low water were negatively or positively impacted because data were not available to make a conclusion either way.

On-site inspections by TRPA’s Project Review and Compliance divisions have significantly reduced the potential of a project to degrade lake habitat (P. Nielson personal communication, TRPA, 2001). TRPA personnel conduct on-site fish habitat verifications as part of the shorezone project review process and have been valuable for determining whether a proposed project will adversely impact ‘prime’ lake habitat. If a project is determined to negatively impact fish habitat, TRPA cannot make findings to approve the project and, therefore, the potential to degrade fish habitat is avoided.

Both the California Department of Fish and Game (CDFG, Staffard Lehr, pers. comm., 2001) and Nevada Division of Wildlife (NDOW 2000) conduct angler surveys on Lake Tahoe. CDFG regularly monitors fish guides take, while NDOW conducts creel and angler surveys.

3. Results of Measurement and Monitoring Efforts

Although there was a lack of monitoring data, it was the professional opinion of the FTAG that the condition of lake habitat, as of 2000, was probably unchanged from the condition reported in the 1996 Threshold Evaluation, in which 3,495 acres of shorezone acreage was considered 'prime' habitat (spawning and feed and cover habitats combined) and undisturbed. As per TRPA GIS, the value reported for 'prime' habitat in the 1996 Threshold Evaluation is less than the value reported in this evaluation (see Table 6-1). A summarization of the most current TRPA GIS lake habitat layer indicated that undisturbed spawning and feed and cover habitat combined amounted to 4,288 acres (Table 6-1). This discrepancy (+793 acres) may exist because the TRPA fish habitat GIS layer was updated in 1997 with new information (C. Shade, pers. comm., 2001). It is worth noting however, that the estimate of 'prime' habitat reported in the this evaluation was likely low because the area of disturbance as defined in the latest TRPA lake fish habitat GIS layer was greater than what was observed on the ground. That is, the GIS layer for fish habitat is a coarse approximation of substrate. Nonetheless, according to acreage calculations in this report, TRPA is 1,660 acres below a target of 5,948 acres of 'prime' fish habitat and therefore not in compliance with the threshold standard for lake fish habitat. If beach clearing and boat activity were not considered an impact to fish habitat, 5,958 acres of 'prime' fish habitat would be accounted for, a value consistent with the threshold standard (Table 6-1).

On-site visits to proposed shorezone projects were an effective project review tool to avoid impacts to fish habitat. No projects have been permitted by TRPA that would significantly impact 'prime' fish habitat. However, there is substantial evidence that indicates that many shorezone structures are being placed in Lake Tahoe without a TRPA permit. For example, in 1999 TRPA reported that there were 3,536 buoys in Lake Tahoe (TRPA 1999). In 2000, TRPA used GPS technology to document all buoys in Lake Tahoe and found that > 6,200 buoys occurred in Lake Tahoe, nearly double the number reported in 1999.

According to NDOW and CDFG, anglers of Lake Tahoe have had a positive fishing experience since 1996. Data suggests that anglers are catching a variety of fish species (mostly lake trout, kokanee salmon, and rainbow trout) of desirable size classes.

Table 6-1. An Estimate Of Substrate Acreage By Habitat Type And 'Disturbance' In Lake Tahoe's Shorezone (Shoreline To 30 Feet Deep).

Habitat Type/Disturbance	Acres
Spawning (gravel 2 to 64mm diameter)	2,041
Not Disturbed	1,482
Disturbed ^a	559
Feed and/or Cover (>64mm diameter, interspersed boulders w/ gravel, sand and/or silt)	3,917
Not Disturbed	2,806
Disturbed ^a	1,111
Subtotal Prime Habitat - not disturbed	4,288
Subtotal Prime Habitat – disturbed	1,670
Subtotal Prime Habitat	5,958
Marginal (sand/silt bed, < 2mm diameter)	3,670
Not Disturbed	3,670
Disturbed ^a	0
Total Habitat	9,628
Total Disturbed	1,670
Total Not Disturbed	7,958
Source: TRPA GIS 2001 [layer name = 'fishhab_trpa8']. ^a Disturbance is defined as substrate redistributed or cleared by people (i.e. beach clearing) during drought years or areas potentially impacted by static shoreline revetments. Acreage for disturbed area is likely to be less than values reported in this table based on FTAG and Byron et al. (1989), Beauchamp et al. (1990, 1991), Allen and Reuter (1996), which stated that it was unknown if the redistribution of lakebed substrates had a negative impact on fish habitat.	

4. Trends

Since the adoption of the lake fish habitat threshold much has been learned, with more to be discovered, related to the condition of Lake Tahoe's fisheries. According to the FTAG it is unknown when TRPA will meet its threshold goal of providing 5,948 acres of undisturbed fish habitat until an effort is put forth to document lake habitat distribution with respect to a meaningful definition of disturbance (i.e., fisheries impacts). When environmental threshold standards for fish were established for Lake Habitat, it was believed that moderate to heavy boat activity and shorezone structures adversely impacted fish habitat (TRPA 1982a and TRPA 1982b). However, research conducted by Tahoe Research Group (TRG) indicated that existing shorezone structures do not degrade lake habitat and that boating activity resulted in an insignificant behavior modification in fish (Byron et al. 1989, Beauchamp et al. 1990, Beauchamp et al. 1991). Additional research focused specifically on how shorezone structures, and the activities associated with them, affect the spawning success of Lake Tahoe's littoral fish species (Allen and Reuter 1996). Among findings and recommendations related to the timing of spawning, shorezone structure construction, and mitigations, Allen and Reuter (1996) reported that the beaching of boats on gravels < 65mm in size was perhaps the most significant impact to the reproductive potential littoral spawning fish species. This study also revealed that the extent of boat beaching was minor and primarily occurred on summer holiday weekends. Thus the FTAG concluded from the findings of TRG researchers that Lake Tahoe's physical habitat for fish is not in a degraded condition as a result of boat activity or the presents of shorezone structures. Additionally, according to the FTAG, the affect of clearing beaches

(moving rock substrate to one side to improve sandy beach conditions) during drought years was unknown and did not necessarily represent an impact or benefit to fish habitat. Additional research would assist TRPA to determine if the redistribution of rocks on beaches affects fish habitat condition.

The FTAG identified other issues that may affect the condition of Lake Tahoe's fish community.

- Polycyclic Aromatic Hydrocarbons (PAH) pollution associated with burned fossil fuel (i.e., boating) may affect Lake Tahoe's fishery when combined with solar radiation. In fish, PAHs are mutagenic (causing mutations), morphogenic (causing physical deformations), carcinogenic (cancer causing), and teratogenic (causing fetal malformations) and cause decreased survivorship and reproduction in zooplankton. Although the direct impacts of boat activity were determined to be negligible, chemicals released by boats, such as PAH's, may decrease fish survivorship in Lake Tahoe. Due to continued projections of increased boat use on Lake Tahoe, it would be prudent to conduct additional research in order fully understand effects of phototoxic PAH on Tahoe's fisheries.
- The introduction and proliferation of exotic, invasive, aquatic weeds, such as Eurasian watermilfoil (*Myriophyllum spicatum*), can reduce habitat quality for native fish by improving conditions for non-native predatory fish like largemouth bass (*Microterus salmoides*), especially in shallow marsh environments critical for fish nursery life stage. Preliminary surveys have identified several locations within Lake Tahoe in which this plant has spread (Anderson 1995). Additionally, surveys have documented the occurrence of milfoil in upland lake within the region.
- Preliminary data indicates that introduced species, such as largemouth bass and smallmouth bass (*Micropterus dolomieu*), have likely altered the community structure of fish in localized areas such as the Tahoe Keys Marina. Alterations to other areas of Lake Tahoe may have occurred or may occur in the future unless preventative actions are taken. Without non-native fish management, it is expected that localized areas within Lake Tahoe's waters will experience a significant decline in native littoral fish populations.

5. Threshold Attainment Status

Although there is no apparent decline in recreational fishing opportunities and in lieu of inconsistent monitoring data, the FTAG concluded that the threshold standard for physical habitat in Lake Tahoe is not in attainment (Table 6-2).

Table 6-2. Status of Lake Habitat Threshold Standard		
<u>Status By Evaluation Year</u>		
1991	1996	2001
NO	NO	NO

6. Effectiveness of Measures in Place

Compliance measures in place are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region or to promote attainment or maintenance of any threshold or standard. In the case of fisheries, these measures would be aimed at ensuring the viability of all desired fish populations in the basin. Supplemental measures are programs, regulations or other measures, which are not currently enacted, but if they were, would assist threshold maintenance and attainment. See Table 6-8 at the end of this chapter for the summary of compliance measures in place for fisheries.

Category: fisheries

Parameter: lake habitat

1. STANDARD: A non--degradation standard shall apply to fish habitat in Lake Tahoe. Achieve the equivalent of 5,948 total acres of excellent habitat.
2. INDICATOR (UNITS): Physical disturbance of rocky ([spawning and feed/cover habitats](#)) substrate (acres).
3. MONITORING SUMMARY: In 1989, ~~monitoring of lake habitat~~ [was inventoried](#) ~~took place~~ in conjunction with ~~the study a research project~~ titled "[Final Report: Littoral Structure and Its Effects on the Fish Community of Lake Tahoe](#)", Byron et al., 1989 ~~et seq.~~ ~~In addition, d~~ [During the summer months of 1993 and 1994 \(during which time Lake Tahoe was at historically low elevations\)](#), the shoreline of Lake Tahoe was surveyed for a number of ~~constituents for the "Lake Tahoe Shorezone Development Cumulative Impact Analysis DEIS characteristics, including lake substrate disturbance".~~ ~~In Lake fish habitat was one of the constituents.~~ [In 1997, TRPA staff performed habitat verifications with the assistance of Cal. Dept. of Fish and Game.](#) ~~This information has been added to TEGIS~~ [was integrated into TRPA's GIS.](#) ~~Since 1997, no additional fish habitat surveys have been conducted beyond fish habitat verifications performed prior to permit approval for shorezone projects.~~ [For the 2001 Threshold Evaluation, The Lake Tahoe Fisheries Technical Advisory Group \(FTAG\), representing fisheries professionals in the basin, were queried about the status of Lake Tahoe habitat conditions. Their professional opinion was used to conclude whether the F-1 standard was in compliance, and can be queried on a parcel-by-parcel basis.](#) ~~Using this data base, TRPA should monitor changes to fish habitat substrate at least every five years. During cycles of low water elevation, it is recommended that annual monitoring be conducted. It is during low Lake elevation years when the majority of habitat manipulation occurs with the removal or relocation of substrate by shoreline property owners.~~

4. ATTAINMENT STATUS: Non-attainment. ~~No quantifiable amount of fish habitat restoration work has occurred over the past five years. However, the numerical standard established for this threshold was based, not only on degraded habitat due to direct human manipulation, but also the assumption that shorezone structures degraded the habitat. Therefore, the indicator, physical disturbance of rocky substrate, has not been correctly mapped. TRPA needs to amend the map to more accurately reflect those areas in need of habitat restoration. Based on more current information related to habitat manipulation, there are approximately 1,000 acres less habitat in need of restoration than was documented in 1982. This means the Region is approximately 1,000 acres closer to threshold attainment today. The lake habitat threshold standard is not in attainment according to the FTAG (2001). However, a GIS analysis revealed that fish habitat is much closer to meeting the threshold standard than previously reported in the 1996 Threshold Evaluation. A conservative estimate of undisturbed 'Prime' fish habitat revealed that a minimum of 4,288 acres occurs in Lake Tahoe as of the last GIS data update in 1997.~~
5. TARGET DATE: 2006
6. EVALUATION INTERVAL: Five years
7. INTERIM TARGETS: [Survey and map lake habitat by 2005 and recalculated extent and distribution of different shorezone substrates. Interim target is to achieve 5,948 acres of 'prime' fish habitat \(spawning and feed/cover\) by 2006 following an assessment of activities that degrade fish habitat. Reassess threshold standard and indicator for lake fishery by 2005.](#) ~~TRPA shall sponsor a study to evaluate different fish habitat restoration and enhancement techniques. Based upon the recommendations of this study, TRPA shall develop a Fisheries Improvement Program for in-Lake fisheries by December January 31, 1999, to guide progress towards threshold attainment.~~
8. COMPLIANCE MEASURES: ~~(See Section II for inventory)~~

- a. MEASURES IN PLACE: FISHERIES: ~~01, 03, 04, 05, 12, 13, 14, 15, 16, and 17~~ 158, 160, 161, 162, 168, 169, 170, 171, 172, and 173; Also see Table 6-3
 - b. EFFECTIVENESS OF MEASURES IN PLACE: In general measures in place are effective, see Table 6-3 for evaluation of measures in place. ~~The 1996 Evaluation recommends review and revision to the Code to enhance controls on manipulation of the Lake bottom, revise location standards for structures in the shorezone, review and revise the Code to emphasize mitigation of adverse impacts to Lake habitat, conduct an in-Lake fish habitat restoration study in order to provide scientifically accurate recommendations for restoration projects in the shorezone, and develop a complete fish habitat restoration program based upon recommendations from a fish habitat restoration study.~~
 - c. SUPPLEMENTAL MEASURES: ~~Not identified~~ Implement non-native fish depredation program. Restrict emissions of Polycyclic Aromatic Hydrocarbons if it is shown to impact the sustainability Lake Tahoe fish populations.
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~Not applicable~~ Since supplemental measures were not identified in 1996 threshold evaluation, not applicable to comment of effectiveness supplemental measures.
9. ADEQUACY OF COMPLIANCE MEASURES: In general measures in place are effective; see Table 6-3 for evaluation of all measures in place. ~~With the recommended changes (see above), the compliance measures should result in attainment and maintenance of the threshold.~~

B. F-2: STREAM HABITAT

1. Evaluation Criteria

NUMERICAL STANDARD: Maintain 75 miles of excellent, 105 miles of good, and 38 miles of marginal stream habitat as indicated by the Stream Habitat Quality Overlay Map (as amended in 1997).

TRPA (1982a) states the following “The quality of stream habitat can be measured and evaluated for compliance with the adopted threshold.” The indicator of stream habitat quality was adopted in 1996 as part of the Threshold Evaluation and states “Miles of stream habitat in the various categories based on field inspections of habitat” (TRPA 1996). Although the threshold standard identifies numerical targets (i.e., miles of stream), the past evaluation approach was based on a list of subjective stream habitat quality criteria (see Table 6-3). Essentially each threshold stream was scored according to criteria identified in the table to conclude the relative condition of each stream. The resulting score for a particular stretch of stream was then fitted into 1 of 3 classes, ‘excellent’, ‘good’, or ‘marginal’ and the overall mileage of that stream segment was calculated (Table 6-4). According to TRPA documents, it was unclear which fish species group the classification scheme was relevant too (e.g., suckers, trout, all). Consequently, an assumption was made that the classification scheme was most relevant to trout species considering the criteria used in the classification scheme. Depending on the availability of data, past evaluations have used different criteria to draw conclusions on the conditions of different streams. For example, biological data were not available for the 1996 Threshold Evaluation and thus those criteria were dropped from the condition assessment of all threshold streams.

For this Threshold Evaluation the professional opinions of FTAG members were used to report on the condition of stream habitat due to lack field effort since 1996.

Table 6-3. Original stream ranking criteria used to rate the condition of threshold streams (from Appendix D of TRPA 1982b)

Criterion	Rating (score)		
	Prominently Dry	Intermittent	Continuous Flow
Seasonal Stream Flow			
Resident	0	2	5
Migratory	0	2	5
Pool Abundance	Less Than 50%	More Than 50%	Close to 50%
Resident	2	2	5
Migratory	2	2	5
Aquatic Cover	Poor	Medium	Good
Resident	0	2	5
Migratory	0	2	5
Substrate	Poor	Fair	Good
Resident	0	2	5
Migratory	0	2	5
Shade Canopy	Poor	Medium	Good
Resident	0	2	5
Migratory	0	2	5
Aquatic Vegetation	Few	Common	Abundant
Resident	0	1	2
Migratory	0	1	2
Benthic Fauna	Poor	Fair	Good
Resident	0	5	10
Migratory	0	5	10

Table 6-3. Original stream ranking criteria (continued)			
Criterion	Rating (score)		
Fish Abundance	Few	Common	Abundant
Resident	0	5	10
Migratory	0	5	10
Reproduction	Poor	Fair	Good
Resident	0	2	5
Migratory	0	5	10
Bank/Channel Stability	Poor	Fair	Good
Resident	0	2	5
Migratory	0	2	5
Stream Gradient	Steep	Slight	Moderate
Resident	0	1	2
Migratory	0	2	5
Barrier/Obstructions	More than one	One	None
Resident	0	1	2
Migratory	0	5	10
% Diversion	High	Moderate	None
Resident	0	5	10
Migratory	0	5	10
Maximum Resident ^a	2	31	71
Maximum Migratory ^a	2	40	87
Criteria were modified for the 1996 Threshold Evaluation (TRPA 1996) by removing biological criteria from stream condition assessment (C. Shade 2001, Senior Planner, TRPA, pers. comm.).			
*Stream Classification Scoring System			
^a 1996 Threshold evaluation maximum scores for a residential or migratory stream was 70% of the maximum score reported in TRPA (1982b).			

Table 6-4. Stream score classes used in 1982 and 1996				
Stream Classification	Original Score Classes for Migratory Streams (1982b)	Original Score Classes for Resident Streams (1982b)	Revised* Score Classes for Migratory Streams (1996)	Revised* Score Classes for Residential Streams (1996)
Marginal	< 55 points	< 35	< 38.5	< 24.5
Good	55 – 68 points	35 - 50	38.5 – 47.5	24.5 - 35
Excellent	> 68 points	> 50	> 47.5	> 35
Refer to Appendix 3 in this evaluation for a summary of stream scores reported in TRPA, 1996				
*The same stream ranking criteria in Table 6-4 were used in 1996, with the exception of biological indicators				

2. Measurement and Monitoring

Limited effort has been put forth to monitor stream habitat conditions between 1996 and 2000. Starting in 2000, the TRPA initiated a program to spatially document and describe opportunities for fisheries habitat improvements. This information was initiated in an effort to more specifically identify EIP projects for fisheries. As of 2000, a total of 8 threshold streams have been inventoried for habitat improvement needs. Additionally, TRPA fisheries staff was trained in and implemented the USDA Forest Service Pacific Northwest Region Stream Inventory Protocol (2000) on one stream. California Department of Fish and Game have completed some fish sampling for stream restoration projects (e.g., Trout Creek) in order to determine if restoration benefited fish populations.

3. Results of Measurement and Monitoring Efforts

Limited effort was put forth to monitor stream fish habitat between 1996 and 2000 beyond data collected by TRPA to identify opportunities for habitat improvements. Notwithstanding, it was the opinion of the Fisheries Technical Advisory Group that habitat conditions have not been significantly diminished or improved between 1996 and 2000. Therefore, it was FTAG's conclusion that the results reported in the 1996 Fisheries Threshold Evaluation would be valid for this threshold evaluation. FTAG noted that as of summer 2000, several stream restoration projects had been initiated, although not completed. Consequently, these restoration projects will likely contribute to the overall threshold goal to improve stream habitat conditions for fish.

Table 6-5. Miles of stream by different ratings for 1982 and 1996 compared to threshold standard.

Stream Rating	Miles of Stream (TRPA 1982b)	Miles of Stream (TRPA 1996)*	Threshold Standard
Excellent	24	43	75
Good	65	41	105
Marginal	129	132	38
Total	218	216	218

According to FTAG, mileage calculations reported in TRPA, 1996 were still reflective of stream conditions as of Fall 2000.
*Revised stream miles are more reflective of actual stream mileage (TRPA 1996).

FTAG suggested that it was difficult to quantify the condition of stream because there are many variables that influence the quality of a habitat and each species will have different habitat requirements. Thus, a stream with 'excellent' habitat for brook trout may not be high quality habitat for Tahoe sucker. Therefore, the FTAG recommended that a different approach be used to evaluate the quality of stream habitat for fish in future threshold standard updates (i.e., 2007 Regional Plan Update). The new evaluation approach would recognize that stream systems are in constant flux and will change over time, and that natural change does not necessarily equate into degradation. Additionally, an updated threshold standard should recognize that different species of fish have different habitat requirements. In order to appropriately assess the threshold standard for stream habitat as articulated would require a substantial field effort.

4. Trends

Since 1996, progress has been made towards initiating stream restoration projects. As of May 2001, nine EIP project with the potential to improve stream habitat were either initiated or near completion. Although many of the EIP projects are not yet completed, there is agreement among basin fisheries professionals that these projects will likely improve stream habitat conditions. FTAG considered the completion of stream restoration projects as the single greatest potential for improving the stream habitat and thus the health of fish populations. The FTAG also stressed the need for a monitoring program in order to report the successes and failures of stream restoration projects.

5. Threshold Attainment Status

According to the FTAG the condition of stream habitat likely has not changed considerably since the 1996 Threshold Evaluation. Therefore, the stream habitat threshold standard is not in attainment (Table 6-6).

Table 6-6. Status of Stream Habitat Threshold Standard		
Threshold Attainment Status By Evaluation Year		
1991	1996	2001
NO	NO	NO

6. Effectiveness of Measures in Place

See Section Table 6-8 at the end of this chapter for the summary of compliance measures in place for fisheries.

Category: fisheries

Parameter: stream habitat

1. STANDARD: maintain 75 miles of excellent, 105 miles of good, and 38 miles of marginal stream habitat as indicated by the map on page 76 of the EIS for the Establishment of Environmental Thresholds (TRPA, 1983).
2. INDICATOR (UNITS): Miles of stream habitat in the various categories based on field inspections of habitat.
3. MONITORING SUMMARY: Limited stream habitat sampling has occurred since the conclusion of USFS-LTBMU effort in 1996. Because limited stream habitat data were available for this evaluation, TRPA relied on the expert opinion of the Lake Tahoe Fisheries Technical Advisory Group (FTAG) to make conclusions on the condition of basin streams. Their conclusions were based on the role of precipitation effects on habitat and progress made on restoration. In 2000, TRPA initiated a stream habitat restoration needs inventory. The goal of the inventory is to spatially document all man-made features and other degraded features along the main stem of threshold streams. Inventory is expected to be completed in Fall 2002. ~~The Forest Service has completed an intensive inventory of the Region's streams. Of the 52 streams originally rated for in-stream fish habitat in Appendix D of the Threshold Study Report (1982), the Forest Service inventory covers all but six (Glenbrook, Bonpland, Mill, Wood, Page Meadow, and Cathedral Creeks). TRPA, with the assistance of the Forest Service, Tahoe Research Group, California Tahoe Conservancy, California Department of Fish and Game, and California State Parks and Recreation, has re-rated the habitat for 48-50 streams. Results are shown in Appendix C.~~
4. ATTAINMENT STATUS: Non-attainment. Threshold streams were re-evaluated in for the 1996 Threshold Evaluation using data collected by USFS-LTBMU between 1989 through 1996. This is the most recent set of information available. Because there has not been any significant changes to streams as a result of precipitation or restoration, FTAG concluded that stream are likely similar to conditions reported in 1996. The EIS for the Environmental Threshold Carrying Capacities cited the need to upgrade 54

~~stream miles of habitat from good to excellent, and 94 miles from marginal to good. Currently, based on the re-rated stream scores, approximately 44 miles are rated excellent, 38 miles are rated good, and 132 miles are rated marginal. These new ratings reflect some improvements and a few degradations. For the most part, the new ratings represent a more accurate appraisal of the condition of the Region's streams. Overall, the majority of streams have maintained their original ratings. There are three migratory streams that have been downgraded due to beaver dams that have been built which are impeding migration upstream for spawning and/or out-migration (see Table 5-2 In-Stream Habitat Re-rated).~~

5. TARGET DATE: 2006
6. EVALUATION INTERVAL: 5 years
7. INTERIM TARGETS: Update threshold standards and indicators for stream habitat by 2006. Develop empirical stream habitat monitoring protocol and analysis protocol by 2006. A total of 50 miles of stream shall be classified as 'excellent' habitat quality for salmon species by 2006 (a result in 8 miles of stream habitat improvement since 1996) and a total of 50 miles of stream shall be classified as 'good' for salmon species by 2006 (a result of 9 miles of stream habitat improvement since 1996) on TRPA designated threshold streams. A qualified fisheries biologist using empirical data should make determinations of stream quality. Based upon the updated stream habitat ratings and the stream habitat potential ratings (see Appendix C-1), TRPA should facilitate the improvement of 15 miles of stream habitat to excellent, and 35 miles of stream habitat to good, by December 31, 2004.
8. COMPLIANCE MEASURES: ~~(See Section II for inventory)~~ See Table 6.3
 - a. MEASURES IN PLACE: FISHERIES- 158, 159, 163, 164, 165, 166, 167, 168, 170, 171, 172, and 173 ~~01, 02, 06, 07, 08, 09, 10, 11, 12, and 16.~~
 - b. EFFECTIVENESS OF MEASURES IN PLACE: In general, measures in place are effective in maintaining stream habitat quality. Please see Table 6.3 for evaluation of measures in place. The

~~1996 Evaluation recommends an expanded, enhanced, and updated SEZ restoration program, amendments to the stream habitat maps to reflect the changes that have occurred as a consequence of re-rating, amendments to Appendix D of the EIS for the Establishment of Environmental Threshold Carrying Capacities by adding the new ratings and new potential ratings, and amendments to Chapter 74 of the Code to include protection of SEZs that supports non-degradation standards found in both the fisheries and wildlife thresholds.~~

- c. SUPPLEMENTAL MEASURES: Implementation of EIP fisheries and SEZ restoration project shall be considered as supplemental measures. ~~Develop a Regional Fish Habitat Improvement Program which incorporates specific habitat restoration projects and becomes a tool for attaining and maintaining thresholds as a part of the EIP.~~
- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~Not applicable~~ Supplemental measure identified in 1996 Threshold Evaluation has been completed as part of the EIP. Effort on identifying opportunities for stream habitat restoration should continue.

9. ADEQUACY OF COMPLIANCE MEASURES: In general, measures in place are effective at maintaining stream habitat quality. See Table 6.3 for full evaluation. ~~The recommended changes to the compliance measures in-place should result in an accelerated rate of stream habitat restoration. Adequacy will be evaluated further upon release of the next stream habitat inventory and ratings.~~

C. F-3: IN-STREAM FLOW

1. Evaluation Criteria

MANAGEMENT STANDARD: Until in-stream flow standards are established in the Regional Plan to protect fishery values, a non-degradation standard shall apply to in-stream flows.

The evaluation criterion for the in-stream flow threshold standard is found in TRPA (1982a), which states, "It can be evaluated for compliance by monitoring the number of new diversions and changes in points of diversion." TRPA (1996) states that the indicator of in-stream flows is "...evaluated by use of an in-stream beneficial use assessment, such as the type established by Title 23, Section 670.6 of the California Administrative Code." Past evaluations have quantified the number of applications for diversions and lake transfers filed with TRPA as an indicator of maintenance of stream flow conditions in the Region.

2. Measurement and Monitoring

TRPA's "TEGIS" permit tracking database stores information relevant to permit applications and permit approvals for water diversion or exchange. The TEGIS database was queried to determine if TRPA has approved water diversions, or water exchanges since 1996.

In June 2000, a contract was signed with the University of Nevada, Reno - Desert Research Station (DRI) to assess the long-term in-stream flow regime of streams in the Lake Tahoe Region. Additionally, in the summer of 2001, DRI will identify water rights and map water diversion on regional streams. Combined, it is anticipated at the completion of this assessment in January 2002 that TRPA will be able to:

- 1) Document the natural range of variation in individual streams flow characteristics in the region;
- 2) Identify which stream can support different life stages of salmonid fish (fish in the salmon family); and
- 3) Specifically identify opportunities to remove water diversions.
- 4) Adopt minimum standards for in-stream flows as per the direction of the 1996 Threshold Evaluation recommendations.

Information from this assessment will also be used to improve threshold standards for the Regional Plan Update for 2007.

3. Results of Measurement and Monitoring Efforts

Since 1996, no applications or permits were entered into the TEGIS database. According to TRPA's records there has not been a degradation to in-stream flows as a result of TRPA project permitting.

4. Trends

Based on the lack of applications for water-diversions entered into the TRPA's records, it appears that additional reductions to stream flow, as a result of diversion, is unlikely. However, continued monitoring is needed.

5. Threshold Attainment Status

According to TRPA records, no new water diversions have been approved since 1996 in the Region. Consequently, water flows have not been diminished as a result of TRPA actions and therefore is in attainment with interim non-degradation standard.

6. Effectiveness of Measures in Place

See Section Table 6-8 at the end of this chapter for the summary of compliance measures in place for fisheries.

Category: fisheries

Parameter: instream flows

1. STANDARD:
TRPA: Until instream flow standards are established in the Regional Plan to protect fishery values, a non-degradation standard shall apply to instream flows.
2. INDICATOR (UNITS): Interim indicator - Number of permits issued that allows long-term reductions to stream flow and degradation to riparian community. Permits shall not be issued unless if it is proven that riparian community will not be impacted. Long-term indicator – stream flows on basin streams shall not unnaturally drop below seasonal flow standards established by TRPA supported by research conducted by Desert Research Institute. Instream flows evaluated by use of an instream beneficial use assessment, such as the type established by Title 23, Section 670.6 of the California Administrative Code. (See Code, Chapter 79, Subparagraph 79.2.B(9)).
3. MONITORING SUMMARY: Since 1996, the TRPA permit database revealed that TRPA has not issued any permits that would contribute to reduced stream flows, nor are there records of permits allowing for the exchange of water diversion from stream to lake in-take lines. Starting in 2000, Desert Research Institute initiated research to identify seasonal stream flow fluctuation on basin streams. Upon completion in 2002, recommendation resulting from this work will be used to establish stream flow standards. Once TRPA adopts numerical instream flow standards, TRPA will evaluate the streams that are currently rated good and excellent, or have the potential to be, with the adopted standards. A long term monitoring protocol will be established.
4. ATTAINMENT STATUS: Unknown. There has been very little monitoring of instream flows, therefore, it is unknown whether the tributaries of the Region are meeting recommended flow standards. Attainment – no permits have been issued that would allow for a reduction of stream flows in basin streams.
5. TARGET DATE: 2006
6. EVALUATION INTERVAL: Five years
7. INTERIM TARGETS: ~~By June 1998, adopt instream flow standards and by December 31, 1998, establish monitoring and evaluation criteria to measure instream flows of the Region's tributaries against the adopted standards. Based upon this information, develop a program that facilitates the transfer of water diversion from stream to Lake Tahoe for those streams that are not in compliance, bringing these streams into conformance by the year 2006 will bring those streams not in compliance into conformance by the year 2006. Complete Desert Research Institute's research on in-stream flow characteristics and adopt minimum flow standard recommendations.~~
8. COMPLIANCE MEASURES: See Table 6-3. (See Section II for inventory)
 - a. MEASURES IN PLACE: FISHERIES-- 01, 12, and 15 158, 159, 170, 171, 172, and 173
 - b. EFFECTIVENESS OF MEASURES IN PLACE: In general, measures in place are effective at maintaining minimum stream flows. See Table 6.3 for full evaluation of measures in place. The 1996 Evaluation recommends adoption of numerical instream flow standards for studied streams (01) and increased compliance activity (15) to maintain this threshold which includes the facilitation of water exchanges from stream diversions to Lake uptake.
 - c. SUPPLEMENTAL MEASURES: ~~To be~~ Added as necessary
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Not applicable
9. ADEQUACY OF COMPLIANCE MEASURES: ~~Compliance measures in place are adequate to maintain this threshold with the changes recommended above. In general, compliance measures are adequate for maintaining threshold standard. See Table 6.3 for full evaluation of measures in place.~~

D. F-4: LAHONTAN CUTTHROAT TROUT

1. Evaluation Criteria

POLICY: It shall be the policy of the TRPA Governing Board to support, in response to justifiable evidence, state and federal efforts to reintroduce Lahontan cutthroat trout.

An evaluation criterion for Lahontan cutthroat trout (LCT) is found in TRPA (1982a), which states, "The threshold would be achieved with the successful establishment of a Lahontan population."

2. Measurement and Monitoring

The USFS and CDFG regularly assess the condition of a small, reintroduced population of LCT in the headwaters of the Upper Truckee River. Additionally, the CDFG has a LCT stocking program. As of 2001, the UC Davis - Tahoe Research Group documented a previously unknown population of LCT in the Cascade Creek watershed (S. Chandra, personal communication, TRG).

3. Results of Measurement and Monitoring Efforts

In 1990, The California Department of Fish and Game and the USFS, LTBMU established a population of LCT in the headwaters of the Truckee River. This population contains approximately 3000 individuals and is restocked with fingerlings regularly (Table 6-7).

Since 1996, CDFG has stocked greater than 5,000 LCT fingerlings into lakes in the Upper Truckee watershed for recreational fishing.

Table 6-7. Number of Lahontan cutthroat trout stocked by lake in the Upper Truckee watershed, Lake Tahoe, CA. 1996 – 2001

Lake	Year					
	1996	1997	1998	1999	2000	2001
Upper Angora Lake	0	4,000	4,000	4,000	4,000	0
Lower Echo Lake	0	10,000	10,000	10,000	10,000	10,000
Middle Four Lakes	0	500	500	500	500	500
Upper Four Lakes	0	500	500	500	500	500
Meiss Lake	5,000	0	0	0	0	0
Round Lake	0	4,000	4,000	4,000	2,000	0
Showers Lake	0	2,000	2,000	2,000	2,000	0
Total Stocked	5,000	21,000	21,000	21,000	19,000	11,000

Source: S. Lehr, CDFG, Associate Fisheries Biologist

4. Trends

As of 2001, CDFG will no longer stocks lakes with LCT or other fish in waters above 5,000 feet elevation due to concerns over the trout's impact on sensitive amphibians. A previously undocumented LCT population may provide research opportunities to better understand LCT natural history in the Region.

5. Threshold Attainment Status

The 1991 Threshold Evaluation reported “one cannot conclude that the Tahoe Region attains the threshold for LCT” due to lack of TRPA support for California Fish and Game reintroduction efforts. The 1996 Threshold Evaluation did not report on the attainment status of the LCT standard. As of 2001, based on the threshold compliance criterion, “a population” of LCT has been established in the region. Therefore the indicator is in compliance with threshold standard because at least one population has been established in the region.

6. Effectiveness of Measures in Place

See Section Table 6-8 at the end of this chapter for the summary of compliance measures in place for fisheries.

Category: fisheries

Parameter: Lahontan Cutthroat Trout

1. STANDARD: It shall be the policy of the TRPA Governing Board to support, in response to justifiable evidence, state and federal efforts to reintroduce Lahontan cutthroat trout.
2. INDICATOR (UNITS): The successful establishment of a Lahontan cutthroat trout population in the Lake Tahoe Region.
3. MONITORING SUMMARY: Since the initial reintroduction of LCT in 1990 to the headwaters of the Upper Truckee River, the USFS-LTBMU and Cal. Dept. of Fish and Game annually monitors the status of the population. More recently (2001), UC Davis - TRG has documented the occurrence of LCT in the Cascade Creek watershed.
4. ATTAINMENT STATUS: Attainment. Evidence suggest that a least two separate populations of LCT occur in the basin
5. TARGET DATE: Not applicable
6. EVALUATION INTERVAL: Five years
7. INTERIM TARGETS: Continue to support well-planned reintroduction efforts.
8. COMPLIANCE MEASURES: See Table 6-3
 - a. MEASURES IN PLACE: FISHERIES- 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, and 173.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: See Table 6-3.
 - c. SUPPLEMENTAL MEASURES: Not identified
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Not applicable
9. ADEQUACY OF COMPLIANCE MEASURES: See Table 6-3

Table 6-8. Effectiveness of Measures in Place for the Fisheries Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(158) Chapter 79, Fish Resources: Intent is to provide protection to fish habitat and to facilitate the enhancement of degraded fish habitat in lakes and streams in the region. Applies to all projects and activities, which could interfere with the health of regional fish populations.	Yes	Chapter clearly articulates standards by which fish habitat shall be managed with respect to projects or activities.	None.
(159) Chapter 71, Tree Removal: Specifies standards for tree removal, tree-cutting practices, logging in SEZs, and yarding. Specifies permissible stream crossings, prohibits placing materials in streambeds, and requires special conditions to protect instream values and habitat diversity.	Yes	For forestry projects, provides setbacks from streams and water bodies in order to maintain the integrity of riparian community	None.
(160) Shorezone BMPs: Provide for protection of vegetation, erosion control, and other practices, which would protect lake fish habitat from degradation from disturbance or siltation.	Yes	Assists in preventing silt deposition into stream mouths and water bodies.	None.
161) Chapter 54: Filling and dredging are strictly limited thus providing for protection of fish habitat from degradation by such projects.			
(162) Location standards for the placement and design of structures lakeward of high water levels. Identifies timeline for research on the impact of structure on fish habitat. Prohibits structures in 'Prime' fish habitat. Setbacks from stream mouths. Design standards for piers, boat ramps, buoys, floating docks, shoreline protective structures, and marinas. Regulations for filling and dredging operations and temporary uses. Regulation of wake zone and motorized watercraft.	Yes	Substantially limits development of shorezone structures.	Need to update location and design standards in chapter 54 to be consistent with research concluded between 1989 and 1996 by Tahoe Research Group. Would allow structures to be placed in all shorezone habitats unless structures impacted another TRPA threshold standard or ordinance.
(163) Chapter 20; Restrictions on SEZ encroachment and vegetation alteration: Protects the quality of stream fish habitat by prohibiting permanent disturbance in SEZs except for certain facilities and then only provided that TRPA make the required findings and offsetting restoration is provided.	Yes	Regulation assist in maintaining the integrity of riparian areas.	None
(164) SEZ Restoration Program: The SEZ restoration program is set forth in Volume III of the 208 plan and EIP.	Yes	None	None
(165) Stream restoration programs: The USDA Forest Service, Nevada State Parks, Cal. State Parks, and CTC have an ongoing program to restore riparian habitat for wildlife, and resident and migratory fish	Yes	Substantially assist with improving degraded fish habitat.	Streamline environmental review of projects designed to improve long-term habitat conditions.

Table 6-8. Effectiveness of Measures in Place for the Fisheries Threshold (continued).

Compliance Measure	Effectiveness	Explanation	Recommendation
(167) Chapter 73: Regulates livestock use in riparian areas. Excludes livestock from stream banks where soil erosion problems exist.	Yes	Attempts to reduce sediment and nutrient load associated with livestock use.	None
(168) BMP and revegetation practices: Best management practices reduce erosion from project areas and therefore reduce the potential of silt deposition into streams.	Yes	None.	None.
(169) Fish habitat study: A study of shorezone and lake fish habitat was conducted to identify projects and activities which affect fish habitat and methods to prevent or mitigate adverse impacts. Based upon the Lake Tahoe Shorezone Development Cumulative Impact Analysis Draft EIS that incorporates the Fish Habitat Study, the Code of Ordinances will be amended as appropriate.	No	Research has been conducted and needs to be incorporated into TRPA regulations.	Delete compliance measure as stated and replace with a generalized compliance measure that allows for fisheries related research as needed to address current issues.
(170) Chapter 9, Remedial Action Plans: Provides for TRPA to request or require a problem assessment to identify situations which adversely impact attainment or maintenance of a threshold and provides for implementation of a remedial action plan to abate the problem.	Yes	Could be effective if implemented. Likely not to be well accepted among other agencies, businesses, and residents.	None
(171) Chapter 56, Mitigation Fee Requirements: Provides for fees to study, restore, or to mitigate any degradation of fish habitat.	Partially	Has provided money for research, however, has not funded restoration projects.	Better ensure that moneys are allocated for fisheries restoration projects.
(172) Compliance inspections: Provides for inspections of project and activities to determine and enforce compliance with the law and conditions of project approval.	Yes	Assist in determining compliance with permit conditions.	Project permit could be more detailed to assist compliance inspector is aware of special condition's intent. Provide more inspections throughout the duration of the project.
(173) Public Education Program: Lahontan cutthroat trout re-introduction program.	Yes	Unknown if effective, but TRPA has developed brochures and 'trading cards' to distribute to public for educational purposes.	Continue to educate public on the importance of maintaining native fish in the region.

IV. STATUS OF 1996 RECOMMENDATIONS

Below is a list of recommendations made in the 1996 Threshold Evaluation. Following, in italics, is a summary of the status of that recommendation.

1. Amend stream habitat maps to reflect the changes that have occurred as a consequence of re-rating. *Completed.*
2. Adopt Appendix C-1 with the amended stream ratings and potential ratings for each stream. *Completed. Recommendation was completed with the completion of the 1996 Threshold Evaluation adoption.*
3. Upon completion of the riparian assessment project, incorporate this information into a revised rating system that evaluates both physical components and biological components for a composite score. *Not Completed. A complete review and revision of stream habitat threshold standards and indicators is anticipated by 2004. As part of this review, a protocol for sampling, monitoring and reporting conditions will be developed.*
4. Develop a fish habitat improvement program for the Region's streams based on the potential a stream has for becoming good or excellent fish habitat, which becomes part of the EIP. *Completed. In may 2001, the EIP was adopted. This document contains an extensive list of fish habitat enhancement projects.*
5. Amend Chapter 74 of the Code in order to provide protection of SEZ's and support the non-degradation standards found in both the fisheries and wildlife thresholds for riparian vegetation. *Completed*
6. Conduct a feasibility study for the reintroduction of amphibians within the drainages that are rated marginal and whose potential to provide fish habitat is marginal. *Not Complete. Basin wide amphibian surveys were conducted by TRPA and USFS in summer 2001. Information will be used in part to identify locations for sensitive amphibian reintroductions.*
7. Facilitate the development of a beaver management program for the Region in coordination with the resource management agencies. *Not Complete. Recommendation should be revised to identify State (CDFG and NDOW) wildlife agencies as lead.*
8. Conduct a mountain whitefish survey to analyze its population status. *Not complete. Funding limitations have hampered TRPA's ability to fund a study.*

V. RECOMMENDATIONS

Recommendations consist of projects, programs, and research needs. Projects are physical manipulations of the landscape in order to achieve a desired condition favorable to sustaining fisheries populations. Programs are plans under which action is taken in order to accomplish a specified fisheries or public outreach goal. Research needs are scientific studies (with well-articulated questions) necessary to support or refute a particular fisheries management standard or policy. It should be noted that the most recent version of the Environmental Improvement Plan contains a list of fisheries projects, which the completion should be considered as recommendations listed for this evaluation.

Considering that the TRPA Regional Plan will be updated in 2007, recommendations for research needs are presented in this evaluation. This will assist the TRPA in securing funding necessary to develop a sound Regional Plan to direct fisheries management policy for the next 20 years following 2007.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~A. Update shorezone ordinance to reflect fish research~~

~~Responsible Entity: TRPA
Funding/Cost: \$5,000 (staff time)
Completion Date: April 2002
Threshold Standard: F-4~~

~~**Recommendation:** Align shorezone development policies (TRPA Code of Ordinances) with fisheries research conducted by Tahoe Research Group between 1989 and 1996 (i.e., Do not base prohibition of shorezone development solely on impacts to fish habitat).~~

~~**Product:** Revision to TRPA Code of Ordinance.~~

~~B. Identify desired future condition of Lake Tahoe fisheries (research)~~

~~Responsible Entity: TRPA, USFS, CDFG, NDOW, USFWS
Funding/Cost: \$10,000
Completion Date: May 2002
Threshold Standard: F1, F2, F3, and F4~~

~~**Recommendation:** Identify desired future composition of Lake Tahoe's fishery. Will require a scientifically derived fisheries community condition that is tempered with a feasibility assessment to determine whether fisheries management can accomplish the identified desired fisheries community condition. May require a consensus approach that includes USFWS, USFS, Cal. Fish and Game, Nevada Division of Wildlife and other research institutions. Will include stream and lake habitats. This recommendation represents a critical step in directing future fisheries policy.~~

~~**Product:** A document with scientifically supported recommendations for a desired future condition for fisheries in the Lake Tahoe basin.~~

C. Review and revise all TRPA threshold standards and indicators for fisheries

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~\$110,000~~
Completion Date: ~~December 2003~~
Threshold Standard: ~~F1, F2, F3, and F4~~

~~**Recommendation:** Based on the identified desired future condition for Lake Tahoe fisheries assessment, assess existing TRPA threshold standards and indicators for consistency with desired future condition and make recommendations for revising threshold standards and indicators. Consideration should be given to developing "Indexes of Biological Integrity" (Karr and Chu 1999) for identifying indicators of lake and stream health. Consideration for this assessment should include 1) classification of aquatic environments, 2) selection of measurable attributes that provide reliable and relevant signals about the biological effects of human activities, 3) sampling protocols that ensure attributes are measured accurately and precisely, 4) analytical procedures to understand patterns in the data. Completion of this recommendation would effectively complete EIP #594.~~

~~**Product:** Document that contains a thorough review of existing TRPA threshold standards and indicators and recommendations for improving standards and indicators.~~

D. Develop threshold standards and indicators for sensitive amphibians.

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~\$10,000~~
Completion Date: ~~November 2003~~
Threshold Standard: ~~N/A~~

~~**Recommendation:** Develop a threshold standard and indicator for sensitive amphibians. Identify amphibians and habitats that need special consideration in the permit process. Develop monitoring protocol that is capable of accurately determining threshold status. Identify potential impediments to achieving such a threshold standard.~~

~~**Product:** Document that contains a scientifically supported recommendation for amphibian threshold standard and indicator.~~

E. Identify effects of non-native fish and aquatic vegetation on native fish.

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~\$30,000~~
Completion Date: ~~November 200~~
Threshold Standard: ~~F-1 and F-2~~

~~**Recommendation:** Conduct an assessment on the effect of non-native fish and vegetation on Lake Tahoe's aquatic community. Which species have the potential to reduce TRPA's ability to achieve the desired future condition of Lake Tahoe fisheries identified in recommendation B? Research should provide recommendations on what management options are available to reduce potential impacts.~~

~~**Product:** Research document that contains a scientifically supported assessment of the role of non-native fish and vegetation in Lake Tahoe's aquatic ecosystem and recommendation for management actions.~~

F. Identify the distribution and extent of lagoon habitats, past and present.

Responsible Entity: TRPA
Funding/Cost: \$20,000
Completion Date: November 2005
Threshold Standard: F-1

Recommendation: Identify the historic and current distribution and extent of lagoon habitats in Lake Tahoe. Research will identify the extent of nursery habitats for native species and identify potential locations for restoration.

Product: Document that contains a description of location of lagoon habitats and recommendations for where restoration of lagoon habitats might be achieved. A map showing the historic and current extent and distribution of lagoon habitats within the Lake Tahoe basin.

G. Re-map Lake Tahoe fish habitat and research the effect of rock clearing on desired fish sustainability.

Responsible Entity: TRPA
Funding/Cost: \$80,000
Completion Date: October 2005
Threshold Standard: F-1

Recommendation: Conduct appropriate scale mapping of fish habitat in Lake Tahoe and use information to update TRPA GIS for fish habitat. Assess the effect of rock clearing in the shorezone on the survivorship and sustainability of desired littoral fish populations.

Product: GIS layer showing distribution of fish habitat types and disturbance features. Scientifically supported assessment of fisheries disturbance features will be identified in a document.

H. Effect of polycyclic aromatic hydrocarbons on desired fish community.

Responsible Entity: TRPA
Funding/Cost: \$80,000
Completion Date: November 2005
Threshold Standard: F-1

Recommendation: Identify the distribution, concentrations, and management implications of gasoline constituents and PAH on Lake Tahoe's desired fish community. Improve managers' and policy makers' understanding of chemical constituents available to fish community, how aquatic community may be affected, and what can be done to mitigate (if necessary).

Product: Document that contains a scientifically supported assessment of the effect of chemical effluents from runoff and boating on desired fish species.

VI. EIP INTEGRATION

The completion of fisheries projects, programs, and research identified in the EIP are central in improving conditions for fisheries in the Lake Tahoe basin and thus achieving threshold standards. A total of 87 projects have been identified in the adopted EIP document (EIP 2001) for fisheries. Of these 87 projects, 65 aim to improve stream habitat, 13 aim to improve lake habitat, and 9 are for research. Many projects listed in the EIP under other threshold categories, such as SEZ, also aid in enhancing conditions for fisheries. Facilitating the completion of EIP projects should be considered as recommendations for this threshold evaluation and the implementation of EIP projects is critical for achieving threshold standards by 2006.

EIP Project Progress Through Fall 2000. According to Volume IV of the 2001 adopted EIP document, a total of 1 fisheries project (Trout Creek) has been completed. However, 16 SEZ and 2 Wildlife projects have been completed that have likely improved fisheries values.

Critical Fisheries Projects for 2006 Threshold Standard Achievement and Benefit. Ultimately the goal of the EIP is to achieve threshold standards as adopted in 1987. Some project may result in a greater overall contribution than other project within the fisheries heading in the EIP, while projects identified under the SEZ heading may also contribute significantly to achieving threshold goals. Below are outlined examples of EIP projects that are believed to contribute significantly to achieving threshold standards if implemented. It should be noted that recommendations listed in this evaluation should also be considered as relevant to achieving threshold goals.

F-1: Lake Habitat. Projects, programs, or research that assists with improving habitat conditions of Lake Tahoe or our understanding of Lake Tahoe's aquatic ecosystem will contribute to threshold attainment. For example, EIP # 339 (Develop In-lake fish habitat restoration techniques), after refining the projects objectives, will assist with identifying disturbed fish habitats in Lake Tahoe and will assist in directing habitat improvement project for Lake Tahoe.

F-2: Stream Habitat. According to FTAG, stream habitat restoration will contribute significantly to sustaining fish populations in the Lake Tahoe basin. The restoration of large-scale streams like Blackwood, Ward, General, Incline, Trout and Upper Truckee should be considered priority restoration streams because they will likely have to greatest benefit to the Lake Tahoe basin's overall fisheries population.

F-3: In-stream Flow. Projects that identify opportunities to remove man-made stream flow impediments will benefit this threshold. Currently, there are no projects in the EIP that specifically address this project need, however, research that is underway and due for completion January 2002, will address this need.

F-4: Lahontan Cutthroat Trout. Projects, programs, or research that assist TRPA with perpetuating and reintroducing Lahontan Cutthroat Trout will aid in maintaining this threshold in 2006. EIP project #10125 (Lahontan Cutthroat Trout Reintroduction), when refined, will serve well to assist TRPA with maintaining and restoring Lahontan Cutthroat Trout populations in the Lake Tahoe basin.

New EIP Project Approaches. As TRPA and its partners make progress on EIP projects, programs, and research, new information is likely to influence future projects. Therefore, it is important that an adaptive approach be used when implementing the EIP. In doing so, beneficial elements that were not previously considered in a project will be implemented or omitted if it found not to be beneficial. Similarly, as TRPA moves towards updating threshold standards and indicators for the 2007 Regional Plan update, there is some likelihood that projects, programs, and research will need to be adjusted to accommodate new threshold language. As with other threshold categories, all EIP projects, programs, and research should be measurable towards its said goal. The adopted EIP has attempted to capture progress made towards threshold goals by identifying 'Units of Benefit' for each threshold category (Table 7-8). In order for this approach to be successful, it will be necessary to have in place a tracking system that TRPA and EIP partners understand and contribute to.

EIP Units of Benefit for Fisheries		
Fisheries		
TH Index	TH Indicator	TH Unit of Benefit
F-1	Lake Habitat	Acres Improved
F-1A	Other Habitat	Acres Improved
F-2	Stream Habitat	Miles Improved to Excellent
F-2A	Stream Habitat	Miles Improved to Good
F-2B	Stream Habitat	Miles Improved to Marginal
F-3	In-stream Flow	Stream flow maintained

VII. SUPPLEMENTAL INFORMATION

- Appendix 1. Status of fish species that have been recorded in the Lake Tahoe basin.
- Appendix 2. Stream ratings reported in the 1996 Threshold Evaluation (TRPA 1996).

Appendix 1. Status of fish species that have been recorded in the Lake Tahoe basin over time

Common Name	Species	Status¹
Arctic grayling*	Thymallus arcticus	No(E)
Atlantic salmon*	<i>Salmo salar</i>	No(E)
Black crappie*	<i>Pomoxis nigromaculatus</i>	Yes
Bluegill*	<i>Lepomis macrochirus</i>	Yes
Brook trout*	<i>Salvelinus fontinalis</i>	Yes
Brown bullhead*	<i>Ictalurus nebulosis</i>	Yes
Carp*	<i>Cyprinus carpio</i>	Yes
Chinook salmon*	Oncorhynchus tshawytscha	No(E)
German brown trout*	<i>Salmo trutta</i>	Yes
Golden shiner*	<i>Notemigonus crysoleucas</i>	Yes
Golden trout*	<i>Oncorhynchus aquabonita</i>	Yes
Goldfish*	<i>Carassius auratus</i>	Yes
Kokanee salmon*	<i>Oncorhynchus nerka kennerlyi</i>	Yes
Lahontan cutthroat trout	Oncorhynchus clarkii henshawi	Yes
Lahontan reddsider shiner	Richardsonius egregius	Yes
Lake whitefish*	<i>Coregonus clupeaformis</i>	No(E)
Largemouth bass*	<i>Micropterus salmoides</i>	Yes
Mackinaw (lake) trout*	<i>Salvelinus namaycush</i>	Yes
Mosquito fish*	<i>Gambusia affinis</i>	Yes
Mountain whitefish	Prosopium williamsoni	Yes
Piute sculpin	<i>Cottus beldingi</i>	Yes
Rainbow trout*	<i>Oncorhynchus mykiss</i>	Yes
Smallmouth bass*	<i>Micropterus dolomieu</i>	Yes
Speckled dace	Rhinichthys osculus	Yes
Tahoe sucker	Catostomus tahoensis	Yes
Tui chub	Gila bicolor	Yes
White crappie*	<i>Pomoxis annularis</i>	Yes

Notes:

¹ Yes = determined to occur in the basin currently, No(E) = presumed to be extirpated from the basin based on a lack of sightings in the last 30 years.

* = Non-native or exotic species (species in bold text are native)

Compiled by Matthew D. Schlesinger and J. Shane Romsos for the *Lake Tahoe Watershed Assessment* (Murphy, D. D., and C. M. Knopp, eds. 2000. Lake Tahoe Watershed Assessment. General Technical Report PSW-GTR-176, USDA Forest Service, Pacific Southwest Region, Albany, California). An explanation of this table and full references appear in that document.

Appendix 2. Stream ratings reported in the 1996 Threshold Evaluation

Stream/Creek Name	Type	Adjusted Scores (TRPA 1996)		Potential Score*	Miles in Condition
		1982	1996		
Angora	Residential	28	32	37	4
Big Meadow	Residential	30	38	48	3.9
Blackwood	Migratory	61	49	70	3.9
Bonplonel	Residential	27	22	-	1.1
Burke	Migratory	26	31	55	1.0
Burke	Residential	28	23	36	3.1
Burton	Migratory	47	31	57	4.9
Carnelian Canyon	Migratory	24	16	50	1.3
Cascade	Residential	45	38	-	4.0
Cold	Resident	35	41	49	8.0
Dollar	Residential	23	23	31	2.5
Eagle	Migratory	54	54	57	0.2
Eagle	Residential	45	40	-	3.0
Edgewood	Migratory	24	14	45	2.4
Edgewood	Residential	24	21	36	3.0
First	Residential	26	26	34	1.8
General	Migratory	43	51	64	9.2
Glen Alpine	Residential	21	41	-	10.5
Glenbrook	Migratory	43	21	55	0.5
Glenbrook	Residential	35	33	49	2.6
Grass Lake	Residential	28	28	38	4.3
Griff	Migratory	40	30	54	4.0
Heavenly Valley	Resident	26	14	42	4.4
Homewood Canyon	Residential	23	23	-	1.9
Incline	Migratory	38	31	55	1.0
Incline	Residential	22	16	37	4.0
Lincoln	Residential	16	16	26	3.1
Logan House	Residential	22	16	29	3.0
Lonely Gulch	Resident	11	22	31	2.0
Madden	Residential	11	14	20	2.9
Marlette	Migratory	51	51	62	0.3
Marlette	Residential	36	39	44	1.5
McFaul	Residential	18	16	39	4.1
McKinney	Migratory	36	39	60	5.8
Meeks	Migratory	41	49	62	6.5
Mill	Residential	-	-	-	1.6
North Canyon	Residential	41	41	53	5.5
Quail	Residential	14	14	-	1.0
Rubicon	Migratory	13	16	50	1.9
Saxon	Resident	37	42	44	6.8
Second	Migratory	31	34	50	1.9
Second	Residential	26	21	37	2.5
Secret Harbor	Residential	36	30	-	1.9
Slaughterhouse	Migratory	38	36	57	3.2
Snow	Migratory	28	26	50	2.4
Tallac	Migratory	25	25	52	4.1
Taylor	Migratory	61	51	64	2.0
Third	Migratory	39	28	60	2.9
Third	Residential	25	25	46	4.0
Trout	Migratory	30	36	57	4.4
Tunnel	Residential	19	9	19	1.9

Appendix 2. Stream ratings reported in the 1996 Threshold Evaluation (continued)

Stream/Creek Name	Type	Adjusted Scores (TRPA 1996)		Potential Score*	Miles in Condition
Upper Truckee	Migratory	35	31	60	21.8
Ward	Migratory	48	38	57	5.8
Watson	Migratory	49	44	60	3.0
Wood	Migratory	41	41	56	1.7
Wood	Residential	28	28	46	1.7
Zephyr Cove	Migratory	19	21	50	0.8
Zephyr Cove	Residential	21	14	36	2.7

* Potential score would be achieved if enhancements were completed on a particular stream.

Chapter 7

WILDLIFE

I. INTRODUCTION

The native wildlife community is a natural and integral component of the Lake Tahoe ecosystem. It has been documented that 289 terrestrial (and semi-terrestrial) vertebrates occur in the Lake Tahoe basin as residents or regular visitors (Murphy and Knopp 2000). This total represents 217 bird, 59 mammal, 8 reptile, and 5 amphibian species (Appendix 1). An additional 57 terrestrial species have been recorded in the basin as accidental visitors or as potentially extirpated species from the basin (Murphy and Knopp 2000). Consequently, the Lake Tahoe basin provides environmental conditions and habitats conducive to providing for a somewhat diverse list of species with opportunities to fulfill their respective life history requirements.

In general, all wildlife requires specific habitat elements such as food, cover, water, and space to survive and reproduce. The availability of essential habitat elements is dynamic and varies in time and space, and the suitability of a habitat or a combination of habitats is dependant on a particular species' life history requirements. Understanding the relationship between wildlife and habitat, the processes that create habitat, and the life history requirements of a wide diversity of wildlife species is at the heart of sound wildlife planning.

BACKGROUND

In recognition of the importance of natural resources (including wildlife) to environmental quality in the Lake Tahoe basin, the Tahoe Regional Planning Compact established the framework from which the TRPA Regional Plan was created and adopted environmental threshold carrying capacities ("thresholds" or "threshold standards") for wildlife. The Regional Plan consists of several documents, two of which, the Goals and Policies (TRPA 1986) and the Code of Ordinances and Rules of Procedure (TRPA 1987), provide relevant policy statements for the maintenance of wildlife threshold standards.

The Wildlife subelement of the Conservation Element of the Goals and Policies identifies wildlife threshold standards (Table 7-1) and presents a general policy direction for the maintenance and enhancement of wildlife resources. Two threshold standards are identified for wildlife: 1) provide a minimum number of Special Interest Species population sites (W-1); and 2) apply a non-degradation standard to habitats of special significance consisting of deciduous trees, wetlands, and meadows while providing opportunities to increase the acreage of such riparian associations (W-2). The foundation of the Species Interest Species threshold (W-1) is for the protection of native wildlife species that are aesthetically pleasing to residents and visitors, and/or are especially vulnerable to extirpation (TRPA 1982a). The Special Interest Species threshold is numerical as it identifies minimum numbers of population sites for each species (or group of species, such as waterfowl) that must be maintained in order for the threshold standard to be in compliance (TRPA 1982b). The basis of the 'Habitats of Special Significance' threshold (W-2) was to provide protection to riparian habitat, which

on a relative scale provides habitat for the greatest number of common species. The locations of Special Interest Species population sites were identified on TRPA Map Overlays (1987) and in the *Environmental Impact Statement for the Establishment of Environmental Threshold Carrying Capacities* (1982b). These maps however did not identify the location or baseline acreage of Habitats of Special Significance.

According to the Wildlife Subelement of the Goals and Policies, there are two goals and five policy statements relative to maintaining wildlife resources. The goals are: 1) Maintain suitable habitat for all indigenous species of wildlife without preference to game or non-game species through maintenance of habitat diversity; and 2) Preserve, enhance, and, where feasible, expand habitats essential for threatened, endangered, rare, or sensitive species found in the basin. The five policies are: 1) TRPA must consider and mitigate project impacts to wildlife; 2) protect riparian vegetation; 3) forbid the release of non-native species; 4) control and contain domestic animals; and 5) protect sensitive species and buffer them against conflicting land uses. In order to achieve the objectives set forth in the Goal and Policies, target timelines were recognized for wildlife threshold standards. At the time the TRPA Environmental Carrying Capacities were adopted, it was believed that threshold standards for Special Interest Species were attained immediately. Because the Habitat of Significance threshold standard is a 'management standard', no numerical goals (such as acres restored) were originally identified for this threshold standard. However, past threshold evaluations (1991, 1996) have used SC-2 condition measurements as an indicator of the status of the Habitats of Significance threshold standard (i.e., W-2, riparian habitat). A 20-year target of restoring 25 percent of disturbed sites within urban boundaries and 100 percent of disturbed sites outside urban boundaries was set for attaining the threshold standard for Stream Environment Zone (See SC-2 in the Soil Conservation Chapter in this Evaluation). Combined, it was estimated that 1,100 acres of riparian habitat were to be restored by 2007 (L. Benoit, TRPA Senior Planner, personal communication, 2001).

TRPA's Code of Ordinances (Code) provides more specific language pertaining to the protection of sensitive wildlife species and their habitats. The core of TRPA's wildlife regulations is detailed in Code Chapter 78 "Wildlife Resources"; however, applicable regulations for the management of wildlife habitats can be found throughout the document. Protection measures for perching and nesting sites of Northern Goshawks (*Accipiter gentilis*), Peregrine Falcons (*Falco peregrinus anatum*), Bald Eagles (*Haliaeetus leucocephalus*), Golden Eagles (*Aquila chrysaetos*), and Ospreys (*Pandion haliaetus*) are outlined in Chapter 78. Details for deer (*Odocoileus hemionus*) fawning habitat and migration corridor protection are also found in Chapter 78. Essentially, wildlife habitat within disturbance (free) zones and movement corridors is provided protected from being impacted by conflicting land uses. Accordingly, only projects or activities that enhance wildlife habitat are allowed within disturbance (free) zones of TRPA designated Special Interest Species and a non-degradation standard is applied to movement corridors and riparian habitat due to this habitat's potential to provide suitable conditions for a relatively great diversity of species compared to other habitats. Additionally, Chapter 78 provides protection to new population areas (equivalent to a new viable nest or den site) of listed Special Interest Species as they are discovered and for additional species designated by other agencies, as their population levels become a concern. Neither Chapter 78 nor Goals and Policies identify management goals for sensitive species list by other agencies (i.e., no minimum number of population sites).

Table 7-1. TRPA's Wildlife Threshold Standards and Indicators.

W1 Standard– Provide a minimum number of population sites and disturbance zones for TRPA listed species. Perching trees and nesting sites shall not be physically disturbed, nor shall the habitat within disturbance zone be manipulated in any manner, unless needed to enhance habitat quality.			
Species	Population Sites	Disturbance Zone (mi.)	Influence Zone (mi.)
Northern Goshawk (<i>Accipiter gentilis</i>)	12	0.50	3.5
Osprey (<i>Pandion haliaetus</i>)	4	0.25	0.60
Bald Eagle (winter) (<i>Haliaeetus leucocephalus</i>)	2	Mapped	Mapped
Bald Eagle (nesting)	1	0.50	Variable
Golden Eagle (<i>Aquila chrysaetos</i>)	4	0.25	9.0
Peregrine Falcon (<i>Falco peregrinus anatum</i>)	2	0.25	7.6
Waterfowl (open-water associated species)	18	Mapped	Mapped
Deer (<i>Odocoileus hemionus</i>)	-	Meadows	Mapped
<u>W-1 Indicator:</u> The minimum number of population sites and disturbance zones maintained as determined by inspection by qualified experts.			
<u>W2 – Wildlife Habitats of Special Significance. Management Standard</u> - A non-degradation standard shall apply to wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations.			
<u>W2 - Indicator:</u> Preserve existing natural functioning Stream Environment Zone (SEZ) lands in their natural hydrologic condition, restore all disturbed SEZ in undeveloped, unsubdivided lands, and restore 25 percent of the SEZ lands that have been identified as disturbed, developed or subdivided, to attain a 5 percent total increase in the naturally functioning SEZ land			

II. THRESHOLD SUMMARY

A. THRESHOLD MATRIX

The wildlife threshold matrix serves as a summary of trends, status, and recommendations for the two wildlife threshold standards, Special Interest Species and Riparian Habitat. The matrix displays the trend towards attainment from 1987 to present, current trends, current status of the each wildlife threshold standard (i.e., W-1 and W-2), recommendations, interim targets, and an attainment schedule. The following narrative expands on the wildlife threshold matrix summary.

B. MEASUREMENT AND MONITORING ACTIVITIES

Wildlife monitoring and surveys are an important aspect of wildlife management and land use planning. Wildlife monitoring can provide information on the distribution, diversity, trends and reproductive activity of sensitive wildlife species or can identify the condition of a habitat of interest. Thus, an effective monitoring program improves an agency's ability to assess the status of a particular species or habitat and, more appropriately, plan land use to accommodate for the long-term sustainability of wildlife populations. Currently, basin resource management agencies conduct surveys which are valuable, yet not as data rich as monitoring. Monitoring is different from surveys in that monitoring data is collected on multiple factors potentially related to the resource of interest (e.g., reproductive success of Osprey) in order to explain the observed variation in the resource of interest. Surveys, on the other hand, focus on the resource of interest and cannot necessarily relate observations to other factors that may be influencing the resource.

The TRPA, along with the US Forest Service – Lake Tahoe Basin Management Unit (USFS-LTBMU), California State Parks, and the Nevada Division of Wildlife, have actively implemented a coordinated, interagency wildlife survey program. Collectively, these agencies have been working together, without land management boundaries, in order to accomplish a similar goal; generate quality information on the status of several wildlife species and habitats throughout the basin. Since 1997, this interagency effort has closely coordinated field efforts; using established and accepted survey protocols, to efficiently, and consistently record information on the basin's wildlife populations. In addition to wildlife surveys, the interagency group continues to develop a wildlife database ("Wildlife2000") in which all agency partners enter survey data. The data can be queried to rapidly generate pertinent wildlife information. As part of the data management effort, the interagency monitoring program continues to develop a Geographic Information System (GIS) for wildlife sightings, population activity locations (i.e., nest and den location), and habitats of significance. Similar to the Wildlife2000 database, the GIS provides wildlife managers with a valuable tool to track the site-specific status of sensitive wildlife and their habitats and relate this information with land use or landscape features.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

Since 1997, there have been increased efforts by basin agencies to survey for sensitive species. Survey efforts have focused on both TRPA Special Interest Species and other agency listed sensitive species. Surveys conducted include California Spotted Owl, Northern Goshawk, Osprey, sensitive amphibians, waterfowl, Willow Flycatcher,

furbearers, Golden Eagle, Peregrine Falcon, and Bald Eagle. Interagency cooperation has resulted in a coordinated and efficient field effort and has provided the TRPA and other land management agencies with a more comprehensive knowledge base on the status of Special Interest Species (and other sensitive species). A continuation of TRPA funding for Special Interest Species surveys along with interagency collaboration will prove to be valuable in land management decision-making and reporting on the status of sensitive species at the local and regional scale.

W-1: SPECIAL INTEREST SPECIES

W-1 Indicator	Threshold Standards	1996 Interim Targets	Threshold Attainment Status			
			Species Interest Species	1991 Attain Status	1996 Attain Status	2001 Attain Status
The minimum number of population sites and disturbance zones maintained as determined by inspection by qualified experts.	Provide a minimum number of population sites and disturbance zones for TRPA listed species. Perching trees and nesting sites shall not be physically disturbed, nor shall the habitat within disturbance zone be manipulated in any manner, unless needed to enhance habitat quality. Number of population sites and disturbance zones for Goshawk (12), Osprey (4), Bald Eagle Nesting (1), Bald Eagle Wintering (2), Golden Eagle (4), Peregrine Falcon (2), Waterfowl (18), and Deer (meadows).	None	Northern Goshawk	Unknown	Attainment	Non-Attainment
			Osprey	Attainment	Attainment	Attainment
			Bald Eagle –Nesting	Non-Attainment	Attainment	Attainment
			Bald Eagle -Wintering	Attainment	Attainment	Non-Attainment
			Golden Eagle	Unknown	Unknown	Non-Attainment
			Peregrine Falcon	Unknown	Non-Attainment	Non-Attainment
			Waterfowl	Attainment	Attainment	Non-Attainment
			Deer	Attainment	Attainment	Non-Attainment
2001 W-1 Monitoring Status						
<p>Northern Goshawk – USFS, TRPA, NDOW, CSP survey Northern Goshawk habitat annually. Since 1996, 3 of 12 ‘threshold sites’ have successfully fledged young; 12 territories have been reproductively active at least once since 1996; mean occupancy rate 7.4 territories per year; mean fledge rate 2.8 territories/year. Recreation activities suspected of fragmenting nesting habitat in violation of the non-degradation standard.</p> <p>Osprey – USFS and TRPA use established protocol to survey reproductive activity annually. Mean activity rate 16 nest per year; mean success 5.4 nest fledge young per year</p> <p>Bald Eagle (Nesting) – USFS, TRPA, NDOW, CSP conduct annual nest surveys. Since 1996, Bald Eagles have successfully fledged at least one chick in 3 of 5 years. Breeding population trend is slightly positive.</p> <p>Bald Eagle (Wintering) – USFS coordinates annual winter counts. USFS conducted assessment of interaction between recreation and bald eagle habitat use during winter of 1997/1998. Assessment found that wintering areas are frequently impacted by recreational activities in violation of non-degradation standard.</p> <p>Golden Eagle – TRPA has conducted annual nest search surveys since 1999. One active nest has been documented since establishment of surveys.</p> <p>Peregrine Falcon - TRPA has conducted annual nest search surveys since 1999. Have not detected reproductive activity since establishment of surveys.</p> <p>Waterfowl – USFS and TRPA conduct breeding season survey annually at TRPA designated threshold sites. Increased recreational encroachment into wetland areas has degraded the quality of waterfowl habitat at threshold sites in violation of non-degradation standard.</p> <p>Deer – NDOW and Cal. Fish and Game – conduct bi-annual aerial surveys. Migration routes and wintering range have been degraded as a result of development. Habitat quality of meadows in the basin is reduced as a result of recreation activities. Other habitats serve (e.g., shrub habitat) as fawning areas.</p>						
W-1 2001 Recommendations						
<ol style="list-style-type: none"> Review and revise threshold standards and indicators for Special Interest Species and Habitat of Special Significance. Establish public education program that improves wildlife awareness of residents and visitors. Use real-time web-cam to monitor behavior of sensitive species and habitat. Adopt ordinance to limit activity operations during critical periods for Special Interest Species. Adopt ordinance that requires project applicants to install bear-proof trash containers in order to reduce negative wildlife-human interactions. Improve enforcement of bald eagle wintering habitat closure by improve signing and temporary fencing. Wetland habitat improvements through realignment of trails. Program would realign trails outside of wetlands and improve vegetation buffer around wetlands. 						
W-1 2006 Attainment Schedule						
<p>Golden Eagle and Peregrine Falcon thresholds may never be realized considering the Lake Tahoe basin has historically been considered suboptimal nesting habitat for both species. Northern Goshawk threshold standard has a low likelihood of attainment by 2006 due to habitat fragmentation attributed to recreation encroachment nesting areas.</p> <p>Deer – Due to recreational encroachment into meadows during fawning season, the non-degradation standard is not likely to be realized. However, if shrub habitats were also considered as fawning habitat, threshold would be achievable by 2006.</p> <p>Bald Eagle wintering and waterfowl threshold standards should be achieved by 2006 with improved management of recreational activities.</p>						

W-2: HABITATS OF SPECIAL SIGNIFICANCE

V-2 Indicator	Threshold Standards	1996 Interim Targets	Threshold Attainment Status		
			1991 Attain Status	1996 Attain Status	2001 Attain Status
Refer to SC-2. Area of naturally functioning SEZs (acres).	A nondegradation standard shall apply to significant wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations	See SC-2	Non-Attainment	Non-Attainment	Non-Attainment
W-2 2001 Monitoring Status					
See SC-2					
W-2 2001 Recommendations					
Update threshold standards and indicators for Habitat of Special Significance (W-2). Also See SC-2					
W-2 2006 Attainment Schedule					
See SC-2					

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

D. W-1: SPECIAL INTEREST SPECIES

1. Evaluation Criteria

Adopted Threshold Standard: Provide a minimum number of population sites and disturbance (free) zones for species identified in Table 7-1. Perching trees and nesting sites shall not be physically disturbed, nor shall the habitat within disturbance zone be manipulated in any manner, unless needed to enhance habitat quality (TRPA 1996).

Adopted Threshold Indicator: The minimum number of population sites and disturbance zones maintained as determined by inspection by qualified experts (TRPA 1996).

The 1996 Threshold Evaluation (TRPA, 1996) does not directly describe the methodology used to draw conclusions on the condition of SIS. However, results reported suggest that the number of 'active' nests was used for some species, such as Northern Goshawk, Osprey, Bald Eagle (nesting), Golden Eagle, and Peregrine Falcon. From TRPA (1996) it appears that an "active" nest site was defined as area that was occupied by SIS in at least one of five years since the previous Threshold Evaluation (TRPA 1991). Documented "active" nest sites did not necessarily successfully produce progeny nor was it necessary for the nest site to be occupied for a minimum number of years. For example, in 1996 (1 of five years in the TRPA threshold evaluation interval), a Bald Eagle pair built a nest at Marlette Lake. This pair, however, did not subsequently produce young. Thus, it appears that the mere presence for the above-noted SIS at a nest site in any one of 5 years was adequate to count towards complying with the W-1 threshold standard.

In the 1996 Threshold Evaluation, a qualitative assessment by wildlife professionals was used to draw conclusions about the status of waterfowl 'population' sites and deer population sites (TRPA 1996). Wintering sites for Bald Eagles were not directly measured, but a combination of annual counts and an evaluation of the condition of wintering sites were made based on available field reconnaissance.

The 1996 Threshold Evaluation (TRPA 1996) did not use empirical data to describe the status of disturbance (free) zones. Two approaches to measuring disturbance within 'disturbance (free) zones' for Special Interest Species were used in this evaluation. In one approach, levels of disturbance were quantified by overlaying disturbance indicators (e.g., density of roads) within disturbance (free) zone buffers or suitable habitat in GIS. For the second approach, disturbance was subjectively quantified based on field observations of the site. Details of measuring disturbance for each special interest species are detailed below. Additionally, the total amount of area designated as disturbance zone is reported for each species.

2. Measurement and Monitoring

Bald Eagle

The TRPA (1986) identifies threshold standards for breeding and wintering Bald Eagles each.

Breeding Season: During annual Osprey surveys and other wildlife field efforts conducted during the breeding season, Bald Eagle nests are actively searched for. If a new and active Bald Eagle nest is discovered or a historic nest is active, a nest observation post is established to monitor the reproductive activity of the pair. This includes regular visits to the monitoring post throughout the season to count the number of eggs laid (if observable), number and age of chicks, and to record the approximate date when chicks fledge (i.e., leave the nest). Additionally, other nesting behaviors, such as food deliveries and disturbances to the nesting pair are recorded.

To be consistent with the 1996 Threshold Evaluation, the number of active (or occupied) nest sites was used to measure whether nesting Bald Eagle were in compliance with the numerical threshold standard.

Winter: An annual Lake Tahoe-wide survey is conducted in January to document the occurrence of Bald Eagles in the basin during winter. This effort results in an index of the number of individual Bald Eagles occurring in the basin and their location. Another effort involving wintering Bald Eagles since 1996, was an investigation to document the relationship between recreational activities and Bald Eagle behavior on the south shore of Lake Tahoe and at Fallen Leaf lake (Laves and Romsos 1999). TRPA identifies applies a 'non-degradation' standard to wintering Bald Eagle site. Thus if chronic degrading activities, such as recreational disturbance, were documented at wintering Bald Eagles sites since the 1996 threshold, then the threshold standard was not considered to be in compliance.

Deer

Deer receive the least amount of monitoring attention. However, the Nevada Division of Wildlife with cooperation from the California Department of Fish and Game bi-annually monitor deer herds that visit the Lake Tahoe region (Espinosa 2001). Deer herds that visit the basin in snow-free months are the Loyalton-Truckee Herd (Kahre 1995) and the Carson Herd (Espinosa 2001). Monitoring consists of aerial flights during the fall and spring each year. Spotters on the aircraft record the number of bucks (males), does (females), and fawns (young) in order to estimate winter survivorship and index the number of individuals occurring in different management areas.

Additionally, the TRPA has generated a deer habitat model based on the California Wildlife Habitat Relationships System (CWHR, CFG 1999) to assist with the identification of suitable fawning areas in the Lake Tahoe Region. The CWHR database was queried to catalog the relative value that each vegetation type's potential to provide conditions suitable for fawning. The CWHR model scales vegetation types suitable for fawning from 0 to 3, with a value of 3 having the highest suitability value. Included in the characterization of vegetation types in the CWHR model was species, size, and canopy cover. Vegetation type suitability values were attributed to the most currently available USFS GIS vegetation map

(EVEG 1997): vegetation polygons that had a value of greater than 2 were assumed to be the most suitable for fawning habitat. This modeling effort made it possible to locate and quantify the amount of area in the basin that is potentially suitable for deer reproduction and, of that area, describe the amount that is potentially impacted by human activities. In order to quantify potential impacts from human activities, roads that occurred within areas with high deer reproductive potential were buffered to 100 meters (each side of the road). It was assumed that deer that occurred within this distance from a road would modify their behavior in response to human activities (e.g., OHV use), and thus diminished the quality of habitat within the buffered habitat.

Compliance to the threshold standard for deer was subjective determined by wildlife biologists.

Golden Eagle and Peregrine Falcon

Potential eagle and falcon nesting sites within the Lake Tahoe Basin were surveyed for breeding activity from May to August in 1999 and 2000. Sites surveyed included TRPA Threshold Sites identified from the Environment Impact Statement for the Establishment of Environment Threshold Carrying Capacities (TRPA 1982b) and TRPA Map Overlays (1987); consequently, one threshold site for eagles (Round Lake Cliffs) is not delineated on TRPA Maps (1987) but is located in TRPA (1982b). In addition, other potential nesting areas were surveyed based on suitable habitat or reports of recent sightings. Surveys involved scanning cliff faces for nesting material and whitewash, watching for raptor flights, listening for calls, and moving throughout the area to observe different views and angles of cliffs and habitats. Binoculars (10x50) and a spotting scope (15x–45x) were used to aid observations of nesting habitat. The time of day in which potential nest sites were surveyed depended on the angle of the sun in relation to the observation point and the eyrie (nest area). The duration of time spent surveying each site was dependent on the size of the survey area and the complexity of the topography and habitat. Enough time was allocated to each survey site to thoroughly view the entire unit for activity. All raptors, raptor nests, and other cliff-nesting bird species detected were recorded and mapped using USGS 1:24,000 scale topographic maps and subsequently digitized into TRPA's GIS. Each site surveyed was also subjectively evaluated for suitable nesting habitat and potential disturbances.

The number of active Golden Eagle and Peregrine Falcon nests was used to conclude whether these species were in compliance with their respective threshold standards.

Northern Goshawk

The year of 1992 marked an increase in efforts to locate active goshawk nest territories in the Lake Tahoe basin with the initiation of a Goshawk research project (Keane 1999). For the most part, elevated survey efforts have continued through today.

The "Survey Protocol for Northern Goshawk (*Accipiter gentilis*) on National Forest Lands in the Pacific Southwest" (USDA 1992) was used to monitor goshawk nest activity in the Lake Tahoe basin. This protocol provided an effective and standardized technique to determine the presence of territorial goshawks in an area and for locating nests within a territory. Consequently, the ability to record

nest productivity was facilitated as a result of using this protocol. This survey approach involves familiarizing field personnel with the goshawk's physical appearance, calls and behavior, and identifying the extent of survey area prior to initiating fieldwork. In the field, wildlife personnel systematically traverse the survey area and broadcast goshawk calls using a megaphone, in an attempt to elicit an auditory response by territorial goshawks. Additionally, some areas are selected for intensive stand searches where field personnel systematically walk a stand suspected of supporting goshawk nests and search for clues of nesting activity. The survey protocol for Northern Goshawk for year 2001 and beyond (USDA 2000) will be slightly modified to include a dawn-acoustical survey to identify territory occupancy prior to the egg laying period of the breeding season. Adjustments to work programs will need to be made in order to accommodate this late winter/early spring survey effort.

Relative disturbance within Goshawk 'disturbance zones' was measured by overlaying a 268m and a ½ mile buffer (centered on Goshawk nests within identified territories) with a current roads layer (tmuteds_99, USFS-LTBMU 2001). Two buffer sizes were analyzed in order to better detail potential disturbance impacts within close proximity to nests (i.e., 268 meters) and throughout the entire TRPA designated 'disturbance (free)' area. To measure the relative level of human activity within 'disturbance-free' zones, miles of road/acre was calculated and used as an index of potential human activity impact.

Compliance with the threshold standard for Northern Goshawk was measured counting the number of occupied or active nest territories and an evaluation of human disturbance index within disturbance (free) zones.

Osprey

The objective of Osprey surveys was to record the location of Osprey nests and to document their reproductive status in the Lake Tahoe basin.

At sites where osprey nesting activity has not been historically recorded, the following survey methodology was followed: All surveys for ospreys were conducted by boat, covering all suitable habitat at a select set of water bodies in the basin. A boat traveled at a slow speed (< 8 mph) approximate 75 meters from shoreline while ≥ 1 observer(s) scanned the tree line along the shoreline (with binoculars) and hill slope for nest(s) and/or osprey activity (e.g., flight, hunting). Two surveys per season were conducted early in the breeding season to locate nest(s) and/or osprey activity. Surveys were initiated soon after lake(s) were ice free; or if ice-free year-round, 2 surveys were conducted between mid-May (~ May 10th) through late June (~June 30th). Initial surveys were spaced in time by a minimum of 2.5 week (17 days). If nest(s) and/or activity were not detected during the first two surveys, no additional survey effort was expended. If new nest(s) were detected, the location was mapped on a copy of USGS 7.5 quad maps and UTM coordinates (Grubb and Engle) of nest(s) and/or activity locations were recorded. Consequently, if a new nest was documented, 3 additional surveys were conducted to determine the reproductive output (number of chicks fledged) of the nest(s). A minimum of 10 minutes was spent at each active nest to record nesting activities during follow-up surveys. Each subsequent survey outing was spaced in time by a minimum of 17 days.

At sites where osprey nesting activity was historically recorded, the following protocol was followed: Prior to the initiation of the season's field effort, a list and map of known osprey nest locations was prepared and a boat travel plan was organized to ensure accounting for all historical nests. Pre-planning improved the efficiency of field efforts and ensured that a full and comprehensive survey effort of known nests was achieved. A minimum of five surveys was required during the breeding season to record historic nests and/or osprey nest activity. The first survey was initiated soon after lake(s) were ice free, or if ice-free year-round, started around mid-May (~ May 10th). All subsequent surveys were spaced in time by a minimum of 2.5 weeks (17 days). Stopping at known nests and observing the nests for a minimum of 10 minutes verified nest locations and nesting activity. Traveling slowly between nests (< 8 mph) provided an additional opportunity to record new nest starts and to tally all individual ospreys observed perched or flying (which can roughly be used as a census of the breeding population in the basin). A digital camera was brought along for all surveys to photograph each nest site observed. For known nests not viewable from waterborne surveys, a similar protocol was used; however, nests were accessed by foot.

Relative disturbance within Osprey 'disturbance zones' was measured by overlaying a ¼ mile buffer (centered on intact Osprey nests) with a current roads layer (tmuteds_99, USFS-LTBMU 2001). To measure the relative level of human activity within 'disturbance-free' zones, miles of road/acre was calculated and used as an index of potential human activity impact.

Compliance with the threshold standard for Osprey was measured with the number of occupied or active nest sites.

Waterfowl

Wetlands on the western, eastern, and southern portions of the Lake Tahoe basin were surveyed (Figure 7-1). Wetlands in the Lake Tahoe basin were assigned to one of three wildlife habitat types; wet meadow, fresh emergent wetland, and lacustrine (Mayer and Laudenslayer 1988). At each wetland, a minimum of one observation site was established such that a large majority of the wetland area was viewable and not obscured by vegetation or topography. In large wetlands (e.g., Grass Lake), it was necessary to establish more observation sites to ensure full survey coverage of the wetland area. Each observation site was visited a minimum of three times over the course of the survey with one hour of observation spent for each visit. A one-hour observation time was selected in order to allow sufficient time for the observer to carefully view the whole area and to reliably identify and count bird species. Binoculars (10x42) and a 60mm, 15 to 45x spotting scope were used to identify birds. Bird identification guides (National Geographic 1987) and recorded birdcalls (Walton and Lawson 1990) also aided in identification of bird species. Visits to wetlands varied by time of day and were categorized into morning (sunrise to 1000 PST), mid-day (1001 to 1400 PST), and afternoon (1401 to 1800 PST) time frames for analysis. Data recorded at each wetland included: bird species, relative abundance of each species, distance a species was from the observer (< or > 50m), visit number, time visit began and ended, date, weather conditions, source of identification (audible or visual), reproductive activity, and a comments section to record habitat conditions, other taxa, and human activities.

The relative quality of wetland sites for supporting Lake Tahoe's wetland bird community was quantified with a species richness measure and Simpson's species diversity index with survey data collected between May through November 1999 and 2000. Species richness is simply a measure of the number of species that occur within an area (e.g., Spooner Lake) and given time frame (e.g., May through October 2000). Simpson's species diversity index (Krebs 1989) was used as a measure of species diversity. This index simultaneously evaluated species richness and evenness (i.e., relative abundance of each species) at each surveyed wetland. Simpson's species diversity index is a non-parametric approach (i.e., makes no assumptions about the shape of species abundance curves) to evaluate species diversity that estimates the probability of picking two organisms at random that are different species. Thus, if an area has a large Simpson's species diversity index value, then the area is more likely to support a greater variety of species. Because bird species other than aquatic obligates (i.e., waterfowl as defined by TRPA) were detected during surveys, birds were categorized as aquatic, riparian/meadow, or upland associated based on the most appropriate habitat association described by Ehrlich et al. (1988). Species richness and species diversity analyses were performed for each habitat association category and for all species combined at each survey site.

Surveyed wetlands were also subjectively evaluated for their potential to provide undisturbed nesting, resting, and feeding habitat (Table 7-2). Much of this evaluation was based on vegetation composition and structure, and observations of human activity or signs of human access into wetlands as human activities have been reported to disrupt normal wildlife behaviors (Knight and Cole 1995). Wetlands were rated on a relative scale of 1 (lowest) to 4 (greatest) based on perceived impacts attributed to human access at wetlands (Table 7-2). These ratings were included in wetland condition description for each surveyed wetland and are provided in Appendix 4.

Table 7-2. Human Activity Rating System for Surveyed Wetlands in the Lake Tahoe Basin, May through November 1999 and 2000.

Rating	Description
1	Low. Perimeter of wetland has not been modified and is intact. Human activity was not observed or was insignificant along small segments of the perimeter. No signs of human encroachment into the wetland interior were observed. Impacts on habitat quality for waterfowl nesting, resting, and feeding behaviors are likely minor to non-existent.
2	Moderate. Perimeter of wetland was mostly intact with small segments modified to accommodate recreation. Human activity was limited to the perimeter of the wetland with minor signs (e.g., trails) of human encroachment into the wetland interior. Human activity levels were consistently low to moderate. Impacts on habitat quality for waterfowl nesting, resting, and feeding behaviors are moderate however likely not significant.
3	Heavy. At least 50 percent of the wetland perimeter was modified to accommodate recreation. Human activity levels were consistently moderate to high, where humans could be predictably observed at the wetland through out the day. Human encroachment and signs of human encroachment into the wetland were obvious and extensive. Impacts on habitat quality for waterfowl nesting behavior were likely significant, however impacts on resting, and feeding behaviors were moderate and likely not significant.
4	Extensive. Nearly 100 percent of the wetland perimeter was modified to accommodate humans (i.e., paved roads, trails, non-native grass, and dirt roads). Recreational activities were predictably high and often emitted load noise. Motorized and non-motorized modes of transport in and around wetland were common. Evidence of human encroachment into wetland interior was extensive. Impacts on habitat quality for waterfowl nesting, resting, and feeding behaviors were likely significant.

^a Refer to Appendix 4 for specific wetland character descriptions.

Compliance to the waterfowl threshold standard (number of waterfowl population sites) was subjectively determined, based on a combination of the sites species diversity index, species richness, potential to support rare or unique species, observed reproductive activity, and human disturbance rankings (Table 7-2). Because a 'non-degradation' standard applies to waterfowl threshold sites, the human disturbance ranking weighed highest in the evaluation. If a population (waterfowl) sites received a ranking of 4, the site was not in compliance.



 TRPA Waterfowl Threshold Sites
 Lakes
 Watershed Boundary

Figure 7.1.
TRPA Waterfowl Threshold Sites.

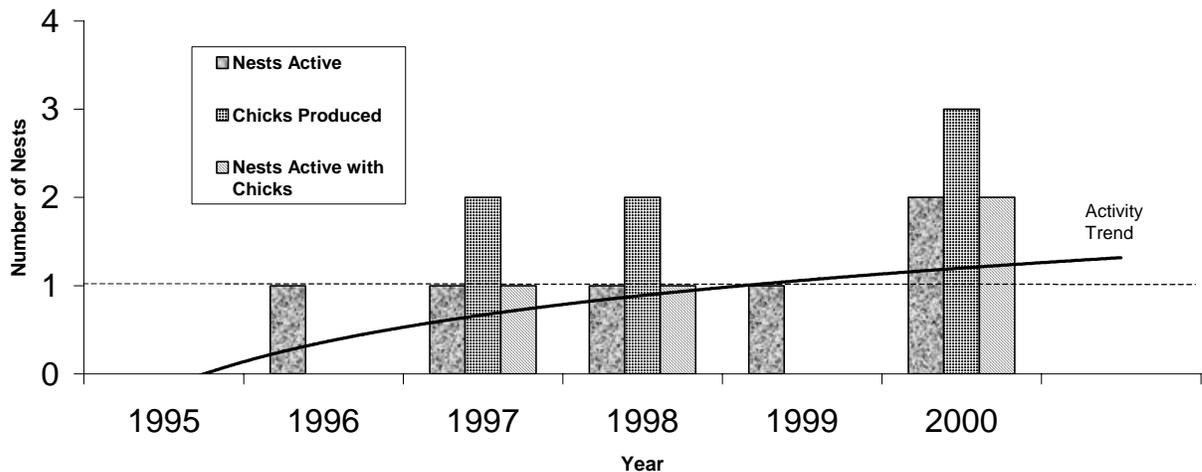


3. Results of Measurement and Monitoring Efforts

Bald Eagle (nesting):

Since 1996, the threshold standard for reproductively viable Bald Eagle nest sites has been met or exceeded in all of the last 5 years (Figure 7-2). On average, 1.1 ± 1.025 ($\bar{x} \pm SD$) chicks have fledged per pair per year with an average annual territory success rate of $40\% \pm 42\%$. Consequently, 1997 marks the first year that a successful Bald Eagle nest has been recorded since 1970 (Reed 1979).

Figure 7-2. Summary of Bald Eagle Nest Activity and Population Trend 1995 to 2000, Lake Tahoe, CA, NV



Within the last five years, the number of active Bald Eagle territories has not met the goal of the Pacific Bald Eagle Recovery Plan (Plan, USFWS 1986) of 4 nest territories or an average active success rate per occupied territory of 65 percent for the Lake Tahoe region (Zone 28). However, the nesting population is achieving the Plan's average reproductive rate goal of producing 1 fledged young per pair per year (USFWS 1986).

As of year 2000, basin agencies have documented 3 separate Bald Eagle nest sites. Combined, a total of 1,500 acres is managed as 'disturbance free' zones (Figure 7-3). In terms of potential for disturbance to nesting activities, 0.002 miles/acre of roads and trails occur cumulatively within disturbance (free) zones. Of the nest (population) sites, the Emerald Bay location is the most likely to be impacted by recreational activities considering the relative popularity of Emerald Bay for both boaters and hikers compared to Marlette Lake.

Bald Eagle (wintering)

Similar to the trend in Bald Eagle nesting in the basin, the winter population appears to be stable and increasing based on data collected between 1998 and 2001 (Figure 7-4). Interestingly, there appears to be a relationship between the number of juvenile eagles produced in the each breeding season and the number counted in the preceding winter count (Figures 7.2 and 7.4). Juveniles observed during winter counts may be the offspring of the previous breeding session. Laves

and Romsos (1999) presumed that the composition of Lake Tahoe's winter population documented in the winter of 1997/1998 likely was a mix of migrants, residents, and offspring of resident birds.

A representation of the condition of TRPA designated Bald Eagle wintering areas was provided in Laves and Romsos (1999). Although the Taylor Creek is officially closed to recreation between October and March (M. Hurt, USFS-LTBMU, pers. com.), Laves and Romsos (1999) recorded multiple occasions where recreation activity modified the normal behavior of wintering Bald Eagles. Bald Eagle behavior modifications ranged from a distraction from normal activity to the abandonment (flight from) of wintering areas. Additional energy expenditure and loss of opportunity to acquire energy as a result responding to recreational activities could ultimately result in reproductive failure because Bald Eagle could be precluded from adequately storing and maintaining energy over winter months (Anthony et al. 1995). Additionally, Laves and Romsos' (1999) report revealed a conflict in land use designations identified in the 'Fallen Leaf Management Area' (USDA 1988) where 'developed recreation' is prescribed within and adjacent to documented Bald Eagle use areas and within TRPA wintering Bald Eagle areas. A 'developed' recreation land use classification is in direct conflict with the intent of TRPA's 'non-degradation' threshold standard for wintering Bald Eagle areas considering the potential of recreational activities to degrade Bald Eagle habitat (Anthony et al. 1995). As such, one cannot conclude that a 'non-degradation' standard is being applied to the wintering Bald Eagle area at Taylor Creek and therefore the threshold standard is not in compliance.

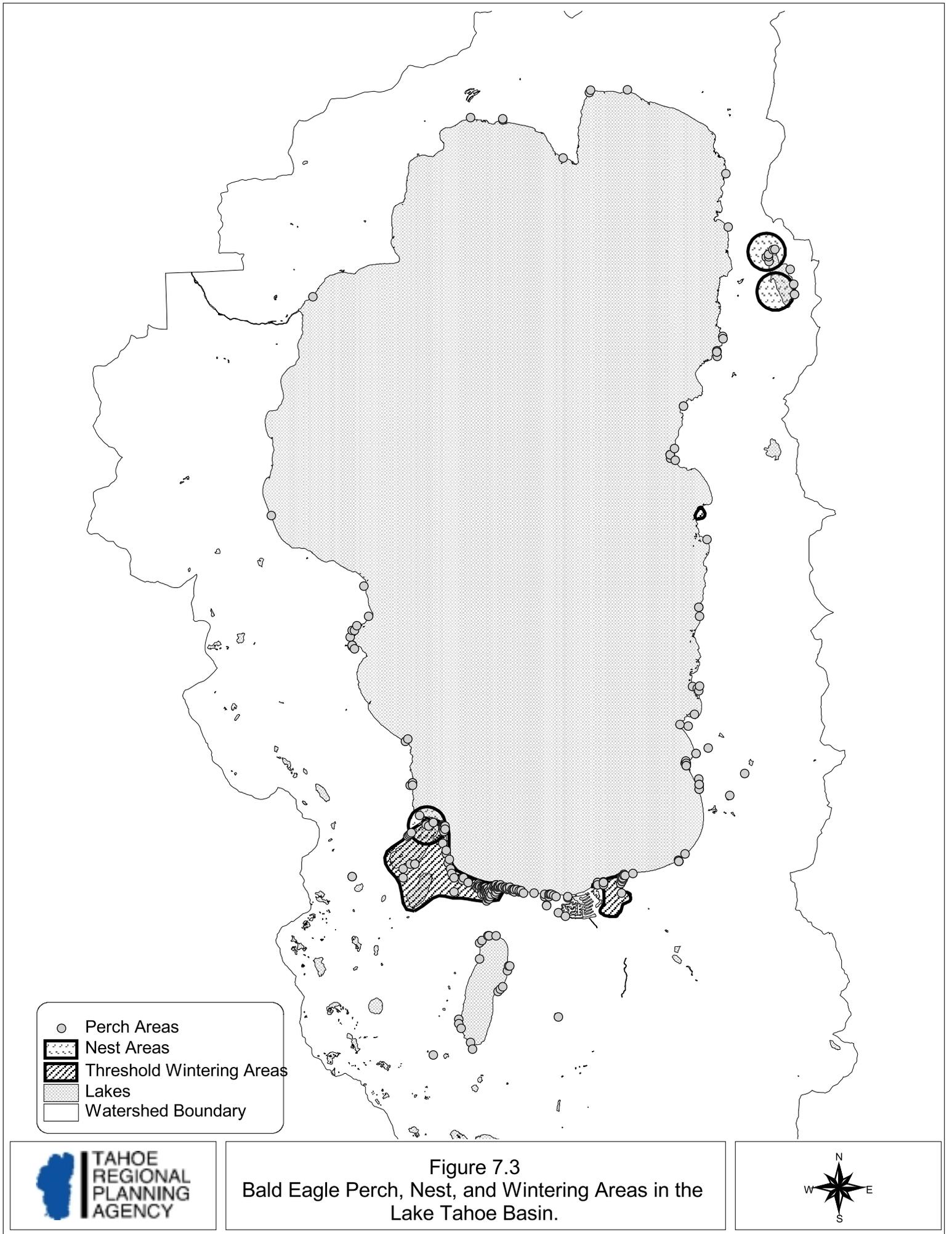
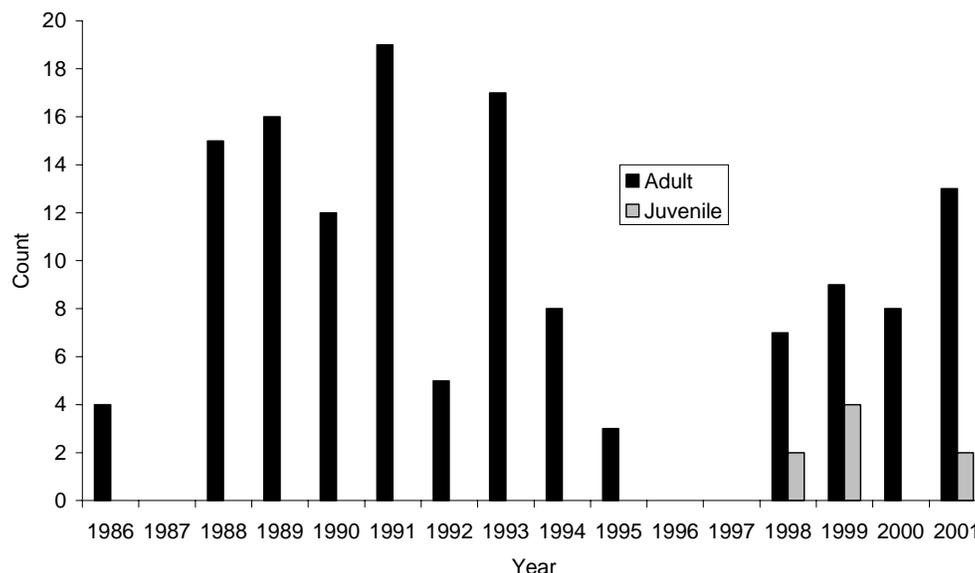


Figure 7-4. Number of Juvenile and Adult Bald Eagles Recorded During Winter Surveys, 1986 - 2001, Lake Tahoe, CA, NV*



*Data collected between 1998 and 2001 is not comparable to data collected prior to 1998. For data collected between 1998 and 2001, count data were scrutinized in order to flesh out individuals that were counted >1 time during the survey. Additionally, juvenile Bald Eagles were recorded independently from adults. It is unknown what protocol was used to assess data collected prior to 1998.

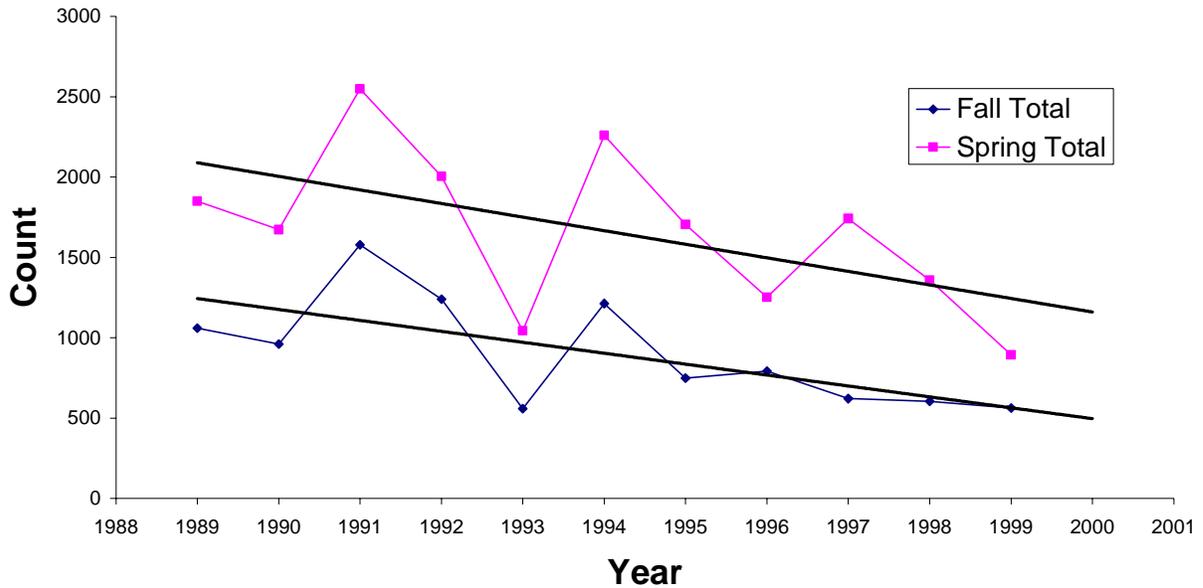
Deer

Deer population numbers in the vicinity of the Tahoe region have been decreasing over time (Figure 7-5). Deer that visit the Lake Tahoe basin during snow-free months migrate to lower elevations outside of the basin in winter months. Movements to wintering grounds can be extensive, traveling greater than 60 miles in one direction (Kahre 1995). Along migration routes to and from the basin and on the wintering grounds themselves, there are several factors that can influence deer survivorship or obstruct deer movements. These factors include fencing, roads, predation, illegal harvest, habitat loss and reduced habitat quality due to housing, grazing, recreation, and transportation development (Kahre 1995). It is suspected that access to wintering grounds and loss of wintering habitat is the primary reason for the decline of deer populations (Espinosa 2001). Consequently, there is little TRPA can do to reverse declining population trends, considering these areas are located outside of the basin. Within the basin however, there is potential to provide fawning habitat. Based on TRPA habitat modeling efforts, it was estimated that approximately 32,000 acres of suitable habitat for fawning occurs in the basin (Figure 7-6). However, 6,400 acres of this area is potentially impacted by recreation access.

TRPA's threshold (1986) identifies that meadows shall be protected as fawning habitat. There has been no direct loss of meadow habitat in the region in the last 5 years. In some cases, e.g., Meiss Meadow, grazing has been eliminated from season to season, which may result in improved conditions for deer. In other cases, e.g., Page Meadow, the quality of habitat for deer fawning has probably decreased as a result of recreation trails that bisect the meadow.

TRPA's threshold of protecting only meadow habitat may not be adequate. The CWHR model used in this threshold evaluation predicted that a greater breadth of habitats is suitable as fawning habitat. A more in-depth assessment of the CWHR model predictions for fawning habitats needs to occur in order to validate whether predicted habitats are viable for deer reproductive activity. Because there has not been a recorded loss of meadow habitats and additional habitats were identified that serve as deer fawning habitat, it was concluded that the threshold standard for deer was in compliance.

Figure 7-5. Total Number of Deer Counted During Fall and Spring Counts in Nevada Division of Wildlife, Hunting Units 192, 194, and 196, Lake Tahoe Region, Nevada, 1989 to 1999.

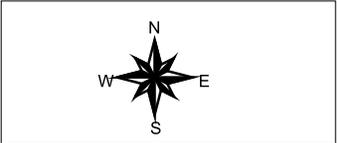




■ Potential Fawning Habitat
■ Lake Tahoe
□ Watershed Boundary



Figure 7.6.
Predicted Deer Fawning Habitat in the Lake Tahoe Basin. Source: CDFG 1999, CWHR Model.



Golden Eagle and Peregrine Falcon

1999 Survey Results: A total of 7 sites, ranging in size from 0.14 to 2.0 km², were surveyed with approximately 5 to 9 hours of effort expended at each site (Table 7-3). Five of the 7 sites surveyed were TRPA threshold sites or within close proximity of threshold sites (Table 7-3). No eagles or falcons, or evidence of their nests, were detected during surveys specific for eagle and falcon. However, eagles were opportunistically observed in flight during other wildlife-related investigations at upland areas of the east shore of Lake Tahoe. Red-tailed Hawks (*Buteo jamaicensis*) were observed at Angora Peak and Christmas Valley, and an unidentified raptor call was heard at Round Lake (Table 7-3). Skyland, Martis Peak, and Mt. Pluto survey sites did not contain cliff topography typical of falcon or eagle nest requirements (Figure 7-7). However, other sites that were surveyed appeared to have sufficient cliff topography that could likely support falcon or eagle nest(s).

Table 7-3. Golden Eagle and Peregrine Falcon Survey Effort and Site Summary in the Lake Tahoe Basin, Summer 1999.			
Site	Survey Effort (hrs)	Area (km²)	Survey Results^a
Angora Peak ^b	7	0.27	Two Red-tailed hawks were observed above saddle northwest of peak. Periodic Red-tailed Hawks flights and calls (~2 hours) were observed.
Christmas Valley ^c	7	0.14	One Red-tailed Hawk was observed flying around cliff area (for ~ 5 minutes).
Martis Peak ^b	8	1.9	No raptors detected.
Mt. Watson/ Mt. Pluto ^b	9	2.0	No raptors detected.
Round Lake ^b	5	0.32	An unidentified raptor call (singular note) was recorded.
Sand Harbor	7	0.56	No raptors were detected during eagle and falcon surveys. However, a pair of eagles was observed flying over-head during other wildlife-related investigations.
Skyland	8	0.78	No raptors were detected during eagle and falcon surveys. However, a pair of eagles was observed flying over-head during other wildlife-related investigations.
TOTAL	51	5.97	
^a A total of 7 sites were surveyed during 51 hours of survey effort. A total of 4 raptors were detected during surveys and no nests were detected. ^b Area is designated as a TRPA Threshold Site for Golden Eagle. ^c Area is designated as a TRPA Threshold Site for Peregrine Falcon.			

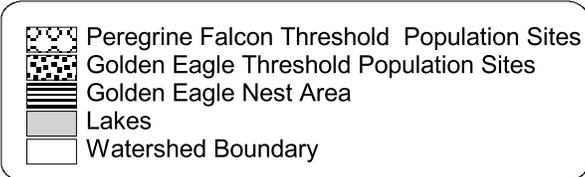
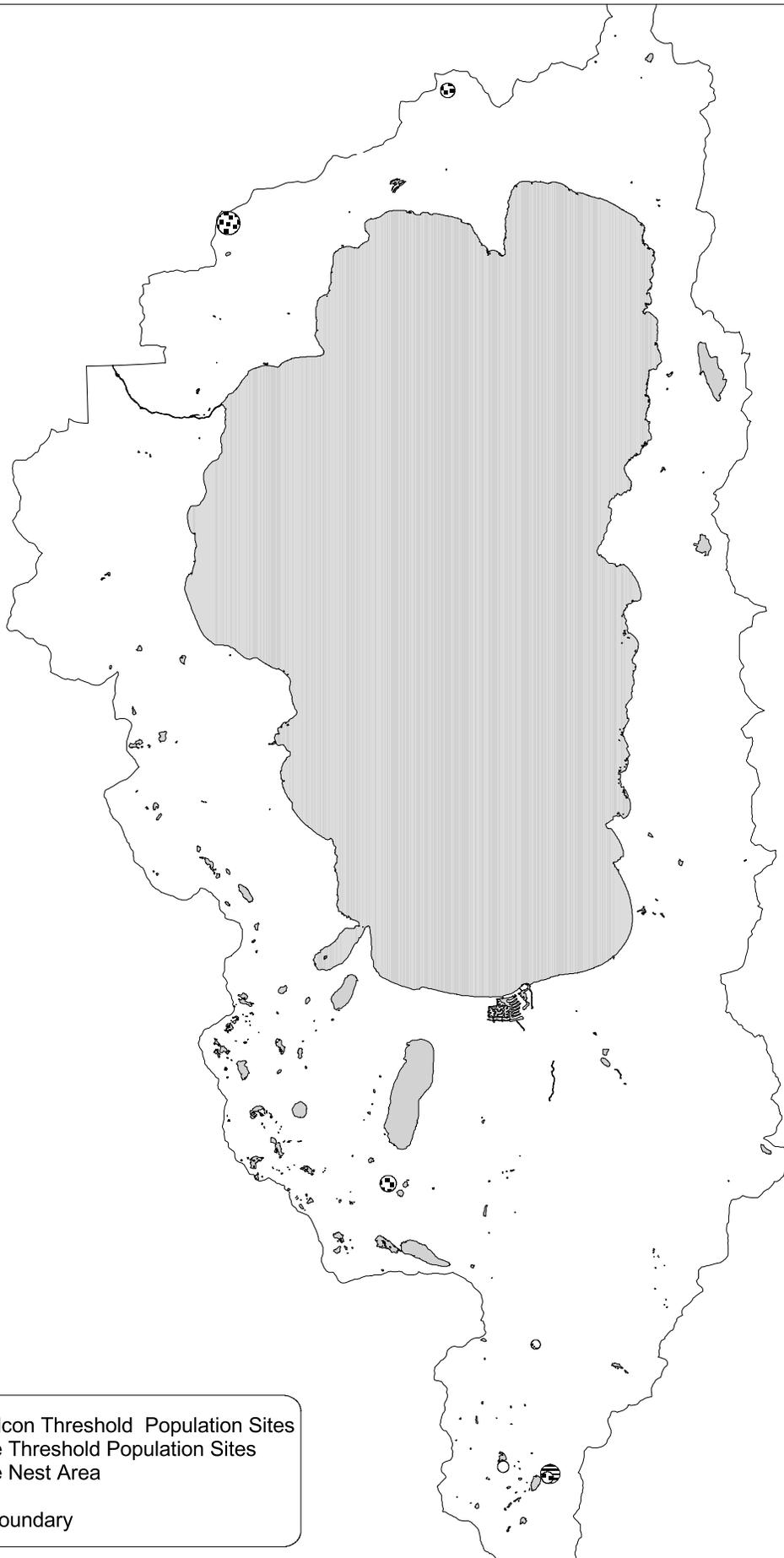


Figure 7.7.
Peregrine Falcon and Golden Eagle Threshold
Population Sites



2000 Survey Results: A total of 14 sites, ranging in size from 0.05 to 8.97 km², were surveyed with approximately 1 to 6 hours of effort expended at each site (Table 7-4). Six of the 14 sites surveyed were TRPA threshold sites (Table 7-4). A single Golden Eagle nest with at least one nestling was found near Round Lake (Figure 7-7, a threshold site identified in TRPA (1982) but not on TRPA Maps (1987)). No Peregrine Falcons were detected during surveys. In addition, two Common Raven (*Corvus corax*) nests and an unidentified stick nest were found (Table 7-4). A total of fifteen individual raptors were observed including Golden Eagle, Prairie Falcon (*Falco mexicanus*), Cooper's Hawk (*Accipiter cooperii*), Northern Harrier (*Circus cyaneus*), Red-tailed Hawks and Turkey Vultures (*Cathartes aura*). Three of 6 threshold sites were found to have marginal habitat (Table 7-4). All other areas monitored appeared to have sufficient cliff topography that could likely support falcon or eagle nest(s). However, human disturbances may reduce the suitability of these sites for nesting eagles or falcons (Table 7-4).

Table 7-4. Golden Eagle and Peregrine Falcon Survey Effort and Site Summary in the Lake Tahoe Basin, Summer 2000.

Site	Survey Effort (hrs.)	Area (km ²)	Survey Results ^a
Angora Peak ^b	1.0	0.59	No raptors detected.
Blackwood Canyon Cliffs	1.5	1.09	No raptors detected though there were two separate areas with whitewash.
Cave Rock	1.0	0.1	One Common Raven nest with incubating adult found. In addition, an unidentified stick nest was found. There were also Rock Doves landing on Cave Rock.
Christmas Valley ^c	3.0	8.97	No raptors observed.
Dardanelles Lake Cliffs ^c	1.5	0.05	One Osprey observed.
Eagle Falls	1.0	1.64	Two adult Red-Tailed Hawks flying around cliffs.
Flagpole Peak	1.0	1.02	No raptors detected.
Floating Island Cliffs	1.0	0.1	No raptors detected.
Martis Peak ^b	1.0	5.19	One Northern Harrier flying above Martis Valley.
Mount Pluto ^b	2.5	3.29	No raptors detected.
Mount Rose	5.5	6.3	A Prairie Falcon was observed flying in the area. Also, One Cooper's Hawk and at least two Red-tailed Hawks were also observed flying and perched on trees.
Mount Tallac	6.0	0.4	One Red-tailed Hawk and one Turkey Vulture observed flying in area.
Round Lake Cliffs ^b	5.0	0.41	A Golden Eagle nest with one nestling found. Observed one adult brooding and flying around.
Shakespeare Point	1.0	0.1	Two Common Ravens and one raven nest found. Also, four Turkey Vultures flying overhead.
TOTAL	32	29.16	
^a A total of 14 sites were surveyed during 32 hours of survey effort. A total of 15 individual raptors were detected during surveys and one confirmed Golden Eagle nest was mapped.			
^b Area is designated as a TRPA Threshold Site for Golden Eagle.			
^c Area is designated as a TRPA Threshold Site for Peregrine Falcon.			

Threshold standards for Golden Eagle and Peregrine Falcon are not in compliance due to lack of nest activity.

Northern Goshawk (nest activity)

Of TRPA's SIS species, the Northern Goshawk is the most difficult and time-consuming species to monitor. This is in part because goshawks within a territory unpredictably shift nest locations from year to year and nests are often concealed in the forest canopy. Consequently, although substantial efforts have been expended annually since 1992 (with the exception of 1995 and 1996) to document goshawk nest activity, the results represented in this evaluation are minimum values of "population site" activity. That is, there is a potential that additional goshawk territories were occupied and/or produced chicks and went undetected. Consequently, agencies and researchers in the basin have never documented population site activity for 12 population sites in any particular year (Figure 7-8, data sources: NDOW, USFS-LTBMU, J. Keane). For TRPA "Threshold sites" (12 sites that were originally identified for the management of Goshawk), only 2 of 12 TRPA threshold sites have maintained an average annual success rate of greater than 11 percent between 1992 and 2000 (Figure 7-9). Between 1996 and 2000, 4 of 12 "Threshold sites" have been occupied or active at least once, only 3 of 12 have successfully fledged young at least once. The annual average territory occupancy among "Threshold Sites" was 1.8 territories/year with an annual territory success rate of 0.8 territories/ year. Assuming that territories originally identified by TRPA to be reproductively viable (i.e., Threshold sites on TRPA maps), and based on this evaluation, TRPA policies and decision-making mechanisms have only been successful in sustaining 25 percent of "Threshold Sites" as viable.

In 1982, all known Goshawk territories were considered as "Threshold Sites" (TRPA 1982a, TRPA 1982b, TRPA maps 1987). Additional Goshawk territories have been discovered in the Basin since 1982. Cumulatively (including "Threshold sites"), a total of 23 territories, containing 51 nest sites, have been documented in the basin since 1976. Between 1996 and 2000, twelve of these 23 territories were occupied/active in at least once with a mean occupancy rate of 7.4 territories/year and a mean annual success rate of 2.8 territories per year.

Northern Goshawk (Disturbance)

Human disturbance is a potentially serious problem in the Lake Tahoe basin (Keane, in Murphy and Knopp 2000). Keane (in Murphy and Knopp 2000) documented 3 separate occasions in the basin where humans harassed active goshawk nests. The result of this harassment was territory abandonment, either temporarily (for the duration of the nesting season) or permanently (no documented return of previously occupied territory). Access to goshawk nests in these cases were facilitated by forest roads and trails through the territory. Accordingly, the potential for disturbance to Northern Goshawk territories was measured using the density of roads and trails within 268 meters (nearest 55 acres to nest) and 500 meters (within 500 acres of nests) of known nests. This index provided a means to compare the relative level of potential disturbance among territories. Within 268 meters of nests within territories, 2 of 23 territories were devoid of roads and trails (Figure 7-10). The Tahoe Mountain territory had the greatest relative level of disturbance in close proximity to nests (Figure 7-10). Within TRPA 'disturbance (free)' zones (500 meters of nests), the Lower Saxon Creek territory had the lowest relative level of disturbance, while the Tahoe Valley territory had the greatest (Figure 7-11). It should be noted that road and trail density itself does not necessarily indicate that the territory is impacted but may only

indicate that there is a greater potential for recreational impacts. Additional information on the level of road and trail use (level of service) would provide for a more powerful analysis in terms of identifying the relationship of nest success and recreational impacts.

'Disturbance (free) zones' delineated in TRPA (1982) and TRPA SIS Maps (1987) are not consistent with the policy adopted by TRPA Regional Plan to manage for Northern Goshawk. According to these documents, a total of approximately 1,870 acres were set aside for Northern Goshawk disturbance zones averaging approximately 155 acres per threshold site (Figure 7-12). At a minimum (assuming one nest per territory), a total of 6,000 acres or 500 acres per threshold site should have been identified as disturbance zones in order to be consistent with TRPA's Northern Goshawk disturbance zone management policy. As of year 2000, based on known (historic and current) Northern Goshawk nest sites and in accordance with TRPA policy, a total of approximately 17,000 acres is dedicated to TRPA Northern Goshawk disturbance zones, averaging approximately 740 acres per territory (n = 23) and 333 acres per nest site (n = 51).

Since the adoption of the TRPA Regional Plan (1987), it appears that there has been an incremental degradation of habitat quality of Northern Goshawk threshold sites. This is in part because goshawks are especially sensitive to human intrusions into active nesting territories. Not realizing the potential to impact reproductive goshawks, TRPA has inadvertently permitted for increases in recreational activities in remote threshold sites. For example, TRPA permitted the expansion of recreational activities in North Canyon (a goshawk threshold site) to include a cross-country ski area, ski huts, and the conversion of a historic flume to a well-publicized mountain bike trail. Consequently, no reproductive activity has been documented within the North Canyon threshold site since the adoption Environmental Threshold Carrying Capacities for wildlife.

Figure 7-8. Summary of Documented Northern Goshawk Territory Activity, 1976 - 2000, Lake Tahoe CA, NV

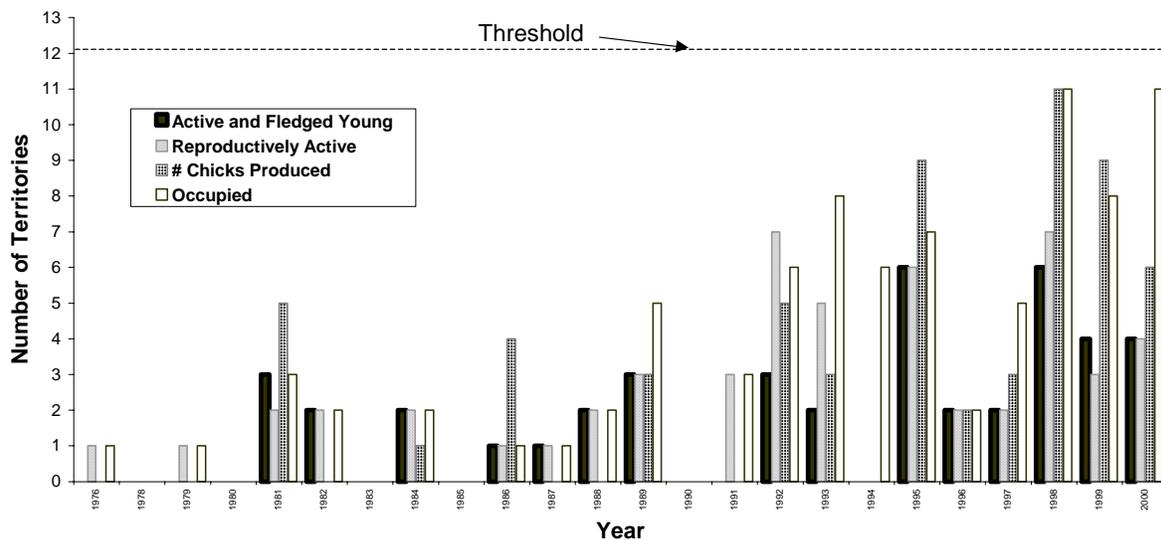
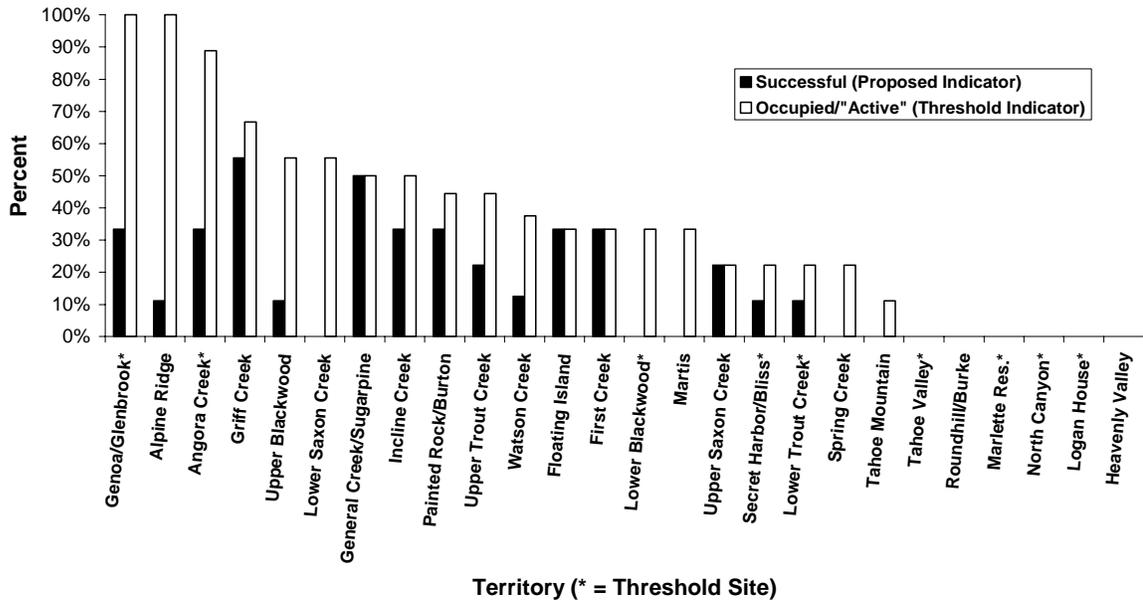


Figure 7-9. Percent of Years Between 1992 to 2000 Each Northern Goshawk Territory was Successful and/or Occupied in the Lake Tahoe Basin, CA, NV



* If a territory was discovered after 1992, then only the years following discovery were used to calculate the percent of years successful and/or occupied.

Figure 7-10. Relative Disturbance Level Within 268m of Known Northern Goshawk Nest Sites, Lake Tahoe, CA, NV.

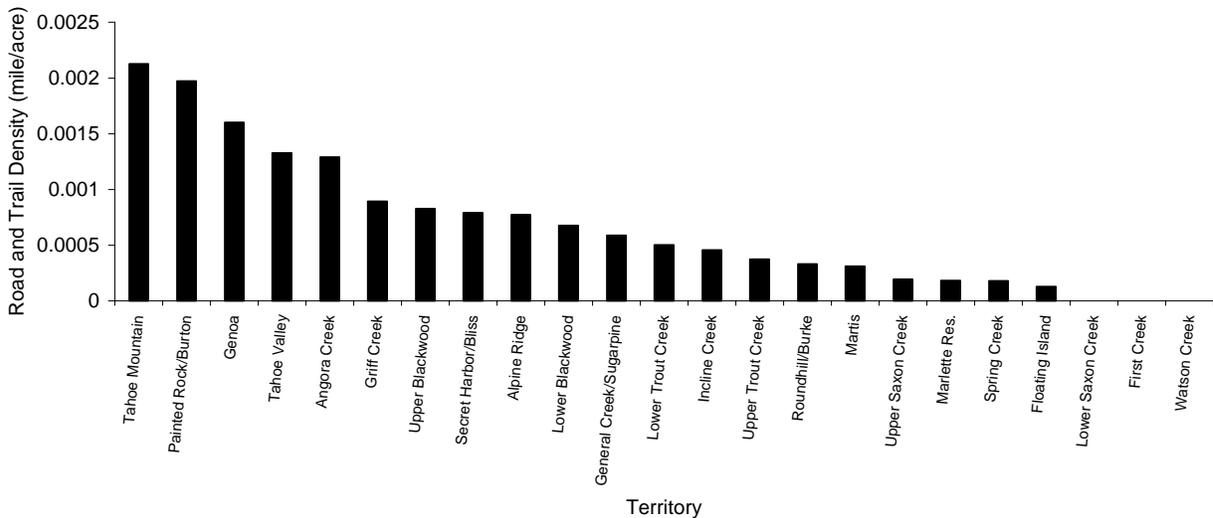
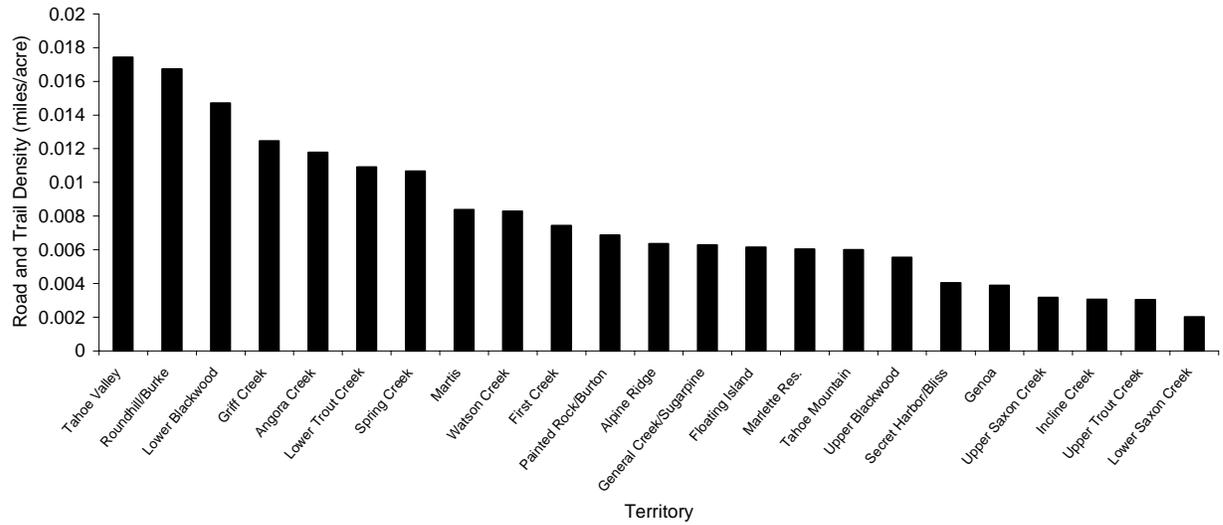
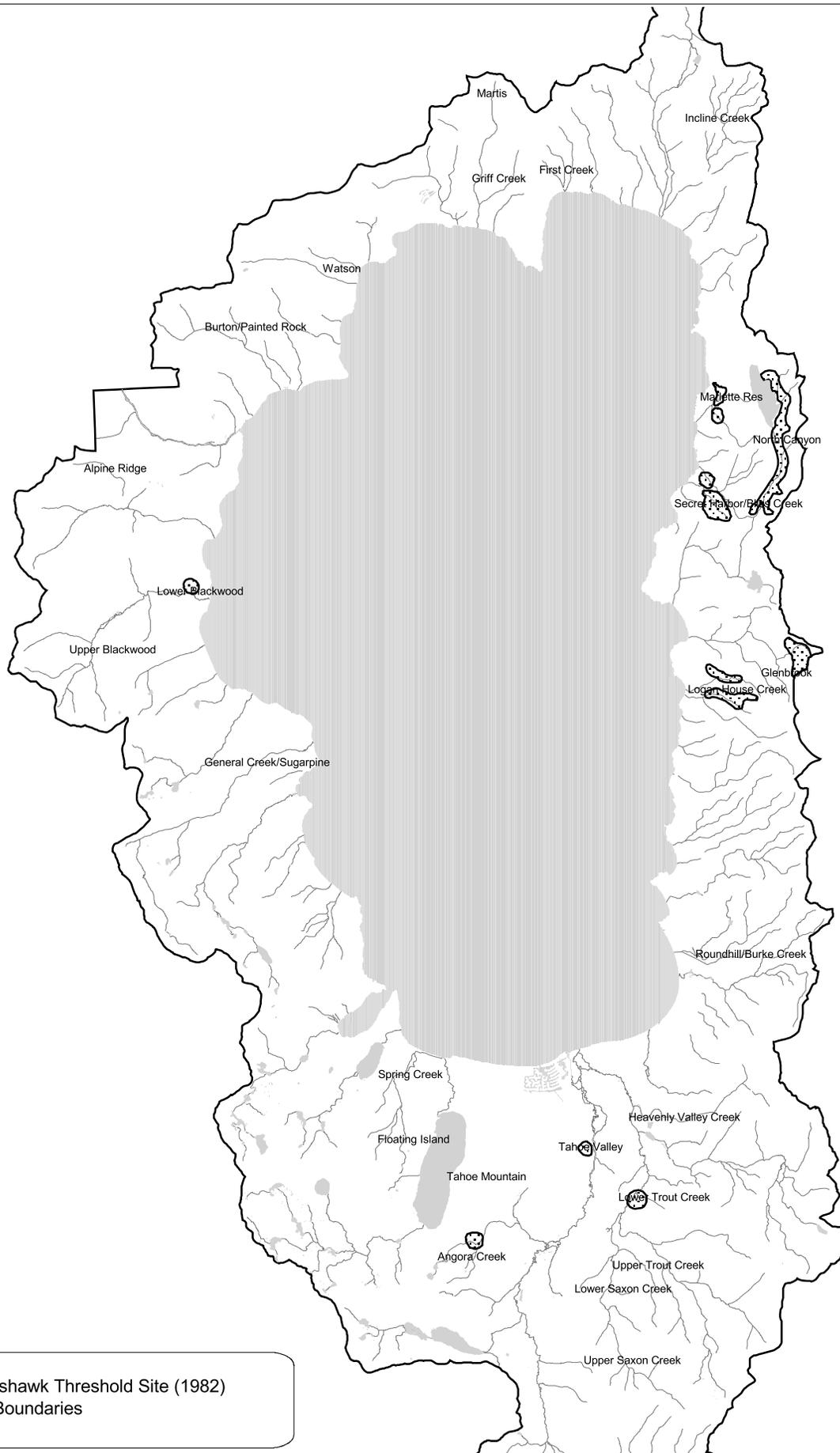


Figure 7-11. Relative Level of Disturbance Within 'Disturbance(Free)' Zones (500 acres) of Known Northern Goshawk Nest.





Lakes
 Northern Goshawk Threshold Site (1982)
 Watershed Boundaries
 Streams

Figure 7.12.
Northern Goshawk Threshold Populations Sites and
Generalized Locations of Known Territories



Osprey (Nesting Activity)

In general, Ospreys build large and conspicuous nests in the tops or side-branches of relatively large and dead trees in close proximity to shorelines of large water bodies in the Tahoe region. Consequently, monitoring Osprey reproductive activity is fairly straightforward and allows for relatively accurate documentation of nest productivity. Since 1996, the threshold standard has been in compliance in each year (Figure 7-13). According to the 'proposed indicator' (i.e., number of reproductively viable nests), the threshold standard for nesting Osprey has been met or exceeded in four of the last five years (Figure 7-13). Since 1996, 16 ± 2.8 (Mean \pm SD) nests were active, of which an average of 5.4 ± 2 nests per year produced well-developed chicks (fledged or near fledging age). Ospreys produced 0.5 ± 0.27 chicks per active nest per year and an average of 9 ± 4 chicks were produced per year.

Osprey (Disturbance Zones)

Certain individuals within Osprey populations are more tolerant of human activities than others (Poole 1989). This appears to be the case in the Lake Tahoe region where some pairs will establish nests in fairly impacted areas (e.g., Memorial Point), while others establish nests in relatively remote areas. Since 1999, TRPA has been investigating the relationship between Osprey nest success and levels of human activity. Preliminary results from this investigation indicate the individuals that establish nests in remote areas become considerably more agitated from human intrusions than Ospreys that establish nests in more developed areas. Although more years of study are needed to determine if human activities affect Osprey nest success, it seems reasonable to conclude that individuals that spend time responding to human intrusions are not spending time attending to eggs or chicks. Consequently, introducing human activity into areas that are not impacted by human activity may be detrimental to TRPA's ability to maintain its threshold objective for Osprey. The results of this investigation should be available in 2004.

As a result of several years of monitoring the Osprey nesting population (1976 through 2000), a sizeable increase in the area considered for disturbance zones has been realized. The original allocation for disturbance zones was 500 acres (four sites @ 125 acres each). At the end of the 2000 breeding season, a maximum of 5,965 acres are considered for disturbance zone management (Figure 7-15, area includes water).

Figure 7-13. Summary of Osprey Nest Activity Relative to TRPA Threshold and Population Trend, Lake Tahoe, CA, NV

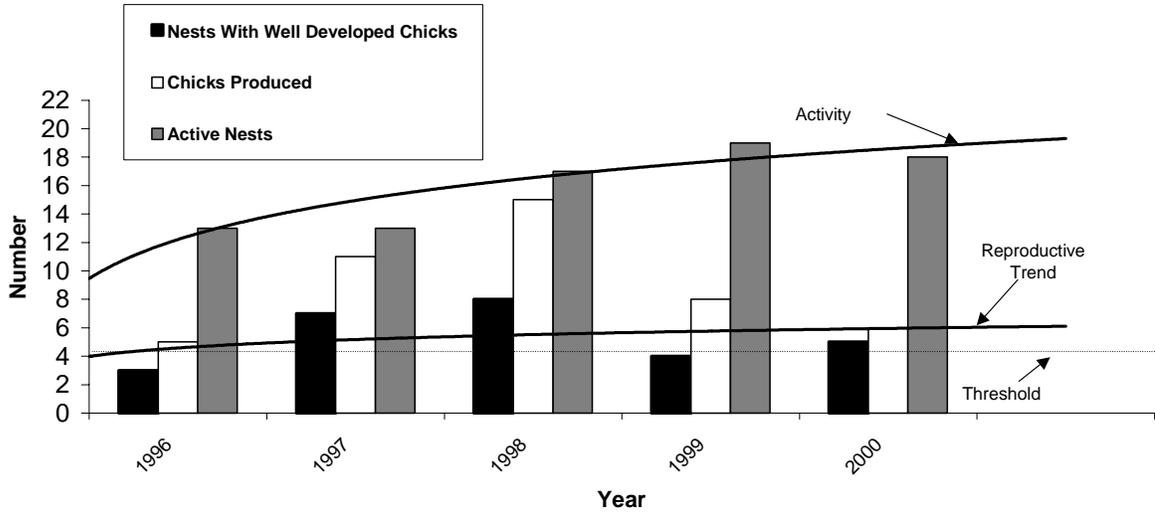
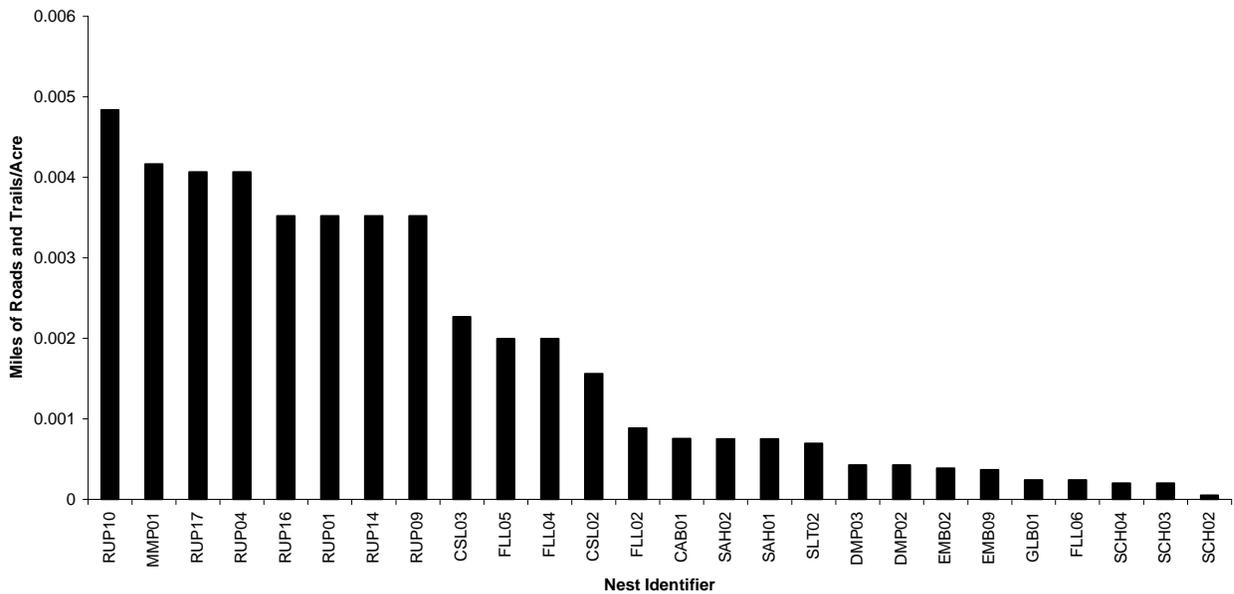


Figure 7-14. Relative Level of Disturbance Within 'Disturbance (Free)' Zones of Intact Osprey Nests, Lake Tahoe, CA, NV, 2000.



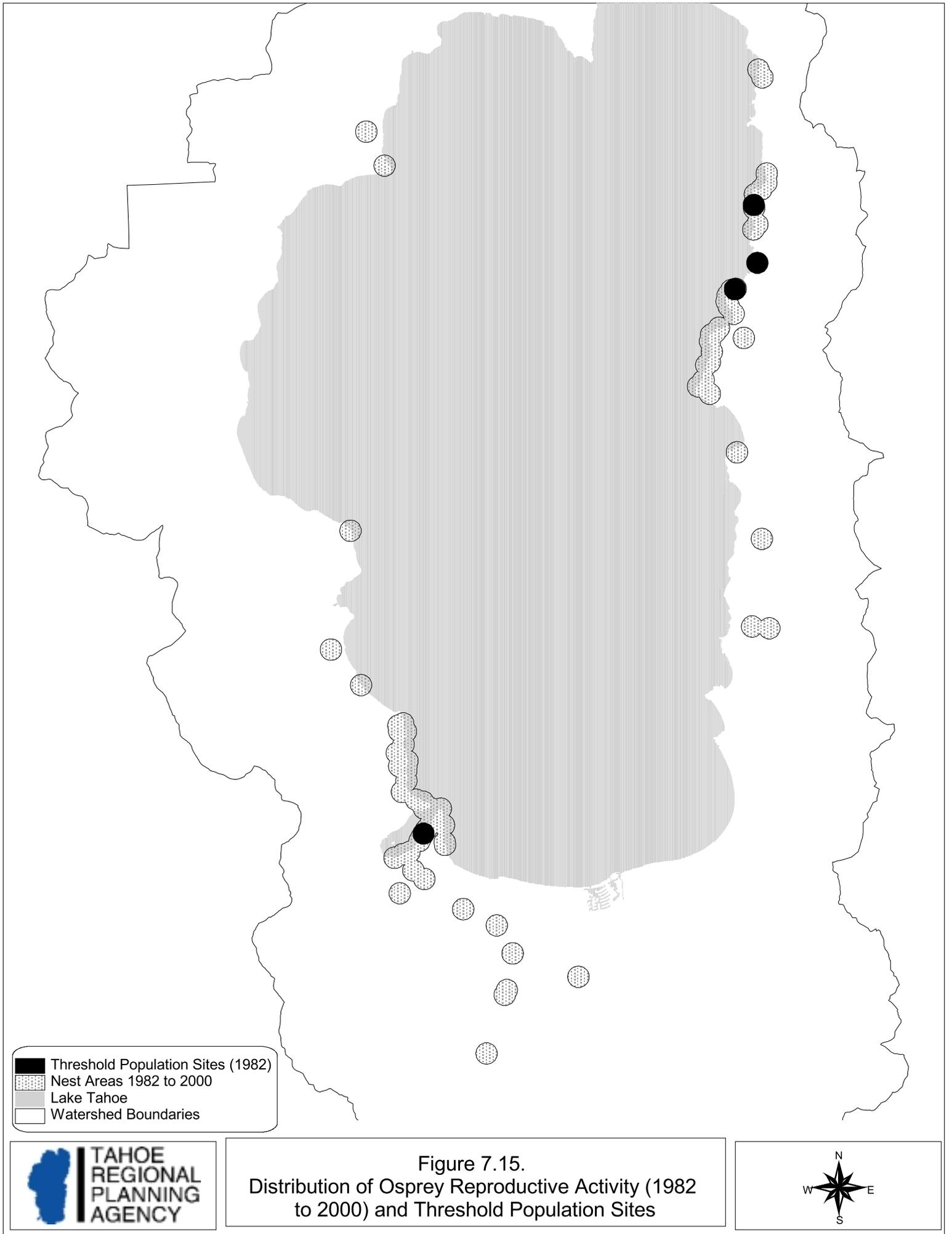


Figure 7.15.
 Distribution of Osprey Reproductive Activity (1982
 to 2000) and Threshold Population Sites



Waterfowl

A greater number of species were detected and more sites were surveyed in 2000 than in 1999 (Figure 7-16). This is likely the result of more experienced surveyors conducting surveys and a more coordinated survey effort between USFS-LTBMU and TRPA in 2000. In general, Pope Marsh, Truckee Marsh, Taylor Creek Marsh, and Spooner Lake supported the greatest number of species for both 1999 and 2000 (Figure 7-16). Edgewood Golf Course and Upper Echo Lake supported the least number of species for the years of 1999 and 2000 (Figure 7-16).

1999 Survey Results: A total of 51 species were recorded from June through August and an additional 17 species were detected during opportunistic surveys conducted between September and November 1999, for a total of 68 species (Appendix 2). In general, American Robin and Mallard were the most widely distributed of all species, as they were detected at 16 of 18 observation sites. Of the species most closely associated with aquatic habitats, Mallard, Ring-necked Ducks, American Coots, and Canada Geese were detected at the greatest number of observation sites (Appendix 2). Of birds associated with riparian and meadow habitats, Red-winged Blackbirds, Song Sparrows, and Brewer's Blackbird, occurred at the greatest number of observation sites (Appendix 2). Of birds most closely associated with upland habitats, American Robin, Mountain Chickadee, Stellar's Jays, and Dark-eyed Juncos were most frequently detected at different observation sites (Appendix 2). A total of three Canada Geese were observed swimming about Fannette Island and no nesting activity was observed.

Bird species richness (i.e., the number of species) was greatest at Spooner Lake, Taylor Creek Marsh, Grass Lake, and Truckee Marsh, and lowest at Echo Lakes (Figure 7-17). In overall species diversity, McKinney Lake ranked highest and Spooner Lake ranked lowest. However, when an observation of an exceptionally large number of American Coots ($n = 500$) at Spooner Lake was removed from the data set, Spooner Lake ranked highest in species diversity over all other wetland sites. Taylor Creek Marsh and Truckee Marsh ranked highest in species diversity with respect to species associated with aquatic habitats, and Echo Lakes and Blackwood Canyon ranked lowest (Figure 7-18). Again, when an observation of a large number of American Coots at Spooner Lake was removed, Spooner Lake ranked highest in species diversity with respect to birds associated with aquatic habitats (Figure 7-18). For riparian and meadow associated species, Rabe Meadow and Truckee Marsh ranked highest and Echo Lakes ranked lowest in species diversity (Figure 7-18). McKinney Lake and Spooner Lake ranked highest in upland species diversity while Truckee Marsh and Echo Lakes ranked lowest (Figure 7-18).

Canada Geese and California Gulls on average were most abundant relative to other species detected between June and August, and American Coots were most abundant relative to other species detected between September and November. Of all the sites surveyed, Truckee Marsh, Baldwin Marsh, Taylor Creek Marsh, and Spooner Lake supported the greatest mean relative abundance of birds and McKinney Lake, Lower Echo Lake, and Blackwood Canyon supported the lowest mean relative abundance. Consequently, four of six Bald Eagle detections were recorded at Taylor Creek Marsh and Spooner Lake where the greatest relative abundance of individual birds and greatest species richness was recorded. A total of six species of concern (i.e., listed by either TRPA, USFS, USFWS, and CDFG)

were recorded at 11 survey locations (Appendix 2). The highest number of sightings of species of concern occurred at Taylor Creek Marsh, Truckee Marsh, and Baldwin Marsh (Appendix 2).

Bird reproductive activity (i.e., observation of chick(s) with parent(s)) was recorded at six wetlands sites and included five species. Sites where reproduction was recorded were Truckee Marsh, North Fallen Leaf Lake, Rabe Meadow, Lake Baron, Upper Echo Lake, and Lake Christopher. Species recorded with chick(s) were Cinnamon Teal, Common Merganser, Mallard, Spotted Sandpiper, and Red-winged Blackbird (Figure 7-1).

Subjective evaluations of surveyed wetlands found that one wetland site, Lake Baron, likely provides low quality habitat for waterfowl nesting, feeding, or resting behaviors during summer months due to high levels of human activity (Appendix 4). Contrarily, Grass Lake, Lily Lake, McKinney Lake, and Osgood Swamp likely provided the best habitat quality, with respect to human activity, for waterfowl nesting, feeding, or resting behaviors during summer months (Appendix 4).

2000 Survey Results: A total of 104 species were recorded from May through August and an additional 13 species were detected during surveys conducted in October 2000, totaling 117 species (Appendix 3). 46 species were detected during surveys in October and were also recorded between May and August. Stellar's Jay, Mountain Chickadee, American Robin, Mallard, and Northern Flicker were the most widely distributed of all species, as they were detected at ≥ 18 of 20 wetland sites (Appendix 3). Of the species most closely associated with aquatic habitats, Mallard was detected at the greatest number of wetland sites (Appendix 3). The greatest number of aquatic-associated species was recorded at Spooner Lake (Figure 7-19). Of birds associated with riparian and meadow habitats, Red-winged Blackbird, Song Sparrow, Wilson's Warbler, and Brown-headed Cowbird, occurred at the greatest number of wetland sites (Appendix 3). The greatest number of riparian/meadow-associated species was recorded at Truckee Marsh. Of birds most closely associated with upland habitats, American Robin, Mountain Chickadee, Stellar's Jay, and Western Wood Pewee were most frequently detected at different wetland sites (Appendix 3). The greatest number of upland-associated species was recorded at Lily and Marlette Lakes (Figure 7-19). A total of four Mallards and one Western Grebe were observed swimming about Fannette Island, and one large addled egg and ground nesting material was observed on Fannette Island. (The egg, due to its large size, was presumed to be residual from Canada Goose nesting efforts).

In overall species diversity, Lily Lake and Meeks Meadow ranked highest and Spooner Lake ranked lowest. Osgood Swamp, Truckee Marsh, Taylor Creek Marsh and Pope Marsh ranked highest in species diversity with respect to species associated with aquatic habitats, and Bliss Pond and Meeks Meadow ranked lowest (Figure 7-20). For riparian and meadow associated species, Spooner Lake, Blackwood Canyon, and Meeks Meadow ranked highest and Upper Echo Lake ranked lowest in species diversity (Figure 7-20). Nearly all sites ranked similarly with respect to upland associated species diversity (Figure 7-20).

Bird reproductive activity was observed at nearly all sites surveyed, with the exception of Bliss Pond (Figure 7-21). The greatest number of species exhibiting reproductive activity was recorded at Pope Marsh and Truckee Marsh (Figure 7-21).

Figure 7-16. Total Number of Species by Year Detected in Surveys Conducted in 1999 and 2000 at Wetland Sites (waterfowl 'population' sites), Lake Tahoe, CA, NV.

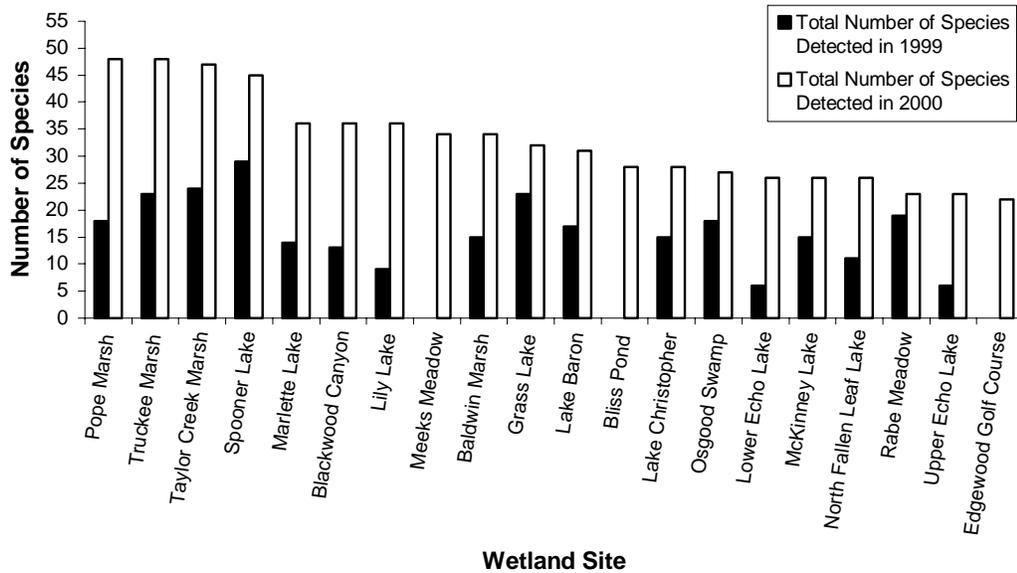


Figure 7-17. Species Richness, Grouped By Habitat Association, Recorded at Wetlands Surveyed (waterfowl 'population' sites) in 1999, Lake Tahoe, CA, NV.

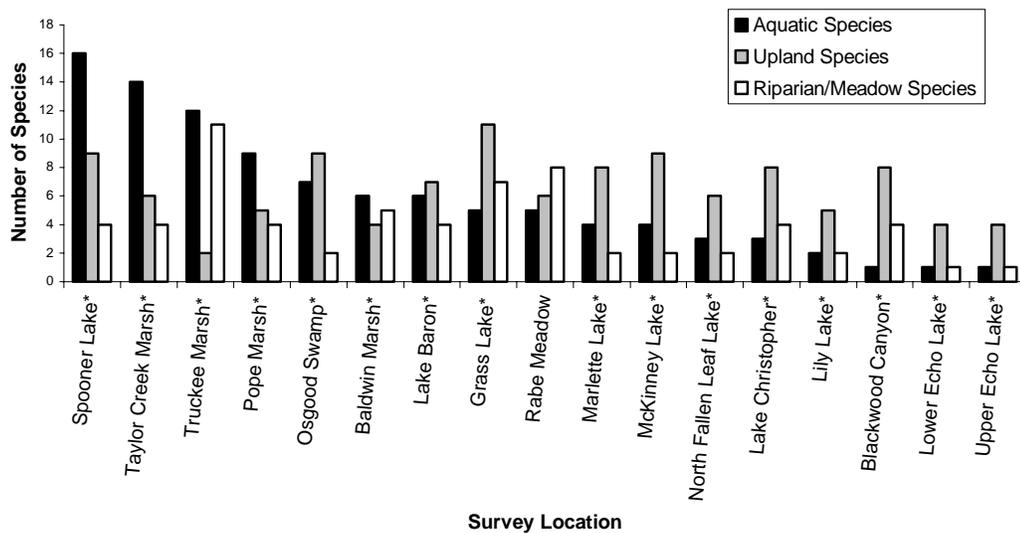


Figure 7-18. Relative Species Diversity, Grouped by Habitat Association Recorded at Surveyed Wetlands (waterfowl 'population' sites), 1999, Lake Tahoe, CA, NV.

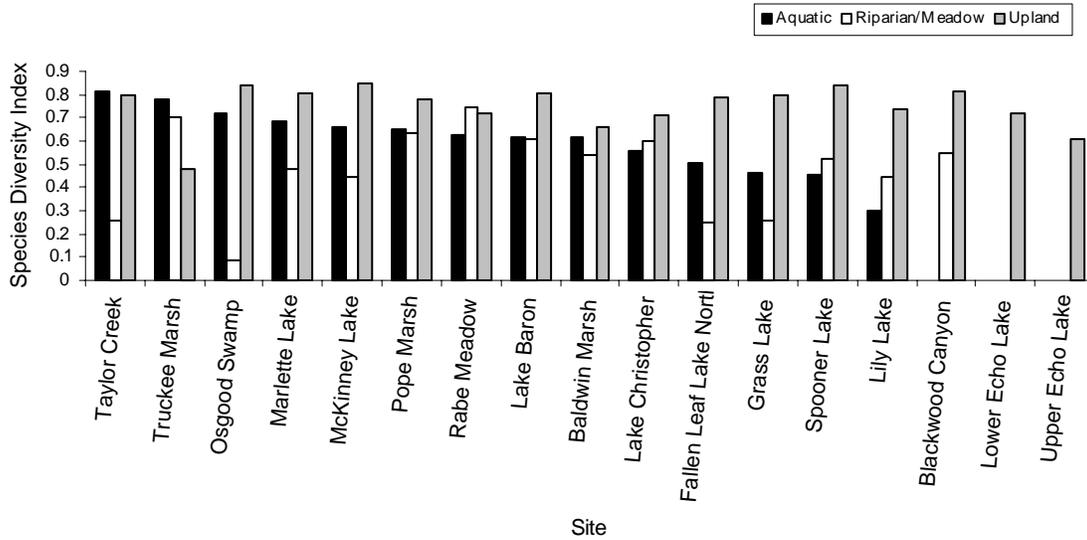


Figure 7-19. Species Richness, Grouped By Habitat Association, Recorded at Wetlands Surveyed (waterfowl 'population' sites) in 2000, Lake Tahoe, CA, NV

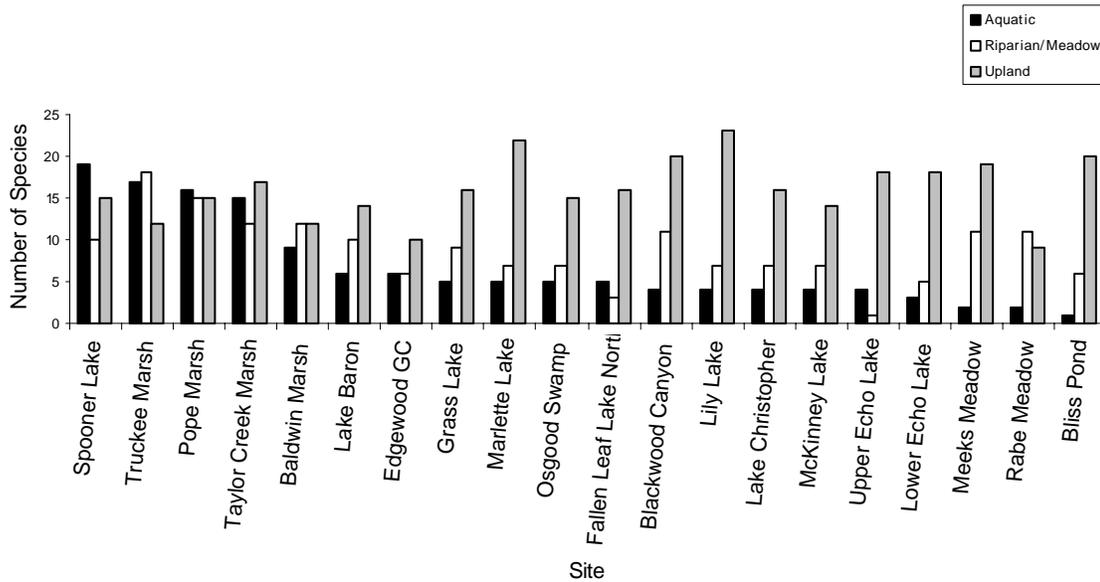


Figure 7-20. Relative Species Diversity, Grouped by Habitat Association Recorded at Surveyed Wetlands (waterfowl 'population' sites), 2000, Lake Tahoe, CA, NV.

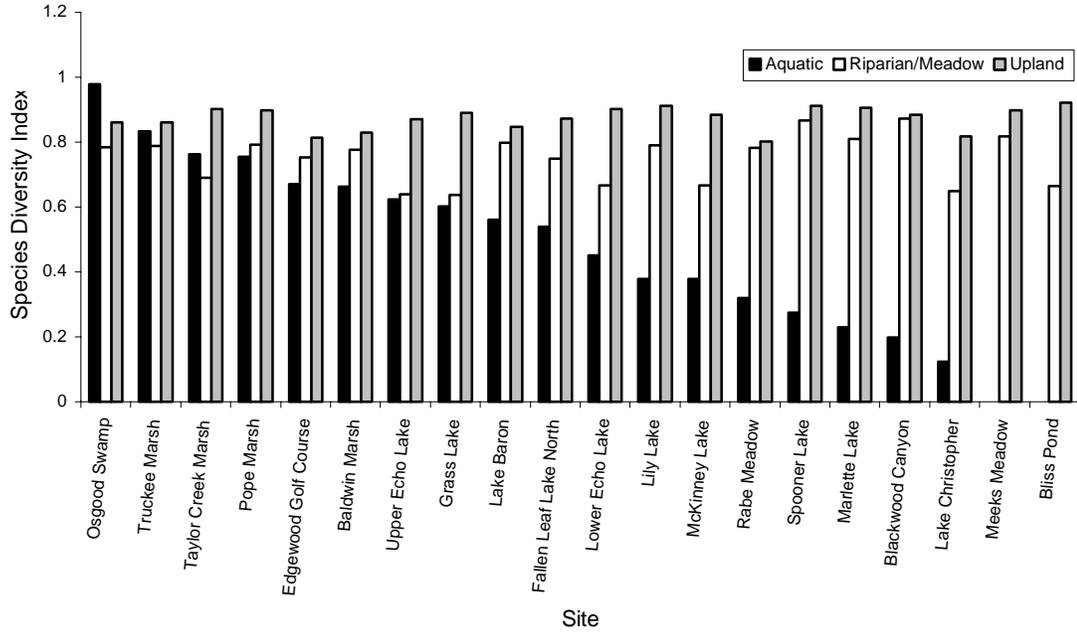
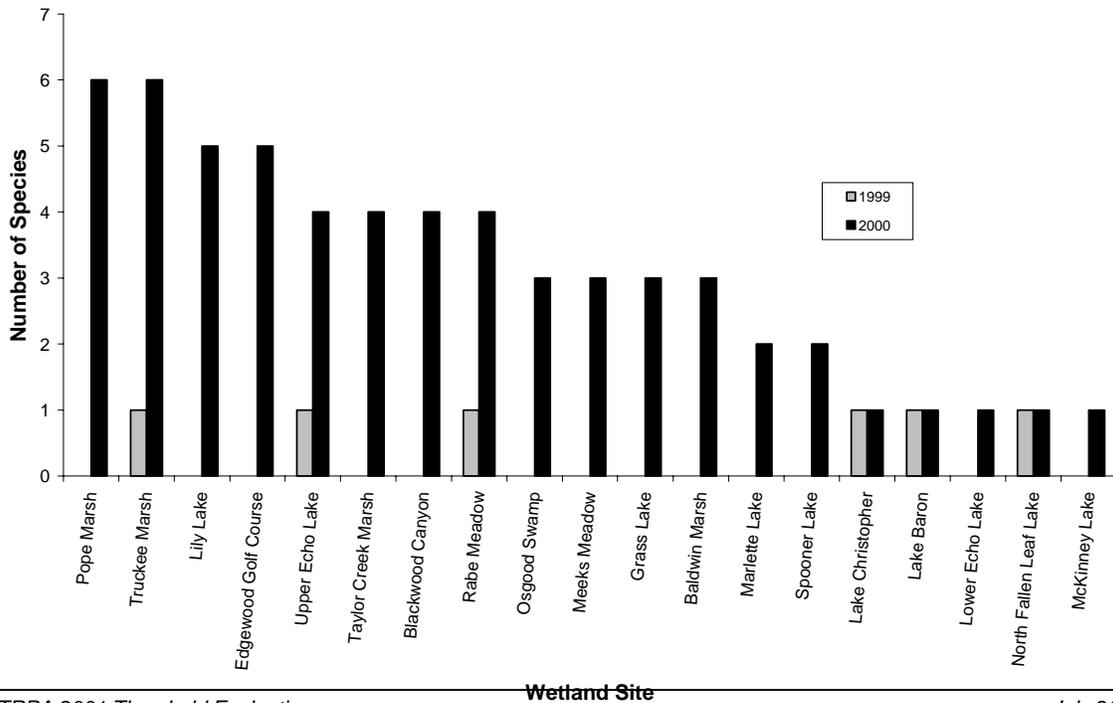


Figure 7-21. Number of Species Recorded at Wetland Sites (waterfowl 'population' sites) Exhibiting Reproductive Behavior, 1999-2000, Lake Tahoe, CA, NV



4. Trends

Bald Eagle

Nesting: Based on data collected since 1996, the trend for Lake Tahoe's Bald Eagle nesting population is gradually increasing (Figure 7-2). The increase in the nesting population may be related to an increase in the overall North American Bald Eagle population. USFWS (1999) reported that the Bald Eagle population of breeding areas in the lower 48 United States has increased dramatically since 1963. The total number of occupied breeding areas recorded in 1963 was 417 and by 1998 the number of occupied breeding areas increased to 5,748, a 13.8 fold increase (USFWS 1999).

Increased recreational access at Bald Eagle nest areas is a concern and needs to be addressed.

Wintering: The number of Bald Eagles counted during annual winter surveys between 1998 and 2001 appears to be stable and increasing (Figure 7-4). Increased numbers of Bald Eagle counted during winter Bald Eagle counts is probably related to an overall population increase documented throughout the lower 48 states (USFWS 1999). However, portions of TRPA designated wintering Bald Eagle areas are designated for developed recreation by other agencies (USFS 1988), a conflict that was recognized by the designating agency. Conflicting land use designations is a concern because recreational disturbance can impact the fitness of Bald Eagles (Anthony et al. 1995). Current and future demand for lakeshore recreational access at wintering Bald Eagle areas is suggestive that these areas will be persistently impacted by human activity into the future. More effective actions to enforce fall and winter closures would improve the quality of wintering habitat for Bald Eagle at the Taylor Creek Marsh site and the reclamation of historic lagoon habitats around Lake Tahoe would approve the region's suitability for wintering Bald Eagles.

Deer

As stated previously, regional deer populations are declining (Figure 7-5). TRPA has limited opportunity to improve deer population numbers considering that factors associated with human population growth (i.e., reduced habitat quality and loss of habitat) are suspected as the major contributor to their decline and occur outside of the basin (Espinosa 2001). Realistically, the Lake Tahoe basin should not be expected to be a major contributor of fawning habitat due to its high elevation. Research is needed to evaluate the overall value of the Lake Tahoe basin for fawning habitat and the efficacy of this threshold.

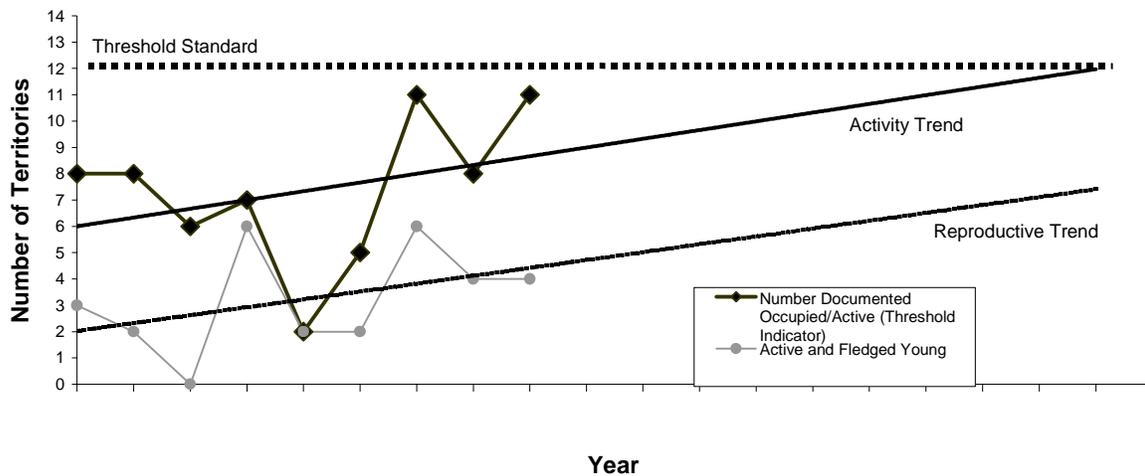
Golden Eagle and Peregrine Falcon

Due to limited information on nest activity, it is inappropriate to speculate on a population trend for nesting Golden Eagle and Peregrine Falcon. Efforts should continue the attempt to document reproductive activity of both species. Habitat suitability for both species in the region is marginal based on historic use by the two species and the region's high elevation relative to typically used areas.

Northern Goshawk

Goshawk productivity is naturally cyclical and can be influenced by several factors including food availability, weather, and availability of undisturbed nesting habitat. Many of these factors cannot be manipulated by TRPA. However, efforts are underway to improve nesting habitat conditions for Goshawk in the basin through road decommissioning projects and proposed vegetation management designed to improve goshawk habitat. Increased demand for recreational access into forested habitats continues to threaten TRPA's ability to achieve and maintain threshold standards for Goshawk considering their susceptibility to human disturbance (Murphy and Knopp 2000). Based on data gathered between 1992 and 2000, and assuming status quo management for Goshawk, it is estimated that the goshawk threshold standard will be achieved in the year 2011 (Figure 7-22).

Figure 7-22. Summary of Northern Goshawk Territory Activity (1992 - 2000) and Trend Towards Achieving TRPA's Threshold Standard.



Osprey

The Osprey nesting population is stable with a slight upward trend (Figure 7-13). TRPA has adopted an ordinance that prohibits watercraft from traveling >5 mph within 600 feet of the shoreline. If enforced, this ordinance will assist in decreasing waterborne sources of recreational disturbance. Continued awareness is needed to ensure that remote shorezone areas remain free of recreational development. In doing so, TRPA ensures the continued nesting success of both Osprey and Bald Eagle in the Region.

Waterfowl

Due to a number of factors, including the great number of species that this threshold standard applies to; a disparity between the number of species detected in 1999 and 2000; the ambiguous intent of the threshold standard for waterfowl; and the limited amount of monitoring (two seasons) it is perhaps premature to speculate on trends for this group of species at this time. Surveys at waterfowl threshold sites have been successful in establishing the relationship of different species to different waterfowl threshold sites. One observation that stands out from the survey data is the nearly ubiquitous distribution of Brown-headed Cowbirds. This non-native species has the potential of significantly impacting the reproductive

success of a number of neotropical migrants. Actions should be taken to significantly reduce the population of Brown-headed Cowbirds to ensure the viability of other species that they impact.

In terms of waterfowl threshold site status (wetlands), several sites have been reduced in quality since the adoption of the 1987 Regional Plan. Others sites are chronically impacted by recreational activities (Appendix 4). Chronic recreation may not impact common species that readily habituate to human activity; however, it does have consequences for rare and unique species. A substantial effort needs to be undertaken to develop a wetland/recreation management plan to ensure the continued persistence of quality waterfowl habitat. This plan would identify appropriate levels of recreation and design recreation access in relatively benign locations at wetland sites where recreation is an issue. Additionally, numerical standards need to be developed such that the performance of the waterfowl threshold standard is measurable.

5. Threshold Attainment Status

Below is a summary of reported Special Interest Species threshold status since 1982 (Table 7-5). Please note that criteria for threshold attainment have been poorly articulated in past evaluations and, in most cases, differ from this threshold evaluation's approach. For this evaluation, methods for determining threshold status have been clearly identified in the narrative and a conservative determination has been made for each Special Interest Species. Determination of attainment was based on standardized field survey methods and review of relevant literature. Past threshold attainment interpretations have been based on the mere presence of a species or speculation of its presence. Consequently, comparisons of compliance determinations in Table 7-5 should be considered with caution.

Table 7-5. Special Interest Species Threshold Attainment Status as Reported for 1982, 1991, 1996, 2001.

Special Interest Species	Threshold Attainment Status By Evaluation Year				Threshold Appropriate
	1982*	1991	1996	2001	
Bald Eagle (nesting)	YES	NO	YES (based on one unsuccessful nest in 1996 only)	YES	YES ^a
Bald Eagle (wintering)	YES	YES	YES	NO	YES ^b
Deer (fawning)	YES	YES	YES	YES	NO ^c
Golden Eagle (nesting)	YES	NO	UNKNOWN	NO	NO ^d
Northern Goshawk (nesting)	YES	NO	YES	NO	YES
Osprey (nesting)	YES	YES	YES	YES	YES
Peregrine Falcon (nesting)	YES	NO	NO	NO	NO ^e
Waterfowl	YES	YES	YES	NO	YES ^f

* Available data does not support attainment for Northern Goshawk, Golden Eagle, Osprey, and Peregrine Falcon in 1982.

^a Should increase number of nesting (population) sites to 4, to be consistent with the Pacific Bald Eagle Recovery Plan (USFWS 1986).

^b Threshold site at Taylor Creek Marsh is impacted by recreational activities (Laves and Romsos 1999).

^c Deer winter range and corridors impacted by factors associated with human population expansion outside of the Lake Tahoe basin. TRPA has limited opportunity to improve conditions for deer at winter range considering these areas are outside of their jurisdiction.

^d An ambitious goal considering that Golden Eagle do not typically nest at elevations found at Lake Tahoe. Additionally, two of the four population sites identified on TRPA maps (1987) are not likely suitable for nesting Golden Eagle.

^e Nesting habitat suitability in the Lake Tahoe region is poor and unlikely to support a viable Peregrine Falcon population.

^f Waterfowl threshold sites have been degraded since the adoption of the Regional Plan. In some cases, open water habitats have been converted to riparian habitat (e.g., Lake Christopher). Other cases, recreation activities have compromised the quality of wetland habitat for nesting and rare species. Wetland condition indicators need to be developed to properly report on the health of wetland sites.

6. Effectiveness of Measures in Place

Compliance measures in place are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region or to promote attainment or maintenance of any threshold standard. In the case of wildlife, these measures would be aimed at ensuring the viability of all wildlife populations in the basin. Supplemental measures are programs, regulations or other measures, which are not currently enacted, but if they were, would assist threshold maintenance and attainment. In general, measures in place are applicable and effective. Consideration should be given to add the implementation of wildlife, fisheries, and SEZ projects listed in the Environmental Improvement Program as a measure to assist the with the attainment of TRPA thresholds for wildlife. (See Table 7-6.)

Category: wildlife

Parameter: special interest species

~~completed in 1995 and a draft is currently being finalized. Bald eagles are counted each year in January, and Osprey nests are under frequent observation from April through September yearly. For details, see the 1996 Evaluation.~~

- STANDARD: Provide a minimum number of population sites and disturbance zone for the following ~~six-species or species groups. Perching sites and nesting trees~~ Nest sites and perch sites shown on TRPA Regional Plan Overlay Maps or in TRPA Geographic Information System shall not be physically disturbed, nor shall the habitat in the disturbance zone be manipulated in any manner, unless necessary to enhance the quality of the habitat (TRPA Code, Chapter 78, Subsection 78.3.A).

Species of Interest	Population Sites	Disturbance Zone
Northern Goshawk	12	0.50-mile
diameter <u>radius</u>		
Osprey	4	0.25 mile
diameter <u>radius</u>		
Bald Eagle (winter)	2	Mapped areas
Bald Eagle (nesting)	1	0.50 mile
diameter <u>radius</u>		
Golden Eagle	4	0.25 mile
diameter <u>radius</u>		
Peregrine Falcon	2	0.25-mile
diameter <u>radius</u>		
Waterfowl	18	Mapped areas
Deer	--	Meadows

- INDICATOR (UNITS): The minimum number of population sites (areas for reproductive activity or wintering habitat) and disturbance (free) zones maintained as determined by inspection by qualified wildlife experts using measures of reproductive activity or habitat quality (unitless).
- MONITORING SUMMARY: Monitoring consists of an ongoing collaborative program between by TRPA, the Forest Service, Nevada Division~~Department~~ of Wildlife, California Department of Fish and Game, ~~California Tahoe Conservancy, Nevada Division of Parks and Recreation,~~ and California State Department of Parks and Recreation. Annual surveys were conducted according to established protocols at known population sites inspections and within suitable habitats of special interests species and other sensitive species, are made of mapped, as well as unmapped, sites where there are known recent occurrences, or population sites for use or disturbance. Many of the The majority of population sites occurred on lands managed by are on California and Nevada state parks and Forest Service, land, Prior to the issuance of a permit for any particular activity that would occur within the disturbance (free) zone, a habitat impact assessment is conducted by TRPA staff or other qualified wildlife biologist, and case-by-case observation of the habitat is carried out prior to any activity which would occur within the disturbance zone. The California Department of Parks and Recreation and the California Tahoe Conservancy underwrote a study of the Northern goshawk in the Region. The study was

- ATTAINMENT STATUS (2001):
 Goshawk: non-attainment
 Osprey: attainment
 Bald eagles (winter): non-attainment
 Bald eagles (nesting): attainment
 Golden eagle: ~~not known~~non-attainment
 Peregrine falcon: non-attainment
 Waterfowl: non-attainment
 Deer: ~~not known~~non-attainment
- TARGET DATE: See INTERIM TARGETS, below
- EVALUATION INTERVAL: Five years
- INTERIM TARGETS:
 - Bald Eagle (wintering) – reduce recreation disturbance at wintering areas reduced to suitable level by 2006.
 - Goshawk – Not likely to ever be achieved at original threshold sites considering level of recreation activity/development permitted within TRPA mapped disturbance (free) zones. Overall however, with USFS and State Park road decommissioning projects, will likely improve disturbance (free) zone nesting habitat equivalent to 12 threshold sites by 2006.
 - Golden Eagle – not likely to ever be achieved in the Lake Tahoe basin due to suboptimal nesting habitat in the region. Standard should be re-assessed.
 - Peregrine Falcon – not likely to ever be achieved in the Lake Tahoe basin due to suboptimal nesting habitat in the region. Standard should be re-assessed.
 - Waterfowl – non-degradation standard not likely to be achieved at ‘threshold sites’ due to continued demand for recreation access into wetland interiors. If greater recreation access restrictions are applied and additional sites considered for ‘threshold site’ status, standard will be achieved by 2006.
 - Deer – considering the ubiquitous intrusion by recreationists into meadow habitats, the non-degradation standard for meadow habitat will not likely ever be achieved. If additional suitable fawning habitats are considered (e.g., shrub dominated), threshold standard will likely be achieved by 2006. ~~For golden eagle – By September November 1998, TRPA, in coordination with other agencies, shall prepare a report, based upon surveys for golden eagle in the region, documenting status and factors affecting habitat utilization. For peregrine falcon – By September~~

Index No.: W-1 ENVIRONMENTAL THRESHOLD COMPLIANCE FORM

~~November 1998, TRPA, in coordination with other agencies, shall evaluate the opportunities to reintroduce peregrine falcon to the Region. Based upon the evaluation, recommendations will be made on maintaining peregrine falcon as a special interest species.~~

8. COMPLIANCE MEASURES: (See Section II for inventory)

- a. MEASURES IN PLACE: WILDLIFE--~~01, 02, 03, 05, 07, 08, 09, and 10~~ 149, 150, 151, 152, 153, 154, and 155.
- b. EFFECTIVENESS OF MEASURES IN PLACE: In general compliance measures in place are effective. Refer to Table 7.6 for a complete evaluation of compliance measures in place. ~~The 1996 Evaluation recommends strengthening the Code to provide additional protection to wildlife species, add a snag and down log recruitment policy, review disturbance zones, and consider additional controls (01), 02 recommend add to the Code, as a chapter all its own, SEZ Protection, in order to codify TRPA's nondegradation standard for SEZs (03), evaluation and enhancement of OHV controls to include snowmobiles and personal watercraft and watercraft in general (07), and the addition of the goshawk study findings (10).~~
- c. SUPPLEMENTAL MEASURES: Supplemental measures 156 and 157 (identified in 1996 Threshold Evaluation) were assessed in Table 7.6. Recommend the implementation of Environmental Improvement Projects for Wildlife, Fisheries, and SEZ as new supplemental measures. ~~TRPA needs to conduct golden eagle and waterfowl surveys annually to determine the status of the populations in the Region. TRPA should work with the Forest Service on the annual spring bird count so that bird species and numbers can be tracked annually with a particular emphasis on neotropical species. TRPA should evaluate the adequacy of TRPA noise standards on wildlife. Also, TRPA should study the noise impacts on the South and East Shores of Lake Tahoe on wintering bald eagles, to better balance land use and eagle management during the winter. Maps and database for special interest species should be updated. The feasibility of providing a hack site for peregrine on one of the casino towers should be studied. In coordination with applicable resource agencies in the Region, TRPA should develop a beaver management plan with the goal of providing balance between water quality, soils, fisheries, and other wildlife standards.~~

- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~Not applicable~~ 1996 Threshold Evaluation supplemental measures were evaluated in Table 7.6 of this document. Implementation of EIP projects for wildlife, fisheries, and SEZ will significantly contribute to the improvement of habitat quality for Special Interest Species.

9. ADEQUACY OF COMPLIANCE MEASURES: In general, compliance measures are adequate; please see Table 7.6 for complete evaluation of compliance measures. ~~Habitat maps should be updated and amended. More attention should be given to monitoring and quantifying habitat disturbance and to studying factors affecting population dynamics to determine whether the compliance measures, with the changes recommended, are adequate.~~

E. W-2: HABITATS OF SPECIAL SIGNIFICANCE

The Habitat of Special Significance applies to riparian habitats in the Lake Tahoe region.

1. Evaluation Criteria

According to TRPA (1996), conclusions on the condition of the 'Habitats of Special Significance' standard shall be similar to those identified for the SC-2.

W-2 Habitat of Special Significance

Adopted Threshold Standard: A non-degradation standard shall apply to significant wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations.

Adopted Threshold Indicator: Preserve existing natural functioning Stream Environment Zone (SEZ) lands in their natural hydrologic condition, restore all disturbed SEZ in undeveloped, unsubdivided lands, and restore 25 percent of the SEZ lands that have been identified as disturbed, developed or subdivided, to attain a 5 percent total increase in the naturally functioning SEZ land (TRPA 1996).

See SC-2 section for more information.

2. Measurement and Monitoring

Refer to SC-2 section for discussion on measurement and monitoring efforts

3. Results of Measurement and Monitoring Efforts

Refer to SC-2 section for discussion on results on measurement and monitoring efforts.

4. Trends

Refer to SC-2 section for discussion on SEZ trends.

5. Threshold Attainment Status

The threshold standard for SEZ is not being attained. See SC-2 section for more information.

6. Effectiveness of Measures in Place

Effectiveness of measures in place is discussed in SC-2 section. Please refer to SC-2 section for discussion on the effectiveness of measures in place.

Category: wildlife

Parameter: habitats of special significance

1. STANDARD: A non-degradation standard shall apply to significant wildlife habitat consisting of deciduous trees, wetlands, and meadows while providing for opportunities to increase the acreage of such riparian associations.
2. INDICATOR (UNITS): ~~See Environmental Threshold Compliance Form SC-2, Naturally-Functioning SEZ, Area of~~ naturally functioning SEZs (acres).
3. MONITORING SUMMARY: See SC-2 (Chapter 4).
4. ATTAINMENT STATUS: See SC-2 (Chapter 4).
5. TARGET DATE: See SC-2 (Chapter 4).
6. EVALUATION INTERVAL: See SC-2 (Chapter 4).
7. INTERIM TARGETS: See SC-2 (Chapter 4).
8. COMPLIANCE MEASURES:
 - a. MEASURES IN PLACE: See SC-2 (Table 4.5), in addition, Wildlife - ~~01, 02, 03, 04, 05, and 08~~ 149, 150, 151, 153, 154, and 155.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: In general, measures in place are effective, refer to Table 4.5 and 7.6 for complete assessment of measures in place. ~~The offsite mitigation/restoration required for incursions into SEZs is not applied in the same manner in the backshore. This results in a net loss of riparian vegetation and habitat in the backshore. The offsite requirement of 1.5:1 restoration needs to also apply in the backshore. A requirement of in-kind restoration needs to be included into the SEZ restoration requirements so that riparian habitat types are maintained and increased.~~
 - c. SUPPLEMENTAL MEASURES: See SC-2 (Table 4.5).
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: See SC-2.
9. ADEQUACY OF COMPLIANCE MEASURES: See SC-2 (Table 4.5). ~~With the facilitation and implementation of projects listed in the 208 Plan, projects being planned by other land management agencies in the Region, and the controls in place, the compliance measures should result in attainment and maintenance of the threshold.~~

Table 7-6. Status of Measures in Place for the Wildlife Threshold

1996 Control Measure	Effective?	Explanation	Recommendation
(149) Chapter 78, Wildlife Resources: Regulates projects and activities, which could affect basin wildlife habitat. Protects SEZs, migration corridors, special interest species and other critical habitat. Provides for protection of snags and CWD.	Partially	1) Since adoption of Thresholds, additional sensitive species have been listed by USFS and other agencies. Consequently, there are no threshold standards (e.g., minimum # of pop. sites) in place for these species. 2) Limited Operating Periods (LOP) need to be clearly articulated in code section, in lieu of insufficient information.	1) As part of threshold update process identify and establish threshold standards for sensitive species listed by other agencies. Threshold standards (indicator) should be based on the amount of area available for suitable nest habitat, giving consideration to natural population fluctuations and potential. 2) Adopt code language that requires a limited operating period for projects with insufficient survey data or with confirmed special interest species breeding activity.
(150) Stream Restoration Program: The USDA Forest Service, CTC, NTRT and others have an ongoing program for stream restoration which provides food and cover for riparian associated wildlife species.	Yes	Restoration of riparian areas that have been degraded as a result of human activities.	Continue to support and facilitate agency stream restoration efforts basin-wide, provided projects result in an improved habitat condition. Environmental Improvement Program habitat restoration projects should be added to this measure (#150).
(151) Best Management Practices (BMP) and re-vegetation practices: Protect and enhance wildlife habitat.	Partially	Staff wildlife biologist should regularly provide BMP training for new Project Review and Compliance staff in order for measure to be fully effective.	In Conservation and Recreation zones, all re-vegetation projects should be reviewed by a wildlife biologist to ensure consistency with basin species habitat requirements and compliance with threshold standards. Biologist's re-vegetation recommendations should be based on best available habitat literature.
(152) OHV limitations: Prohibit OHV uses within sensitive species disturbance zones and during critical breeding seasons.	No	Lack of Enforcement. Local human population is virtually unregulated, resulting in the creation of non-system trails. Snowmobiles often disregard minimum snow depth standards (which are inadequate).	Improve enforcement. Improve public education. Require minimum snow depth of 12" for snowmobile concessionaires and other users.

Table 7-6. Status of Measures in Place for the Wildlife Threshold (continued)

1996 Control Measure	Effective?	Explanation	Recommendation
(153) Chapter 73: Exclude livestock from stream banks. Range improvements are prohibited from interfering with migration routes of deer and other wildlife.	Yes	Measure improves multiple threshold categories.	None
(154) Chapter 9, Remedial Action Plans: Provides for TRPA to request or require a problem assessment to identify situations which adversely impact attainment or maintenance of a threshold and provides for implementation of a remedial action plan to abate the problem.	Yes	Potentially valuable tool to reduce impact to sensitive species and habitat.	Could be used more; however likely politically unpalatable.
(155) Project Review: Review project plans for conformance with the Thresholds, Goals and Policies, and Code. Sets forth conditions for approval.	Yes	Has been effective, need to continue communication between Wildlife Program and Project Review division	Need to improve and/or continue cross-divisional line of communication and/or training with Project Review to be fully effective.
(156 Supplemental) Goshawk Research (Keane 1999) - Analyzed Northern Goshawk ecology and habitat use in the region. Implement habitat management recommendations from research.	Yes	Measure is complete. None needed	Delete supplemental measure. Incorporate Keane research into Northern Goshawk management strategy for the Lake Tahoe basin.
(157 Supplemental) Peregrine Falcon Reintroduction Program: In order to attain the numerical threshold standard for peregrine falcon in the region, reintroduction is necessary.	No	Region not likely to provide habitat condition necessary to support a viable Peregrine Falcon population (Murphy and Knopp 2000).	Delete measure. Peregrine Falcons typically do not establish nests above 4,000 Feet.

IV. STATUS OF 1996 RECOMMENDATIONS

Below is a list of recommendations made in the 1996 Threshold Evaluation. Following, in italics, is a summary of the status of that recommendation.

Special Interest Species (W-1):

1. *“Conduct Golden Eagle survey and study.” Survey efforts to identify the nest locations of both Peregrine Falcon and Golden Eagle were initiated in 1999 and continued in 2000 (see above for monitoring details). Thus far, one Golden Nest was located and no Peregrine Falcon nests have been located.*
2. *“Conduct annual waterfowl survey.” Waterfowl surveys were initiated by TRPA in 1999 and continued in 2000 with the assistance of the USFS-LTBMU. The majority of locations surveyed have been threshold waterfowl sites with additional sites considered important for waterfowl.*
3. *“Actively pursue grant funds to finance needed studies and wildlife enhancement and restoration in the Region.” The TRPA has had little success in accomplishing this task due to inadequate staffing. TRPA has acquired money to complete a ‘Sensitive Shorezone Species’ public outreach program. This program developed an educational brochure for visitors and locals, and trading cards for school children to enlighten the public on issues that impact sensitive shoreline species in Lake Tahoe. Another grant to conduct furbearer surveys was submitted but denied. The USFS-LTBMU, NDOW, and CTC have made substantial progress in acquiring grant moneys. For example, the USFS-LTBMU has generated \$60,000 in grant money for wildlife-related public outreach and habitat improvement projects. This recommendation should be adopted by the 2001 Threshold Evaluation.*
4. *“Conduct a study that evaluates the overall population dynamics and habitat utilization of wildlife species in the Region.” This recommendation was completed as part of the Lake Tahoe Watershed Assessment (Murphy and Knopp 2000). TRPA staff was directly involved with the completion of this document. The Biological Integrity section of the Watershed Assessment thoroughly evaluated the state of knowledge of Lake Tahoe’s wildlife and the communities on which they depend.*
5. *“Evaluate the current controls on OHV’s (to include snowmobiles and jetskis). Included in this evaluation should be an analysis of the adequacy of the noise standards as they relate to wildlife.” The full extent of this recommendation has not been realized. That is, a comprehensive evaluation of OHV use has yet to be coordinated. However, several disconnected yet related projects and data gathering efforts have been made towards completing this recommendation. Starting in 1998, the USFS-LTBMU, as part of their road-decommissioning program has been inventorying the extent of system and non-system roads and trails in the basin. This is a critical step in order to evaluate OHV impacts because it allows the evaluator to relate road and trail networks with sensitive wildlife habitats. Completion of the road and trail inventory is expected in 2002, at which time a more detailed analysis can be coordinated. Additionally, the USFS-LTBMU has received limited California*

'Green Sticker' funds to develop a wildlife habitat protection plan in OHV use areas. 'Green Sticker' funds are also used to survey designated 'Green Sticker' trail in order to delineate suitable habitat and sensitive species conflicts. Additionally, the TRPA has initiated an investigation into the relationship of recreation activities' (including waterborne activities) impact on the reproductive success of Osprey.

6. *"Study of human impacts on the south and east shore of Lake Tahoe on wintering Bald Eagles." An analysis was completed for the south shore area of Lake Tahoe in 1999 (Laves and Romsos 1999). This study documented that recreation activities resulted in Bald Eagles' temporary abandonment of feeding and perching areas and that there was a conflict in land use designations for recreation and wintering Bald Eagle areas. Results of this study can be extrapolated to the east shore regions of Lake Tahoe due to the commonality of the wintering Bald Eagle population.*
7. *"Adopt a new chapter in the Code focused on the protection of SEZ's that codifies the non-degradation standards found in both the wildlife and fisheries thresholds." Completed.*
8. *"Update maps and database for Special Interest Species." Since 1997, the TRPA has been actively facilitating the development of an interagency GIS and database for tracking wildlife information. The database, titled 'Wildlife2000', contains survey information for the majority of TRPA SIS and other sensitive species. The USFS-LTBMU, NDOW, and California State Parks have been integral in accomplishing this task.*
9. *"Study the feasibility of providing a hack site for Peregrine Falcons on one of the casino towers." This recommendation should be deleted. Historic occurrence in the region and life history of species imply that the suitability of the Lake Tahoe basin for sustaining a Peregrine Falcon population is low.*
10. *"Facilitate and participate in the annual spring bird count." Not completed. Goals and objectives of recommendation need to be further developed.*
11. *"In cooperation with other resource agencies in the Region, develop a beaver management plan." Not completed. A rationale for this recommendation needs to be developed*

Habitats of Special Significance (W-2, Riparian Habitat)

1. *"Amend Chapter 74 of the Code to incorporate protection of SEZs that codifies the non-degradation standards found in both the wildlife and fisheries threshold." Completed*
2. *"Amend the Code to provide consistency in mitigation measures for disturbance in SEZs and Backshore areas. Develop special shorezone landscaping and BMP requirements." Not completed. Although provisions for this recommendation have been outlined in the 1999 Draft Environmental Impact Statement for Shorezone Code Amendments, this policy has yet to be adopted. The anticipated adoption date of new Code language is 2002.*

3. “Adopt old growth forest as a habitat of significance and provide for a non-degradation policy.” *In 1998, an interim late successional/old growth (LSOG) standard was adopted. In 2001, new Threshold, Goals and Policies, and Code language was adopted under the Vegetation Threshold Program. The new language identifies a non-degradation standard for LSOG and minimum standards for coarse woody debris and snag retention. Because this standard is well articulated and protected as a Vegetation Threshold, perhaps it is redundant to include it as a Wildlife Habitat of Significance.*

V. 2001 RECOMMENDATIONS

Recommendations listed include projects, programs, and research needs. Projects are physical manipulations of the landscape in order to achieve a desired condition favorable to sustaining wildlife populations. Programs are plans under which action is taken in order to accomplish a specified wildlife or public outreach goal. Research needs are scientific studies (with well-articulated questions) necessary to support or refute a particular wildlife management standard or policy. The implementation of the adopted 2001 Environmental Improvement Program should be considered as an over-arching recommendation to achieve threshold standards for wildlife.

The TRPA Regional Plan will be updated in 2007. Prior to the drafting of an updated Regional Plan, a critical review and revision to existing threshold standards is needed. Recommendations for new research in support of threshold standard updates are presented in this evaluation to direct wildlife conservation for the next 20 years following 2007.

In general, four factors are responsible for perpetuating wildlife populations. These factors include food, water, cover and space. Identifying management policies, research, and programs around the maintenance of these factors will generally provide for the perpetuation of wildlife in the Lake Tahoe basin.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~A. SPECIAL INTEREST SPECIES – Update threshold standards and indicators~~

~~Threshold Standard: _____ W-1
Responsible Entity: _____ TRPA and USFS
Funding/Cost: _____ TRPA - \$50,000, USFS - \$20,000
Completion Date: _____ November 2003~~

~~**Recommendation:** Conduct a comprehensive evaluation of TRPA's existing threshold standards and threshold indicators for special interest species. Evaluation shall make recommendations for new standards and indicators or improvements to existing standards and indicators based on the most applicable science, information specific to the Lake Tahoe basin, and habitat models. All proposed threshold standards and indicators shall be measurable, scientifically defensible, and attainable. The evaluation shall also include recommendations for monitoring. Completion of this recommendation would effectively complete EIP #341.~~

~~**Product:** Document that identifies scientifically supported recommendations for 1) updated Special Interests Species threshold standards and indicators, 2) protocol(s) for monitoring Special Interest Species, and 3) protocol(s) for analysis and report procedures for Special Interest Species.~~

~~B. HABITATS OF SPECIAL SIGNIFICANCE – Update threshold standards and indicators~~

~~Threshold Standard: _____ W-2
Responsible Entity: _____ TRPA and USFS
Funding/Cost: _____ TRPA - \$50,000, USFS - \$300,000
Completion Date: _____ November 2003~~

~~**Recommendation:** Conduct a comprehensive evaluation of TRPA's existing Threshold standards and indicators for habitats of special significance. Evaluation shall make recommendations for new standards and indicators or improvements to existing standards and indicators based on the most applicable science, information specific to the Lake Tahoe basin, and habitat models. All proposed threshold standards and indicators shall be measurable, scientifically defensible, and attainable. The evaluation shall also include recommendations for monitoring.~~

~~**Product:** Document that identifies scientifically supported recommendations for 1) updated Habitat of Special Significance threshold standards and indicators, 2) protocol(s) for monitoring Habitat of Special Significance, and 3) protocol(s) for analysis and report procedures for Habitats of Special Significance.~~

~~**C. Public outreach wildlife website**~~

~~Threshold Standard: W-1 and W-2
Responsible Entity: TRPA and USFS
Funding/Cost: TRPA \$10,000, USFS \$10,000
Completion Date: October 2002~~

~~**Recommendation:** Establish a Public Outreach Program that creates and maintains a Wildlife Awareness Web Site. The web site should have a live feed 'Web Camera' at nests (e.g., Osprey) or significant wildlife use areas (e.g., Taylor Creek Marsh). Will provide public the opportunity view sensitive wildlife and gain greater appreciation for their conservation.~~

~~**Product:** Website with real time images of sensitive wildlife and their habitats.~~

~~**D. Adopt limited operating periods for special interest species**~~

~~Threshold Standard: W-1
Responsible Entity: TRPA
Funding/Cost: \$3,000 (staff time)
Completion Date: Winter 2003~~

~~**Recommendation:** Adopt limited operating periods for TRPA Special Interests Species, and other agency sensitive species. Policy would restrict impacting activities and projects to outside of critical periods.~~

~~**Product:** Chapter 78, TRPA Ordinance that identifies Limited Operating Periods for Special Interest Species.~~

~~**E. Bear-proof trash container requirement**~~

~~Threshold Standard: N/A
Responsible Entity: TRPA
Funding/Cost: \$3,000 (staff time)
Completion Date: March 2003~~

~~**Recommendation:** Adopt an ordinance requiring bear-proof trash containers on new projects and projects with significant modifications. This should especially apply to recreation facilities such as campgrounds and day use areas. Ordinance will assist in controlling wildlife (such as bear, coyote, domestic dogs and raccoon) dependency on human-generated waste.~~

~~**Product:** Chapter 30, TRPA Ordinance that calls for approved bear-proof trash containment devices on all new and significant remodel projects. Additional language should identify the need to retrofit recreation facility, such as campgrounds, with bear-proof food lockers and trash containers.~~

~~**F. Bald eagle wintering habitat improvement**~~

~~Threshold Standard: W-1 and W-2
Responsible Entity: USFS
Funding/Cost: \$20,000
Completion Date: Spring 2002~~

~~**Recommendation:** Work with USFS to enforce closure of wintering area at Taylor Creek, install temporary fencing around core wintering areas, and improve signage at Bald Eagle wintering areas to reduce and eliminate impacts to bald eagle from human activity during winter months. This recommendation is partially comparable to EIP #10045.~~

~~**Product:** Installation of temporary fence (between October and March) at Taylor Creek Marsh.~~

~~**G. Wetland habitat improvement assessment**~~

~~Threshold Standard: W-1 and W-2
Responsible Entity: TRPA, USFS, and CTC
Funding: \$50,000
Completion Date: April 2003~~

~~**Recommendation:** Systematically assess existing trails and roads that bisect wetlands and identify opportunities that more appropriately direct and buffers human activity away from the periphery and interior of wetlands. This can be accomplished by realigning existing trails away from or outside of wetland areas, designating the wetland area as a preserve and limiting access into the wetland, establishing native riparian shrub and tree vegetation along the periphery of the wetland to hamper access, and design observation platforms to serve as blinds and interpretive opportunities. In doing so, the public still has access, yet their impact is reduced considerably. This project is in-line with EIP #10045.~~

~~**Product:** A document that assesses and recommends opportunities to improve wetland habitat in the region.~~

VI. EIP INTEGRATION

A total of 42 projects, research, and programs have been identified in the Environmental Improvement Program (EIP) to enhance wildlife habitat and improve basin agencies decision-making ability (please refer to 2001 adopted EIP document for complete list of wildlife projects). Ultimately, the goal of the EIP is to achieve and maintain environmental threshold standards. Consequently, implementation of the EIP is critical for achieving and maintaining threshold standards for wildlife. A project, program, or research project qualifies for inclusion in the EIP if their objectives are one (or several) of the following: 1) to directly and/or indirectly enhance existing wildlife habitat conditions, 2) to acquire, reclaim and restore degraded wildlife habitats, 3) to improve the information base on special status wildlife species life history, their basin-wide distribution or their habitats, and 4) to reduce or eliminate chronic impacts to wildlife and their habitats. The following outline provides some examples of EIP projects, programs, and research needs aimed to improve wildlife conditions, and thus achieve and maintain wildlife threshold standards, in the basin.

Projects with direct enhancement to wildlife and their habitats.

- Mimic natural processes and/or protect sensitive ecosystems.
 1. Prescribed burning when and where appropriate
 2. Forest manipulations (prescriptions) designed to meet focal species habitat requirements.
 3. Remove encroaching conifers from meadow and aspen communities.
 4. Provide nest boxes where appropriate.
 5. Acquisition and protection of sensitive habitats and wildlife movement corridors.
- EIP Project Number 10086, “Prescribed Burning in California State Parks for Wildlife Habitat Enhancement”, is an example of a project that accomplishes this objective of directly improving habitat condition if implemented.

Projects with indirect improvement to wildlife habitat.

- Restore hydrologic regimes to riparian communities where appropriate.
 1. Remove stream diversions and man-made obstructions.
 2. Reestablish or enhance wildlife movement corridors.
 3. Re-establish beneficial native vegetation at disturbed sites.
 4. Implement appropriate vegetation management that is consistent with wildlife habitat needs.
- EIP Project Number 27 and 606, “Blackwood Creek SEZ/Fishery Restoration/riparian Habitat Enhancement”, is an example of a project that would accomplish this objective of indirectly enhancing wildlife habitat if implemented.

Projects to reclaim and restore degraded or developed wildlife habitat.

- Restoring habitat refers to reestablishing pre-European settlement habitat conditions to the extent feasible.

1. Remove fill from historic marshes and wetlands and restore to historic functioning natural community.
 2. Reestablish plant species diversity and structure (e.g., sugar pine in place of fir, perpetuate old growth communities where appropriate)
 3. Road decommissioning
 4. Reestablish streams routes into historic courses.
- EIP Project Number 10044, “ Tallac Creek/Marsh Restoration”, is an example of a project that would accomplish this objective of reclaiming habitat if implemented.

Monitoring programs, assessments, and applied research to improve information on Special Status wildlife species.

- Build knowledge base and trend information on at-risk species.
 1. Distribution of sensitive species nests, dens, and sightings databases
 2. Home range, habitat use, food habits, and movement research
 3. Reproductive activity research and monitoring
 4. Applied research.
 5. Viability and reintroduction assessments (e.g., sensitive amphibians)
 6. Identification and protection of locations with extraordinary species or taxa diversity
 7. Habitat needs assessments
 8. Habitat condition assessments or habitat needs assessments
- EIP Project Number 933. “East Shore Watersheds Furbearer Survey”, is an example of a project that would increase basin agencies understanding of the distribution of furbearers in the Tahoe region and may provide for additional research opportunities.

Projects/programs to reduce or eliminate existing impacts to wildlife and their habitats.

- Reduce human generated forms of disturbance to wildlife.
 1. Provide vegetation screening and low impact viewing decks at high human use areas.
 2. Establish interpretive signing to educate public where appropriate.
 3. Reroute trails that interrupt natural hydrologic regimes or have the potential to disturb Special Status wildlife.
 4. Decommission unneeded roads especially within sensitive species disturbance zones.
 5. Limit OHV and recreational use to appropriate areas.
 6. Limit human use of sensitive shorezone environs.
- EIP Project Number 583, “Public Lands Road Obliteration/Coverage Retirement”, is an example of a project that would reduce impacts to special interest species by eliminating sources of recreational disturbance.

Recommendation for EIP Updates

As TRPA moves closure to updating threshold standards and indicators for the 2007 regional plan renewal, attention should be given to revising and refining EIP projects consistent with the new standard and indicators. Additionally, as projects are completed, it would be beneficial to have in tracking system place to keep track of EIP accomplishments. A tracking system capable of synthesizing information from multiple threshold categories would be beneficial for wildlife because wildlife will benefit from projects identified for other threshold categories.

EIP Units of Benefit for Wildlife

Units of benefit are intended to track progress gained toward achieving and maintaining threshold standards. However, in order for units of benefit to be effective, it is necessary for threshold standards be articulated using similar units. For example, using the W-1 threshold standard, an EIP project should be able to identify the number of population sites or what proportion of a population site will be improved or added. Unfortunately, in the wildlife sciences, it is often difficult to precisely identify the number of population sites gained or what proportion of a population site will be improved because often times there are multiple variables influencing the quality of a particular area. Ultimately it is the goal of TRPA is to translate EIP projects into progress made towards achieving threshold standards. The following table summarizes EIP units of benefit for wildlife.

EIP Units of Benefit for Wildlife (bolded text is existing threshold indicators)		
Wildlife		
TH Index	TH Indicator	Unit of Benefit
W1	Special Interest Species	# Population Sites
W1-A	Critical Wildlife Habitat	Acres Acquired/Improved
W2	Habitats of Special Significance	Acres Improved/Acquired
W2-A	Forest Habitat	Acres Improved/Acquired
W2-B	Meadow Habitat	Acres Improved/Acquired
W2-C	Riparian Habitat	Acres Improved/Acquired

VII. SUPPLEMENTAL INFORMATION

Appendix 1 – Wildlife species of the Lake Tahoe basin.

Appendix 2 – Species by habitat association recorded at different wetland locations in the Lake Tahoe basin, June through November 1999.

Appendix 3 – Species by habitat association recorded at different wetland locations in the Lake Tahoe basin, June through November 2000.

Appendix 4 - Wetland site descriptions, human disturbance rating (refer to Table 1), type of wetland, distinguishing characteristics, and human influences, June through August 1999 and 2000 in the Lake Tahoe basin.

Appendix 1. Current status of vertebrate species of the Lake Tahoe basin.

Common name	Scientific name	Current Status¹
BIRDS		
American Avocet	<i>Recurvirostra americana</i>	Yes
American Bittern	<i>Botaurus lentiginosus</i>	Yes
American Coot	<i>Fulica americana</i>	Yes
American Crow	<i>Corvus brachyrhynchos</i>	Yes
American Dipper	<i>Cinclus mexicanus</i>	Yes
American Goldfinch	<i>Carduelis tristis</i>	Yes
American Kestrel	<i>Falco sparverius</i>	Yes
American Pipit	<i>Anthus rubescens</i>	Yes
American Redstart	<i>Setophaga ruticilla</i>	No(A)
American Robin	<i>Turdus migratorius</i>	Yes
American White Pelican	<i>Pelecanus erythrorhynchos</i>	Yes
American Wigeon	<i>Anas americana</i>	Yes
Anna's Hummingbird	<i>Calypte anna</i>	Yes
Arctic Loon	<i>Gavia arctica</i>	Yes
Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	Yes
Baird's Sandpiper	<i>Calidris bairdii</i>	No(A)
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Yes
Band-tailed Pigeon	<i>Columba fasciata</i>	Yes
Bank Swallow	<i>Riparia riparia</i>	Yes
Barn Swallow	<i>Hirundo rustica</i>	Yes
Barrow's Goldeneye	<i>Bucephala islandica</i>	Yes
Belted Kingfisher	<i>Ceryle alcyon</i>	Yes
Bewick's Wren	<i>Thryomanes bewickii</i>	Yes
Black Phoebe	<i>Sayornis nigricans</i>	No(A)
Black Swift	<i>Cypseloides niger</i>	Yes
Black Tern	<i>Chlidonias niger</i>	Yes
Black-backed Woodpecker	<i>Picoides arcticus</i>	Yes
Black-bellied Plover	<i>Pluvialis squatarola</i>	No(A)
Black-billed Magpie	<i>Pica pica</i>	Yes
Black-capped Chickadee	<i>Poecile atricapillus</i>	Yes
Black-chinned Hummingbird	<i>Archilochus alexandri</i>	Yes
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>	Yes
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	Yes
Black-necked Stilt	<i>Himantopus mexicanus</i>	Yes
Blackpoll Warbler	<i>Dendroica striata</i>	No(A)
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>	Yes
Black-throated Sparrow	<i>Amphispiza bilineata</i>	No(A)
Blue Grouse	<i>Dendragapus obscurus</i>	Yes
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>	Yes
Blue-winged Teal	<i>Anas discors</i>	No(A)
Bohemian Waxwing	<i>Bombycilla cedrorum</i>	No(A)
Bonaparte's Gull	<i>Larus philadelphia</i>	Yes
Brant	<i>Branta bernicla</i>	No(A)
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	Yes
Brewer's Sparrow	<i>Spizella breweri</i>	Yes
Broad-tailed Hummingbird	<i>Selasphorus platycercus</i>	Yes
Brown Creeper	<i>Certhia americana</i>	Yes
Brown-headed Cowbird	<i>Molothrus ater</i>	Yes
Bufflehead	<i>Bucephala albeola</i>	Yes
Bullock's Oriole	<i>Icterus bullockii</i>	Yes
Bushtit	<i>Psaltriparus minimus</i>	Yes
California Gull	<i>Larus californicus</i>	Yes

Common name	Scientific name	Current Status ¹
BIRDS (continued)		
California Quail*	<i>Callipepla californica</i>	Yes
California Towhee	<i>Pipilo crissalis</i>	Yes
Calliope Hummingbird	<i>Stellula calliope</i>	Yes
Canada Goose	<i>Branta canadensis</i>	Yes
Canvasback	<i>Aythya valisineria</i>	Yes
Canyon Wren	<i>Catherpes mexicanus</i>	No(E)
Caspian Tern	<i>Sterna caspia</i>	Yes
Cassin's Finch	<i>Carpodacus cassinii</i>	Yes
Cassin's Vireo	<i>Vireo cassinii</i>	Yes
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Yes
Chestnut-backed Chickadee	<i>Poecile rufescens</i>	No(A)
Chestnut-collared Longspur	<i>Calcarius ornatus</i>	No(A)
Chipping Sparrow	<i>Spizella passerina</i>	Yes
Chukar	<i>Alectoris chukar</i>	No(A)
Cinnamon Teal	<i>Anas cyanoptera</i>	Yes
Clark's Nutcracker	<i>Nucifraga columbiana</i>	Yes
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	Yes
Common Goldeneye	<i>Bucephala clangula</i>	Yes
Common Loon	<i>Gavia immer</i>	Yes
Common Merganser	<i>Mergus merganser</i>	Yes
Common Nighthawk	<i>Chordeiles minor</i>	Yes
Common Poorwill	<i>Phalaenoptilus nuttallii</i>	Yes
Common Raven	<i>Corvus corax</i>	Yes
Common Snipe	<i>Gallinago gallinago</i>	Yes
Common Tern	<i>Sterna hirundo</i>	Yes
Common Yellowthroat	<i>Geothlypis trichas</i>	Yes
Cooper's Hawk	<i>Accipiter cooperii</i>	Yes
Dark-eyed Junco	<i>Junco hyemalis</i>	Yes
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Yes
Downy Woodpecker	<i>Picoides pubescens</i>	Yes
Dunlin	<i>Erolia alpina</i>	Yes
Dusky Flycatcher	<i>Empidonax oberholseri</i>	Yes
Eared Grebe	<i>Podiceps nigricollis</i>	Yes
Eastern Kingbird	<i>Tyrannus tyrannus</i>	No(A)
Eurasian Wigeon	<i>Anas penelope</i>	No(A)
European Starling*	<i>Sturnus vulgaris</i>	Yes
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Yes
Ferruginous Hawk	<i>Buteo regalis</i>	No(A)
Flammulated Owl	<i>Otus flammeolus</i>	Yes
Forster's Tern	<i>Sterna forsteri</i>	Yes
Fox Sparrow	<i>Passerella iliaca</i>	Yes
Gadwall	<i>Anas strepera</i>	Yes
Glaucous Gull	<i>Larus hyperboreus</i>	No(A)
Glaucous-winged Gull	<i>Larus glaucescens</i>	No(A)
Golden Eagle	<i>Aquila chrysaetos</i>	Yes
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Yes
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	Yes
Gray Flycatcher	<i>Empidonax wrightii</i>	No(A)
Gray-crowned Rosy Finch	<i>Leucosticte tephrocotis</i>	Yes
Great Blue Heron	<i>Ardea herodias</i>	Yes
Great Egret	<i>Ardea alba</i>	Yes
Great Horned Owl	<i>Bubo virginianus</i>	Yes
Greater Scaup	<i>Aythya marila</i>	Yes

Common name	Scientific name	Current Status ¹
BIRDS (continued)		
Greater White-fronted Goose	<i>Anser albifrons</i>	Yes
Greater Yellowlegs	<i>Tringa melanoleuca</i>	Yes
Green Heron	<i>Butorides virescens</i>	Yes
Green-tailed Towhee	<i>Pipilo chlorurus</i>	Yes
Green-winged Teal	<i>Anas crecca</i>	Yes
Hairy Woodpecker	<i>Picoides villosus</i>	Yes
Hammond's Flycatcher	<i>Empidonax hammondii</i>	Yes
Harris's Sparrow	<i>Zonotrichia querula</i>	No(A)
Hermit Thrush	<i>Catharus guttatus</i>	Yes
Hermit Warbler	<i>Dendroica occidentalis</i>	Yes
Herring Gull	<i>Larus argentatus</i>	Yes
Hooded Merganser	<i>Lophodytes cucullatus</i>	Yes
Horned Grebe	<i>Podiceps auritus</i>	Yes
Horned Lark	<i>Eremophila alpestris</i>	Yes
House Finch	<i>Carpodacus mexicanus</i>	Yes
House Sparrow*	<i>Passer domesticus</i>	Yes
House Wren	<i>Troglodytes aedon</i>	Yes
Killdeer	<i>Charadrius vociferus</i>	Yes
Lapland Longspur	<i>Calcarius lapponicus</i>	No(A)
Lark Sparrow	<i>Chondestes grammacus</i>	Yes
Lazuli Bunting	<i>Passerina amoena</i>	Yes
Least Bittern	<i>Ixobrychus exilis</i>	Yes
Least Grebe	<i>Tachybaptus dominicus</i>	Yes
Least Sandpiper	<i>Calidris minutilla</i>	Yes
Lesser Goldfinch	<i>Carduelis psaltria</i>	Yes
Lesser Scaup	<i>Aythya affinis</i>	Yes
Lesser Yellowlegs	<i>Tringa flavipes</i>	No(A)
Lewis's Woodpecker	<i>Melanerpes lewis</i>	No(E)
Lincoln's Sparrow	<i>Melospiza lincolnii</i>	Yes
Loggerhead Shrike	<i>Lanius ludovicianus</i>	Yes
Long-billed Curlew	<i>Numenius americanus</i>	Yes
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	Yes
Long-eared Owl	<i>Asio otus</i>	Yes
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	Yes
Mallard	<i>Anas platyrhynchos</i>	Yes
Marbled Godwit	<i>Limosa fedoa</i>	Yes
Marsh Wren	<i>Cistothorus palustris</i>	Yes
Merlin	<i>Falco columbarius</i>	Yes
Mountain Bluebird	<i>Sialia currucoides</i>	Yes
Mountain Chickadee	<i>Poecile gambeli</i>	Yes
Mountain Quail	<i>Oreortyx pictus</i>	Yes
Mourning Dove	<i>Zenaida macroura</i>	Yes
Nashville Warbler	<i>Vermivora ruficapilla</i>	Yes
Northern Flicker	<i>Colaptes auratus</i>	Yes
Northern Goshawk	<i>Accipiter gentilis</i>	Yes
Northern Harrier	<i>Circus cyaneus</i>	Yes
Northern Mockingbird	<i>Mimus polyglottos</i>	Yes
Northern Pintail	<i>Anas acuta</i>	Yes
Northern Pygmy-owl	<i>Glaucidium gnoma</i>	Yes
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Yes
Northern Saw-whet Owl	<i>Aegolius acadicus</i>	Yes
Northern Shoveler	<i>Anas clypeata</i>	Yes
Northern Shrike	<i>Lanius excubitor</i>	Yes

Common name	Scientific name	Current Status ¹
BIRDS (continued)		
Oldsquaw	<i>Clangula hyemalis</i>	No(A)
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Yes
Orange-crowned Warbler	<i>Vermivora celata</i>	Yes
Osprey	<i>Pandion haliaetus</i>	Yes
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	Yes
Parasitic Jaeger	<i>Stercorarius parasiticus</i>	No(A)
Pectoral Sandpiper	<i>Calidris melanotos</i>	No(A)
Peregrine Falcon	<i>Falco peregrinus</i>	No(E)
Pied-billed Grebe	<i>Podilymbus podiceps</i>	Yes
Pileated Woodpecker	<i>Dryocopus pileatus</i>	Yes
Pine Grosbeak	<i>Pinicola enucleator</i>	Yes
Pine Siskin	<i>Carduelis pinus</i>	Yes
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>	Yes
Prairie Falcon	<i>Falco mexicanus</i>	Yes
Purple Finch	<i>Carpodacus purpureus</i>	Yes
Purple Martin	<i>Progne subis</i>	Yes
Pygmy Nuthatch	<i>Sitta pygmaea</i>	Yes
Red Crossbill	<i>Loxia curvirostra</i>	Yes
Red Knot	<i>Calidris canutus</i>	No(A)
Red-breasted Merganser	<i>Mergus serrator</i>	Yes
Red-breasted Nuthatch	<i>Sitta canadensis</i>	Yes
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	Yes
Redhead	<i>Aythya americana</i>	Yes
Red-necked Grebe	<i>Podiceps grisegena</i>	Yes
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Yes
Red-shouldered Hawk	<i>Buteo lineatus</i>	No(A)
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Yes
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Yes
Ring-billed Gull	<i>Larus delawarensis</i>	Yes
Ring-necked Duck	<i>Aythya collaris</i>	Yes
Rock Dove*	<i>Columba livia</i>	Yes
Rock Wren	<i>Salpinctes obsoletus</i>	Yes
Ross's Goose	<i>Chen rossii</i>	No(A)
Rough-legged Hawk	<i>Buteo lagopus</i>	Yes
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Yes
Ruddy Duck	<i>Oxyura jamaicensis</i>	Yes
Ruddy Turnstone	<i>Arenaria interpres</i>	No(A)
Rufous Hummingbird	<i>Selasphorus rufus</i>	Yes
Sabine's Gull	<i>Xema sabini</i>	No(A)
Sage Sparrow	<i>Amphispiza belli</i>	No(A)
Sanderling	<i>Calidris alba</i>	No(A)
Sandhill Crane	<i>Grus canadensis</i>	Yes
Savannah Sparrow	<i>Passerculus sandwichensis</i>	No(E)
Say's Phoebe	<i>Sayornis saya</i>	No(A)
Semipalmated Plover	<i>Charadrius semipalmatus</i>	Yes
Sharp-shinned Hawk	<i>Accipiter striatus</i>	Yes
Short-billed Dowitcher	<i>Limnodromus griseus</i>	No(A)
Snow Goose	<i>Chen caerulescens</i>	Yes
Snowy Egret	<i>Egretta thula</i>	Yes
Snowy Plover	<i>Charadrius alexandrinus</i>	No(A)
Song Sparrow	<i>Melospiza melodia</i>	Yes
Sora	<i>Porzana carolina</i>	Yes
Spotted Owl	<i>Strix occidentalis</i>	Yes

Common name	Scientific name	Current Status ¹
BIRDS (continued)		
Spotted Sandpiper	<i>Actitis macularia</i>	Yes
Spotted Towhee	<i>Pipilo maculatus</i>	Yes
Steller's Jay	<i>Cyanocitta stelleri</i>	Yes
Surf Scoter	<i>Melanitta perspicillata</i>	No(A)
Swainson's Hawk	<i>Buteo swainsoni</i>	No(A)
Swainson's Thrush	<i>Catharus ustulatus</i>	Yes
Swamp Sparrow	<i>Melospiza georgiana</i>	No(A)
Thayer's Gull	<i>Larus thayeri</i>	Yes
Three-toed Woodpecker	<i>Picoides tridactylus</i>	No(A)
Townsend's Solitaire	<i>Myadestes townsendi</i>	Yes
Townsend's Warbler	<i>Dendroica townsendi</i>	Yes
Tree Swallow	<i>Tachycineta bicolor</i>	Yes
Tricolored Blackbird	<i>Agelaius tricolor</i>	Yes
Tundra Swan	<i>Cygnus columbianus</i>	Yes
Turkey Vulture	<i>Cathartes aura</i>	Yes
Varied Thrush	<i>Ixoreus naevius</i>	Yes
Vaux's Swift	<i>Chaetura vauxi</i>	Yes
Vesper Sparrow	<i>Pooecetes gramineus</i>	Yes
Violet-green Swallow	<i>Tachycineta thalassina</i>	Yes
Virginia Rail	<i>Rallus limicola</i>	Yes
Warbling Vireo	<i>Vireo gilvus</i>	Yes
Western Bluebird	<i>Sialia mexicana</i>	Yes
Western Kingbird	<i>Tyrannus verticalis</i>	Yes
Western Meadowlark	<i>Sturnella neglecta</i>	Yes
Western Sandpiper	<i>Ereunetes mauri</i>	Yes
Western Screech-owl	<i>Otus kennicottii</i>	Yes
Western Scrub Jay	<i>Aphelocoma californica</i>	Yes
Western Tanager	<i>Piranga ludoviciana</i>	Yes
Western Wood-pewee	<i>Contopus sordidulus</i>	Yes
Western/Clark's Grebe	<i>Aechmophorus occidentalis/clarkii</i>	Yes
Whimbrel	<i>Numenius phaeopus</i>	No(A)
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Yes
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	Yes
White-faced Ibis	<i>Plegadis chihi</i>	No(A)
White-headed Woodpecker	<i>Picoides albolarvatus</i>	Yes
White-throated Sparrow	<i>Zonotrichia albicollis</i>	Yes
White-throated Swift	<i>Aeronautes saxatalis</i>	Yes
White-winged Scoter	<i>Melanitta deglandi</i>	No(A)
Wild Turkey*	<i>Meleagris gallopavo</i>	Yes
Willet	<i>Catoptrophorus semipalmatus</i>	Yes
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>	Yes
Willow Flycatcher	<i>Empidonax traillii</i>	Yes
Wilson's Phalarope	<i>Phalaropus tricolor</i>	Yes
Wilson's Warbler	<i>Wilsonia pusilla</i>	Yes
Winter Wren	<i>Troglodytes troglodytes</i>	Yes
Wood Duck	<i>Aix sponsa</i>	Yes
Yellow Warbler	<i>Dendroica petechia</i>	Yes
Yellow-billed Loon	<i>Gavia adamsii</i>	Yes
Yellow-billed Magpie	<i>Pica nuttalli</i>	Yes
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	Yes
Yellow-rumped Warbler	<i>Dendroica coronata</i>	Yes

Common name	Scientific name	Current Status ¹
MAMMALS		
Allen's chipmunk	<i>Tamias senex</i>	Yes
Badger	<i>Taxidea taxus</i>	Yes
Beaver*	<i>Castor canadensis</i>	Yes
Belding's ground squirrel	<i>Spermophilus beldingi</i>	Yes
Big brown bat	<i>Eptesicus fuscus</i>	Yes
Black bear	<i>Ursus americanus</i>	Yes
Black-tailed hare	<i>Lepus californicus</i>	Yes
Bobcat	<i>Felis rufus</i>	Yes
Brazilian free-tailed bat	<i>Tadarida brasiliensis</i>	Yes
Broad-footed mole	<i>Scapanus latimanus</i>	Yes
Brush mouse	<i>Peromyscus boylii</i>	Yes
Bushy-tailed woodrat	<i>Neotoma cinerea</i>	Yes
California ground squirrel	<i>Spermophilus beecheyi</i>	Yes
California myotis	<i>Myotis californicus</i>	Yes
Canyon mouse	<i>Peromyscus crinitus</i>	No(E)
Coyote	<i>Canis latrans</i>	Yes
Deer mouse	<i>Peromyscus maniculatus</i>	Yes
Desert woodrat	<i>Neotoma lepida</i>	Yes
Douglas' squirrel	<i>Tamiasciurus douglasii</i>	Yes
Dusky shrew	<i>Sorex monticolus</i>	Yes
Ermine	<i>Mustela erminea</i>	Yes
Fisher	<i>Martes pennanti</i>	Yes
Fringed myotis	<i>Myotis thysanodes</i>	Yes
Golden-mantled ground squirrel	<i>Spermophilus lateralis</i>	Yes
Grizzly bear	<i>Ursus arctos</i>	No(E)
Heather vole	<i>Phenacomys intermedius</i>	No(E)
Least chipmunk	<i>Tamias minimus</i>	Yes
Little brown myotis	<i>Myotis lucifugus</i>	Yes
Lodgepole chipmunk	<i>Tamias speciosus</i>	Yes
Long-eared chipmunk	<i>Tamias quadrimaculatus</i>	Yes
Long-eared myotis	<i>Myotis evotis</i>	Yes
Long-tailed vole	<i>Microtus longicaudus</i>	Yes
Long-tailed weasel	<i>Mustela frenata</i>	Yes
Marten	<i>Martes americana</i>	Yes
Mink	<i>Mustela vison</i>	Yes
Montane vole	<i>Microtus montanus</i>	Yes
Mountain beaver	<i>Aplodontia rufa</i>	Yes
Mountain lion	<i>Felis concolor</i>	Yes
Mountain pocket gopher	<i>Thomomys monticola</i>	Yes
Mountain sheep	<i>Ovis canadensis californiana</i>	No(E)
Mule deer	<i>Odocoileus hemionus</i>	Yes
Muskrat	<i>Ondatra zibethicus</i>	Yes
Northern flying squirrel	<i>Glaucomys sabrinus</i>	Yes
Nuttall's cottontail	<i>Sylvilagus nuttallii</i>	Yes
Pallid bat	<i>Antrozous pallidus</i>	Yes
Pika	<i>Ochotona princeps</i>	Yes
Pinyon mouse	<i>Peromyscus truei</i>	Yes
Porcupine	<i>Erethizon dorsatum</i>	Yes
Raccoon	<i>Procyon lotor</i>	Yes
River otter	<i>Lutra canadensis</i>	Yes
Sierra Nevada red fox	<i>Vulpes vulpes necator</i>	No(E)
Sierra Nevada snowshoe hare	<i>Lepus americanus tahoensis</i>	Yes

Common name	Scientific name	Current Status ¹
MAMMALS (continued)		
Silver-haired bat	<i>Lasionycteris noctivagans</i>	Yes
Striped skunk	<i>Mephitis mephitis</i>	Yes
Trowbridge's shrew	<i>Sorex trowbridgii</i>	Yes
Vagrant shrew	<i>Sorex vagrans</i>	Yes
Water shrew	<i>Sorex palustris</i>	Yes
Western gray squirrel	<i>Sciurus griseus</i>	Yes
Western jumping mouse	<i>Zapus princeps</i>	Yes
Western pipstrelle	<i>Pipistrellus hesperus</i>	Yes
Western spotted skunk	<i>Spilogale gracilis</i>	Yes
White-tailed hare	<i>Lepus townsendii</i>	No(E)
Wolverine	<i>Gulo gulo</i>	No(E)
Yellow-bellied marmot	<i>Marmota flaviventris</i>	Yes
Yellow-pine chipmunk	<i>Tamias amoenus</i>	Yes
Yuma myotis	<i>Myotis yumanensis</i>	Yes
AMPHIBIANS		
Bullfrog*	<i>Rana catesbeiana</i>	Yes
Long-toed salamander	<i>Ambystoma macrodactylum</i>	Yes
Mountain yellow-legged frog	<i>Rana muscosa</i>	Yes
Northern leopard frog [#]	<i>Rana pipiens</i>	No(E)
Pacific treefrog	<i>Hyla regilla</i>	Yes
Western toad	<i>Bufo boreas</i>	Yes
REPTILES		
Common garter snake	<i>Thamnophis sirtalis</i>	Yes
Northern alligator lizard	<i>Elgaria coerulea</i>	Yes
Rubber boa	<i>Charina bottae</i>	Yes
Sagebrush lizard	<i>Sceloporus graciosus</i>	Yes
Southern alligator lizard	<i>Elgaria multicarinata</i>	Yes
Western aquatic garter snake	<i>Thamnophis couchii</i>	Yes
Western fence lizard	<i>Sceloporus occidentalis</i>	Yes
Western terrestrial garter snake	<i>Thamnophis elegans</i>	Yes

Source: USDA 2000

* = Exotic species

= Possible exotic species

Notes:

¹ Yes = determined to occur in the basin currently;

No(A) = accidental according to Lake Tahoe basin bird species pamphlet (Eastern Sierra Interpretive Association ca. 1993);

No(E) = presumed to be extirpated from the basin based on a lack of sightings in the last 30 years.

Compiled by Matthew D. Schlesinger and J. Shane Romsos for the *Lake Tahoe Watershed Assessment* (Murphy, D. D., and C. M. Knopp, eds. 2000. Lake Tahoe Watershed Assessment. General Technical Report PSW-GTR-176, USDA Forest Service, Pacific Southwest Region, Albany, California). An explanation of this table and full references appear in that document.

Appendix 2. Species by habitat association recorded at different wetland locations in the Lake Tahoe basin June through November 1999.

Species	Baldwin Marsh	Blackwood Canyon	North Fallen Leaf Lake	Lake Baron	Lily Lake	Lake Christopher	Lower Echo Lake	Marlette Lake	McKinney Lake	Grass Lake ^a	Spooner Lake	Osgood Swamp	Pope Marsh	Rabe Meadow	Taylor Creek Marsh	Truckee Marsh	Upper Echo Lake	Location Total
Habitat Association - Aquatic																		
Mallard	X	X		X	X	X		X	X	X	X	X	X	X	X	X	X	16
Ring-necked Duck	X		X		X				X		X	X	X		X	X		9
American Coot				X						X	X	X	X		X	X		8
Canada Goose	X		X					X			X		X	X	X	X		8
Common Merganser	X		X				X	X			X			X	X	X		8
California Gull ^(sc)	X			X							X		X		X	X		6
Osprey ^(sc)				X					X		X		X		X	X		6
Bufflehead									X			X		X	X	X		5
Cinnamon Teal						X				X			X		X	X		5
Forster's Tern	X												X		X	X		4
Spotted Sand Piper						X				X						X		4
American Wigeon				X							X	X						3
Bald Eagle ^(sc)								X			X				X			3
Pied-billed Grebe				X							X	X						3
Great Blue Heron													X		X			2
Killdeer														X		X		2
Canvasback											X							1
Common Goldeneye												X						1
Gadwall															X			1
Green-winged Teal											X							1
Norhtern Pintail											X							1
Redhead											X							1
Ring-billed Gull															X			1
Ruddy Duck											X							1
Sora										X								1
Western Grebe											X							1
Aquatic Total	6	1	3	6	2	3	1	4	4	5	16	7	9	5	14	12	1	102

^(sc) Species of Concern listed by TRPA, USFWS, USFS, or CDFG.

Appendix 2. Species by habitat association recorded at different wetland locations in the Lake Tahoe basin June through November 1999.

Species	Baldwin Marsh	Blackwood Canyon	North Fallen Leaf Lake	Lake Baron	Lily Lake	Lake Christopher	Lower Echo Lake	Marlette Lake	McKinney Lake	Grass Lake ^a	Spooner Lake	Osgood Swamp	Pope Marsh	Rabe Meadow	Taylor Creek Marsh	Truckee Marsh	Upper Echo Lake	Location Total
Habitat Association - Riparian / Meadow																		
Redwing Blackbird	X		X	X	X	X			X	X	X	X	X	X	X	X	X	15
Song Sparrow	X	X	X	X	X	X		X		X	X	X	X			X		12
Brewer's Blackbird	X	X								X	X		X	X	X	X		9
Barn Swallow	X	X												X		X		4
Wilson's Warbler		X								X	X			X				4
Western Kingbird										X				X		X		3
Bank Swallow ^(sc)							X			X								2
Belted Kingfisher									X							X		2
Cliff Swallow														X	X			2
Tree Swallow				X		X												2
Willow Flycatcher	X													X				2
Yellow-headed Blackbird													X			X		2
Yellow-rumped Warbler										X						X		2
Brown-headed Cowbird						X												1
Common Snipe															X			1
Downy Woodpecker								X										1
Lincoln's Sparrow														X				1
Northern Harrier ^(sc)																X		1
Red-winged Blackbird																X		1
Savannah Sparrow				X														1
Riparian/Meadow Total	5	4	2	4	2	4	1	2	2	7	4	2	4	8	4	11	1	69

^(sc) Species of Concern listed by TRPA, USFWS, USFS, or CDFG.

Appendix 2. Species by habitat association recorded at different wetland locations in the Lake Tahoe basin June through November 1999.

Species	Baldwin Marsh	Blackwood Canyon	North Fallen Leaf Lake	Lake Baron	Lily Lake	Lake Christopher	Lower Echo Lake	Marlette Lake	McKinney Lake	Grass Lake ^a	Spooner Lake	Osgood Swamp	Pope Marsh	Rabe Meadow	Taylor Creek Marsh	Truckee Marsh	Upper Echo Lake	Location Total
Habitat Association - Upland																		
American Robin	X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	16
Mountain Chickadee	X	X	X	X	X		X	X	X	X	X	X		X	X		X	15
Stellar's Jay		X	X	X	X	X	X	X	X	X		X	X		X		X	14
Dark-eyed Junco		X	X	X		X	X		X	X	X		X	X				11
Red-breasted Nuthatch			X		X			X	X	X	X	X		X	X			9
Western Wood Peewee		X		X		X			X	X	X	X						8
Mourning Dove	X		X			X					X	X	X	X				7
Olive-sided Flycatcher	X	X				X				X								4
Common Raven					X						X	X				X		4
Turkey Vulture								X		X	X		X					4
Blue Grouse		X					X		X									3
Clark's Nutcracker				X				X		X								3
Northern Flicker						X								X	X			3
Western Tanager								X			X						X	3
Red-tailed Hawk		X							X									2
Cassin's Finch										X								1
Common Nighthawk						X												1
Downy Woodpecker												X						1
Lesser Goldfinch																		1
Loggerhead Shrike				X														1
Morning Dove																X		1
Pine Grosbeak								X										1
Ruby-crowned Kinglet										X								1
Western Bluebird				X														1
White-crowned Sparrow												X						1
Upland Total	4	8	6	7	5	8	4	8	9	11	9	9	5	6	6	2	4	116
All Habitat Assocs. Total	15	13	11	17	9	15	6	14	15	23	29	18	18	19	24	25	6	277

^a Survey data for north and south Grass Lake were combined

Appendix 3. Species by habitat association recorded at different wetland locations in the Lake Tahoe basin, June through November 2000.

Common Name	Baldwin Marsh	Blackwood Canyon	Bliss Pond	Edgewood Golf	North Fallen Leaf	Grass Lake	Lake Baron	Lake Christophe	Lower Echo Lake	Lily Lake	Marlette Lake	McKinney Lake	Meeks Meadow	Osgood Swamp	Pope Marsh	Rabe Meadow	Spooner Lake	Taylor Creek	Truckee Marsh	Upper Echo Lake	Location Total
Aquatic Associated Species																					
Mallard	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X	X	X	X	18
Spotted Sandpiper		X				X	X	X		X	X	X					X	X		X	10
Canada Goose	X			X							X			X	X		X	X	X	X	9
Pied-billed Grebe	X				X	X	X							X	X		X	X	X		9
Common Merganser		X			X				X		X						X	X	X	X	8
American Coot				X		X	X								X		X	X	X		7
Belted Kingfisher	X						X						X		X		X	X	X		7
Killdeer		X		X			X	X									X	X	X		7
Osprey	X				X						X				X		X	X	X		7
Ring-necked Duck	X			X						X				X	X		X		X		7
Forster's Tern	X			X											X			X	X		5
American Wigeon	X						X											X	X		4
Greater White-fronted Goose												X			X		X		X		4
Wood Duck	X													X	X	X					4
Bald Eagle											X				X			X			3
Bufflehead										X							X		X		3
Double-crested Cormorant									X						X		X				3
Gadwall															X			X	X		3
Green-winged Teal								X										X	X		3
Ruddy Duck															X		X	X			3
Northern Pintail															X				X		2
American Dipper													X								1
Canvasback																	X				1
Clark's Grebe																	X				1
Common Loon																	X				1
Eared Grebe					X																1
Horned Grebe																	X				1
Northern Shoveler																			X		1
Ring-billed Gull															X						1
Sora						X															1
Western Grebe																	X				1
Aquatic Species Total	9	4	1	6	5	5	6	4	3	4	5	4	2	5	16	2	19	15	17	4	

Appendix 3. Species by habitat association recorded at different wetland locations in the Lake Tahoe basin, June through November 2000.

Common Name	Baldwin Marsh	Blackwood Canyon	Bliss Pond	Edgewood Golf	North Fallen Leaf Grass Lake	Lake Baron	Lake Christophe Lower Echo Lake Lily Lake	Marlette Lake	McKinney Lake	Meeks Meadow Swamp	Osgood Swamp	Pope Marsh	Rabe Meadow	Spooner Lake	Taylor Creek	Truckee Marsh	Upper Echo Lake Location	Total
Riparian/Meadow Associated Species																		
Red-winged Blackbird	X		X	X		X	X	X		X	X	X	X	X	X	X		16
Song Sparrow	X	X	X			X	X	X	X	X		X	X	X	X	X		16
Wilson's Warbler	X	X	X		X	X	X	X	X		X	X				X	X	15
Brown-headed Cowbird	X	X	X	X	X		X	X		X	X		X	X	X	X		14
Barn Swallow	X	X		X		X	X		X		X	X	X	X	X	X		13
Brewer's Blackbird	X			X		X	X	X			X	X	X	X	X	X		11
Cliff Swallow	X			X		X	X			X	X	X	X	X		X		11
Downy Woodpecker			X			X			X		X	X	X		X			8
Tree Swallow	X					X			X		X			X	X	X		8
Common Snipe	X				X					X			X		X			5
Great Blue Heron	X											X		X	X	X		5
Western Meadowlark		X										X		X	X	X		5
Yellow Warbler					X	X				X		X				X		5
California Gull	X							X							X	X		4
MacGillivray's Warbler		X	X							X	X							4
White-crowned Sparrow		X						X				X				X		4
Nashville Warbler						X		X	X									3
Yellow-headed Blackbird												X	X			X		3
Black-billed Magpie												X				X		2
Chipping Sparrow		X				X												2
Hammond's Flycatcher		X						X										2
Northern Harrier	X															X		2
Northern Rough-winged Swallow				X									X					2
Savannah Sparrow		X			X													2
Violet-green Swallow												X		X				2
Black-crowned Night Heron															X			1
Canyon Wren							X											1
Cedar Waxwing						X												1
Horned Lark										X								1
House Wren										X								1
Lazuli Bunting		X																1
Long-billed Dowitcher																X		1
Marsh Wren												X						1

Appendix 3. Species by habitat association recorded at different wetland locations in the Lake Tahoe basin, June through November 2000.

Common Name	Baldwin Marsh	Blackwood Canyon	Bliss Pond	Edgewood Golf	North Fallen Leaf Grass Lake	Lake Baron	Lake Christophe Lower Echo Lake Lily Lake	Marlette Lake	McKinney Lake	Meeks Meadow	Osgood Swamp	Pope Marsh	Rabe Meadow	Spooner Lake	Taylor Creek	Truckee Marsh	Upper Echo Lake	Location Total		
Riparian/Meadow Associated Species (continued)																				
Rock Wren									X										1	
Tricolored Blackbird													X						1	
Western Sandpiper																X			1	
Riparian/Meadow Species Total	12	12	6	6	3	9	10	7	5	7	7	7	11	7	16	11	11	13	19	1
Upland Associated Species																				
Mountain Chickadee	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20
Steller's Jay	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	20
American Robin	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	19
Northern Flicker	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	18
Western Wood-pewee	X	X	X			X	X	X	X	X	X	X	X	X	X	X		X	X	17
Dark-eyed Junco	X	X	X		X	X	X	X	X	X	X	X	X		X			X	X	16
Yellow-rumped Warbler	X	X	X			X	X	X	X	X	X	X	X		X	X	X	X	X	15
Western Tanager		X		X	X		X	X	X	X	X	X			X	X			X	13
Common Raven	X	X	X		X	X		X	X	X			X		X	X	X	X	X	12
Red-breasted Nuthatch		X		X	X	X		X	X	X		X			X	X		X	X	12
Warbling Vireo		X	X		X		X		X	X	X	X		X	X	X		X	X	12
White-breasted Nuthatch		X	X		X	X		X	X	X	X	X		X	X		X	X	X	12
Mourning Dove	X			X	X		X	X			X		X	X	X	X	X	X	X	11
Brown Creeper			X			X				X	X		X	X	X		X		X	9
Red-tailed Hawk		X	X		X	X			X	X	X				X	X				9
Hairy Woodpecker		X	X	X	X				X			X	X						X	8
Olive-sided Flycatcher								X		X	X	X					X		X	7
European Starling	X			X				X				X		X				X		6
Pine Siskin	X	X	X			X				X	X									6
Pygmy Nuthatch			X	X				X		X		X				X				6
Turkey Vulture	X		X										X		X	X	X			6
Clark's Nutcracker					X			X	X		X							X		5

Appendix 3. Species by habitat association recorded at different wetland locations in the Lake Tahoe basin, June through November 2000.

Common Name	Baldwin Marsh	Blackwood Canyon	Bliss Pond	Edgewood Golf	North Fallen Leaf Grass Lake	Lake Baron	Lake Christophe	Lower Echo Lake	Lily Lake	Marlette Lake	McKinney Lake	Meeks Meadow	Osgood Swamp	Pope Marsh	Rabe Meadow	Spooner Lake	Taylor Creek	Truckee Marsh	Upper Echo Lake	Location Total
Fox Sparrow								X	X	X	X		X							5
Mountain Quail		X						X			X		X						X	5
Band-tailed Pigeon					X	X				X									X	4
Black-headed Grosbeak						X	X							X			X			4
Blue Grouse		X	X					X	X											4
Cooper's Hawk									X					X	X			X		4
Ruby-crowned Kinglet		X			X				X			X								4
Townsend's Solitaire			X		X	X				X										4
Cassin's (Solitary) Vireo			X			X						X								3
Hermit Thrush		X								X		X								3
Cassin's Finch									X	X										2
Rock Dove							X											X		2
Sharp-shinned Hawk							X											X		2
Spotted Towhee		X										X								2
White-headed Woodpecker					X								X							2
Black-backed Woodpecker			X																	1
Calliope Hummingbird												X								1
Evening Grosbeak									X											1
Golden Eagle								X												1
Golden-crowned Kinglet					X															1
Lesser Goldfinch														X						1
Pine Grosbeak									X											1
Pinyon Jay																		X		1
Purple Finch														X						1
Red-breasted Sapsucker			X																	1
Three-toed Woodpecker										X										1
Williamson's Sapsucker																			X	1
Upland Species Total	12	20	21	11	16	16	14	17	18	24	22	14	20	15	15	9	15	18	12	18
All Species Total	33	36	28	23	24	30	30	28	26	35	34	25	33	27	47	22	45	46	48	23

Appendix 4. Wetland site descriptions that include human disturbance rating (refer to Table 7-1), type of wetland, distinguishing characteristics, and human influences, June through August 1999 and 2000 in the Lake Tahoe Basin.

Site	Disturbance Ranking ^a	Description
Baldwin Marsh	2	Fresh Emergent Wetland. A parking lot and access road occurs to the east of the marsh that bisects this marsh from Taylor Creek Marsh. The parking lot serves moderate to high level of beach-goers at Baldwin Beach during summer months. The interface of the marsh and beach is fenced and probably serves to reduce human access into the marsh. Horses and mules (~ 50 head) graze interior marsh during summer months and likely impact ground nesting species. However, this site may provide moderate habitat quality for resting and feeding behaviors. Removal of parking lot and restoration of wetland would significantly benefit the Baldwin/Taylor Creek marsh complex. Weixelman and Fites (1999) describe the wetland as fully functioning (i.e., healthy).
Blackwood Canyon	3	<u>Wet Meadow</u> . The wet meadow site itself looks as if earth-moving tractors previously and significantly disturbed it. Road into canyon is highly used by biker, inline skaters, walkers, dogs, cars, and motorcycles. There is evidence of light trail use through meadow to Blackwood Creek. A gun firing range is in close proximity to wetland as evidence of frequent gunfire noise. Weixelman and Fites (1999) describe meadows along Blackwood Creek as fully functioning (i.e., healthy). However, high levels of human activity likely reduce habitat quality for waterfowl nesting, resting, and feeding behaviors.
North Fallen Leaf Lake	3	<u>Lacustrine with fresh emergent wetland characteristics near shallow shoreline at dam outlet</u> . Vegetation at the lake interface is a mixture of deciduous (e.g., aspen) and coniferous (mostly late seral Jeffrey pine) tree species. A trail system occurs throughout north shore of lake that accommodates a high level of human traffic (e.g., bikes, horses, dogs, children, and hikers), especially on weekends during summer months. Motorized and non-motorized boat use is common on lake however was not observed in shallower wetland area.
Grass Lake	1	<u>Wet Meadow (bog)</u> . This meadow is bordered on one side by Hwy 89 (which emits continuous and predictable road noise) and is setback from wetland perimeter. The meadow is dominated with late seral grasses and forbs with intermittent patches of willow (<i>Salix spp.</i>) occurring throughout its interior and bordering the interface between the wetland and coniferous forest upland. No noticeable trail networks occur through the meadow itself or are other types of human activities obvious during summer months. Habitat quality for nesting, resting, and feeding waterfowl is likely high due to minimal human access.
Lake Baron	4	<u>Lacustrine (man made)</u> . Trail and road adjacent to a large majority of the shoreline. Loud activity from children playing on rafts and bikes common during daytime hours of summer. Other activities include sunbathing and beach play on shores, dog walking, and a water-ski slalom course in center of lake (used daily during summer months). Vegetation around the perimeter of the lake is a mix of deciduous and conifer species. Habitat quality during summer months for nesting, resting, and feeding waterfowl is likely low due to excessive human activity.

Appendix 4. Wetland site descriptions that include human disturbance rating (refer to Table 7-1), type of wetland, distinguishing characteristics, and human influences, June through August 1999 and 2000 in the Lake Tahoe Basin.

Site	Disturbance Ranking ^a	Description
Lake Christopher	2	<u>Wet Meadow</u> . Cold Creek meanders through this wet meadow with one small (~ 30m ²) open water body intercepting the creek. Residential development is predominant on the upland north and south perimeter of the meadow. Tall (≤ 1m) grasses and forbs dominate the interior of the meadow with intermitted outcrops of riparian shrubs and live and dead lodgepole pine trees. Some evidence of low human activity is present although the area is posted closed during summer. Habitat quality for nesting, resting, and feeding waterfowl is likely high due to low to minimal human access. The site's habitat has been significantly modified since inception of TRPA Regional Plan. Converted from an open water, lacustrine to wet meadow/riparian.
Lily Lake	1	<u>Lacustrine (shallow)</u> . Dirt road passes along one side of the lake with moderate OHV and hiking use. The other side of the lake is nearly devoid of human activity. The lake's surface is nearly completely covered with water lily and forbs, and late-seral conifers occupy the perimeter. Site likely provides high quality waterfowl habitat for nesting, resting, and feeding behaviors. Weixelman and Fites (1999) describe the wetland as fully functioning (i.e., healthy).
Lower Echo Lake	2	<u>Lacustrine</u> . The west end of the lake is populated with cabins and moderate levels of human activity. Small, motorized boats frequently observed cruising on the lake. The shore is granite with virtually no vegetation. Habitat quality for ground nesting waterfowl likely low due to the lack of herbaceous vegetation along shoreline. However, the large size of the lake and moderate level of boating probably provide moderate to high quality habitat for resting and feeding waterfowl.
Marlette Lake	2	<u>Lacustrine</u> . Lake with trail on ~0.4 miles of shore. Moderate use by hikers and bikes. No boat use on lake itself. Some fishing and swimming was observed. Vegetation around the perimeter is dominated with deciduous and coniferous trees and shrubs. Habitat quality for waterfowl for nesting, resting, and feeding is likely high due the lake's large size and confined human access.
McKinney Lake	1	<u>Lacustrine (shallow)</u> . Rough dirt road passing one side of the lake with moderate OHV use. Lake is ~70m below dirt road and no trails observed from road down to lake. Similar to Lily Lake, approximately 70% of the water surface is covered with water lily and forbs, and late-seral conifer trees dominate the perimeter. Habitat quality for waterfowl for nesting, resting, and feeding is likely high due limited human access.
Osgood Swamp	1	<u>Lacustrine (shallow, bog)</u> . Water body surrounded with riparian association shrubs and trees, and intermittent stands of dead standing timber distributed throughout wetland center. Beaver activity is evident along perimeter within open water. A gated dirt road surrounds the swamp however is set back and not noticeable from wetland. Area appears conducive for providing high quality nesting (especially for cavity nesting waterfowl), resting, and feeding habitat.

Appendix 4. Wetland site descriptions that include human disturbance rating (refer to Table 7-1), type of wetland, distinguishing characteristics, and human influences, June through August 1999 and 2000 in the Lake Tahoe Basin.

Site	Disturbance Ranking ^a	Description
Pope Marsh	2	<p><u>Fresh Emergent Wetland.</u> Paved access and parking for public beach borders north and west perimeter, a setback bike trail occurs along south perimeter and Tahoe Keys housing development along the east perimeter. A narrow band of willows borders the public access road along the south and west perimeters while conifer trees interface the wetland to the south. Intermittent patches of willow occur along the east perimeter and do little to obscure the Tahoe Keys development. A predominant stand of live and mostly dead lodgepole pine occurs in the interior of the wetland. No observed human activity in the wetland interior probably due to water inundation. Because of its large size, this wetland is suspected to provide high quality habitat for waterfowl nesting, resting, and feeding behaviors. Weixelman and Fites (1999) describe the wetland as fully functioning (i.e., healthy).</p>
Rabe Meadow	3	<p><u>Wet Meadow with an open water body.</u> Weixelman and Fites (1999) describe this area as a complex of three meadow types (ecological conditions); Willow-graminoid (functioning but at risk), Moist meadow (fully functioning), Wet meadow-Nebraska sedge (nonfunctioning). Area highly bisected with hiking trails - hikers, unleashed dogs, and bikes common. A major highway occurs along the east perimeter of the meadow and multi-family residential housing occurs along the south perimeter. High human use of this area reduces habitat quality of this area for nesting waterfowl to low; however, appears to provide moderate quality habitat for feeding and resting behaviors for species habituated to human activities.</p>
Spooner Lake	2	<p><u>Lacustrine.</u> Grass, forbs, riparian shrubs and coniferous trees occur along the periphery of the wetland. A trail occurs around the lake and accommodates moderate hiking traffic. Fishing is common along shoreline only. Motorized and non-motorized boating not observed at this wetland. Vehicle noise permeates wetland from Hwy 50. Because of the lake's relatively large size, habitat quality for resting and feeding behaviors for waterfowl appears to be high. However, human activity along perimeter of open water, likely makes habitat quality for waterfowl nesting low.</p>
Taylor Creek Marsh	3	<p><u>Fresh Emergent Wetland.</u> A highly used trail along the eastern perimeter of the marsh to Lake Tahoe shoreline at Kiva Beach, starts at USFS visitor center. Numerous walkers (often with dogs) and sunbathers congregate on beach that interfaces with the marsh. Kayakers occasionally observed rowing into the interior of the marsh. Human activity levels are high throughout summer months leading to perpetual reduction of habitat quality for nesting waterfowl. However, because of lake's large size and apparent abundant availability of necessary habitat elements for feeding and resting, probably provides high quality habitat for these behaviors.</p>

Appendix 4. Wetland site descriptions that include human disturbance rating (refer to Table 7-1), type of wetland, distinguishing characteristics, and human influences, June through August 1999 and 2000 in the Lake Tahoe Basin.

Site	Disturbance Ranking ^a	Description
Truckee Marsh	2	<u>Fresh Emergent Wetland</u> . This is a large wetland dominated by standing water and islands with herbaceous plant growth. Mature willow stands are distributed intermittently throughout wetland, especially along Truckee River channel. A dirt landfill occurs on west perimeter where a highly used trail (used by walkers, often accompanied with unleashed dogs and cyclist) is established. The east perimeter is developed for residential housing in which late-seral aged conifers exist in interstitial openings. Kayakers were observed rowing in the interior of the marsh area. Due to the large size of this wetland, habitat quality for nesting, resting and feeding is likely high.
Upper Echo Lake	2	<u>Lacustrine</u> . The lake is dotted with small islands that support vegetation (mostly lodgepole pine). The perimeter of the lake is mostly granite with conifer tree irregularly distributed. Small pockets of grasses and forbs can be found intermittently around lake. Motorized boat traffic to cabins is condensed and heavy through channel between Upper and Lower lakes. Due to its high elevation, lake remains from well into June probably resulting in reduce suitability for nesting waterfowl. However, after thaw, lake likely provides opportunities for resting and feeding waterfowl.
Meeks Meadow	1	<u>Wet Meadow</u> . Mostly saturated soils through meadow complex. Lodgepole pine and mature riparian shrubs are distributed sufficiently across the extent of the meadow area. One trail occurs on the northern perimeter and is used to access Desolation Wilderness. Area appears conducive for providing high quality nesting, resting, and feeding habitat for riparian/meadow associated bird species.
Bliss Pond	2	<u>Lacustrine (shallow)</u> . Small water body surrounded with dense riparian associated shrubs and trees. Western boundary is heavily impacted due to State Route 28. However, area appears conducive for providing high quality nesting, resting, and feeding habitat for all bird habitat associations.
Edgewood Golf Course	4	<u>Lacustrine (man modified)</u> . Complex of 5 to 6 small lakes, centered on a golf course. Virtually no riparian vegetation surrounding lakes except for manicured grass. In the shallow margins of the lakes is a nylon mesh used to hold sod together that potentially entangles diving waterfowl and fish. Human activity is chronic. Poor potential to provide nesting habitat for rare waterfowl species, however nesting may be reasonable for common species habituated to human activity.

^aRefers to Table 7-1.

Chapter 8

SCENIC RESOURCES AND COMMUNITY DESIGN

I. INTRODUCTION

The visual landscape of the Tahoe Region presents one of its most impressive qualities. It contains the unusual combination of rugged mountain peaks, the vast, flat lake surface, and thickly forested slopes. This combination of landscape elements makes it one of the truly unique places in the world.

Despite significant development and alteration of the landscape for over a century, the Tahoe Region continues to attract visitors due to its powerful and stunning inherent landscape character, which successfully maintains visual dominance over most of the area. It is the natural features of views offered from the region's scenic corridors and recreation areas and bike trails that the framers of the TRPA Compact intended to preserve when they declared, "Maintenance of the social and economic health of the region depends on maintaining the significant scenic ... values provided by the Lake Tahoe Basin." (TRPA Compact, Public Law 96-551-Dec. 19, 1980, Article I)

BACKGROUND

The TRPA Compact provided for the development and implementation of environmental carrying capacities or thresholds. In 1982, TRPA completed inventory work necessary to define and establish threshold standards for preservation of scenic quality. Numerical standards were established at that time for roadway and shoreline travel route ratings and roadway and shoreline scenic quality ratings. Additionally, TRPA adopted a management standard policy statement for overall community design elements. In 1993, TRPA adopted numeric standards for designated public recreation areas and bike trails.

INDICATORS

SR-1, Travel Route Rating

The travel route rating threshold tracks long-term, cumulative changes to views seen from major roadways in urban, transitional, and natural landscapes in the region and to the views seen from Lake Tahoe looking toward the shore. To secure threshold attainment, all travel routes with a 1982 score of 15.5 (roadway) or 7.5 (shoreline) or greater must maintain their scores, and all travel routes with a 1982 score of 15 (roadway) or 7 (shoreline) or less must improve their scores until the threshold score is reached.

SR-2, Scenic Quality Rating

The scenic quality rating threshold protects specific views of scenic features of Tahoe's natural landscape that can be seen from major roadways and from the Lake. To secure threshold attainment, all 1982 scenic quality scores must be maintained.

SR-3, Public Recreation Areas and Bike Trails

The public recreation area threshold protects the viewshed from public recreation areas and certain bicycle trails. To secure threshold attainment, all 1993 scenic quality scores must be maintained.

SR-4, Community Design

The community design threshold is a policy statement that applies to the built environment. Design standards and guidelines found in the Code of Ordinances, the Scenic Quality Improvement Program, and in the adopted Community Plans provide specific implementation direction. To secure threshold attainment, design standards and guidelines must be widely implemented to improve travel route ratings and produce built environments compatible with the natural, scenic, and recreational values of the region.

II. THRESHOLD SUMMARY

A. THRESHOLD MATRIX

The threshold matrix serves as a summary of the trends, status, and recommendations for individual thresholds. It displays for each threshold program, the trend toward attainment from 1987 to present, the current status of the threshold, progress on the 1996 recommendations, future threshold recommendations, interim targets and an attainment schedule to ensure the individual indicators and/or standards for the threshold are in attainment over time. For a complete detail on the items summarized by this Matrix, please see the following program narratives.

The list of recommendations identifies the scheduling time frames that can be expected for implementation of the listed programs, studies and projects.

B. MEASUREMENT AND MONITORING ACTIVITIES

The history of monitoring and assessment differs for the distinct elements of the scenic quality and community design thresholds. Region-wide monitoring for travel route ratings occurred in 1971, 1982, 1986, and as part of the 1991, 1996, and 2001 Threshold Evaluations. This represents the most extensive and well-documented chronology of change to resources available within TRPA's entire environmental threshold evaluation system; ~~it is also internationally unique~~. In contrast, the bike trails and recreation areas were inventoried in 1982, and their condition assessed based solely on fieldwork completed for their associated roadways in 1993 and 2001.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

The results of these threshold-monitoring activities are expressed in terms of attainment or non-attainment and are found under "Status" on the Threshold Matrix. These results are discussed in greater detail under Section III below for each threshold.

The 2001 status includes ~~28~~27 roadway units in threshold attainment and 26 units out of attainment with the travel route rating criteria. (These numbers include 11 roadway units that were separated out of three previously delineated units.) The 2001 condition for shoreline units includes ~~49~~20 shoreline units in threshold attainment and ~~44~~13 units out of attainment with the travel route rating criteria. Compared to the 1996 situation, ~~five~~

[four](#) new units fell from threshold attainment and none were raised into attainment (although minor score improvements were noted in some areas).

2001 conditions include 11 roadway and five shoreline scenic resources realizing an improvement in score. However, scenic quality declined in four roadway and six shoreline resources. Improvements are most noticeable in the roadway units, which can be attributed in large part to public improvements.

Threshold scores for recreation areas and bike trails were first adopted in 1993 and were not evaluated for change during the 1996 threshold evaluation process. This current evaluation noted improvements and degradations in threshold scores, as well as new features that have been scored and added to the inventory. In summary, seven of the 386 public recreation area and bike trail scenic resources are now no longer in threshold attainment.

The effects of changes to the built environment, central to the evaluation of the community design threshold, are identified and discussed throughout this report. Table 8-12 uses field observations and document review to assess the 2001 condition relative to producing buildings compatible with the natural, scenic and recreational values of the region. Although a numerical standard to assess threshold attainment for community design does not exist, it is possible to draw conclusions from other numerical ratings. Overall, the contribution from the built environment to non-attainment for travel route and scenic quality ratings precludes meeting the requirement to produce buildings compatible with the natural, scenic, and recreational values of the region. Specifically, while the quality of the built environment is being enhanced in some areas, there is an overall trend towards increased view blockage by buildings and loss of traditional community character. The goal of maintaining desired character cannot be attained because of the failure to specify desired community character in many communities. This threshold is not in attainment.

SR-1: Travel Route Rating

Threshold Standards	SR-1 Indicator	1996 Interim Targets		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
Maintain or improve the 1982 TRRs published in the Threshold Study Report (TRPA, 1982). Restore scenic quality in roadway units rated 15 or below and shoreline units rated 7 or below.	Travel route rating (TRR) as measured by unitless composite index of relative scenic quality for viewsheds seen from state and federal highways and Pioneer Trail, and from Lake Tahoe looking toward the shoreline using a defined criteria	Targets on Table SR-1 in Environmental Threshold Compliance Form	Roadway Travel Route Rating	Non-Attainment	Non-Attainment	Non-Attainment
			Shoreline Travel Route Rating	Non-Attainment	Non-Attainment	Non-Attainment
SR-1 2001 Monitoring Status						
<p>Roadway: 2001 status is 27 units in attainment and 26 units in non-attainment. Eight new roadway units have been added to the inventory. Four roadway units gained threshold attainment, three fell from attainment. Of the 8 new units, 5 are in non-attainment. Overall, 9 roadway units realized a rating increase of 11.5 points and two units realized a rating decrease of 1.5 points.</p> <p>Shoreline: 2001 status 49-20 units in attainment and 44-13 units in non-attainment. Five-Four additional shoreline units fell from attainment. Overall one <u>non-attainment</u> unit realized a rating increase of 1.5 points and two-one units realized a rating decrease of 1.50 points.</p>						
SR-1 2001 Recommendations						
<ol style="list-style-type: none"> TRPA should amend Chapter 30, Design Standards to create limits on <u>size-bulk, mass</u> and scale of structures visible from the scenic travel routes. TRPA should standardize scenic requirements for project applications and develop a region wide scenic requirement checklist. TRPA should complete and adopt the proposed scenic review system for the Shorezone Ordinances. TRPA should develop new design standards for development on littoral parcels that limits size and scale of structures visible from the scenic shoreline travel routes. Amend Chapter 30, <u>Design Standards</u>, to prohibit limit colors of metal roofs visible from sensitive scenic roadways and shoreline scenic travel routes to <u>dark, matte finishes</u>. Amend Chapter 71, Forest Health, to require a scenic professional be consulted prior to approval of forest health projects. Amend Chapter 4, Exemptions, to allow the alteration in structure color and roof-materials provided they meet TRPA Design Standards <u>and adopted Munsell Color Ranges</u>. Develop a demonstration painting project. Amend Chapter 30, Design Standards, to protect lake views from the roadway. Develop a region-wide plan for enhancement and development of scenic turnouts. Identify and pursue scenic conservation easements. Adopt highway design standards. Coordinate with USFS and State Parks to develop an enforcement program on temporary and seasonal uses to limit undesignated parking and unpermitted signage. Coordinate with the State's DOT and USFS to reduce highway parking and congestion along SR28 and Emerald Bay. Review and revise Scenic Resource Thresholds. Coordinate with CA State Lands, NV State Lands, and Compliance Division in implementing the proposed buoy sticker program. Coordinate with local jurisdictions to revise and consistently enforce the substitute sign ordinance. Institute a scenic monitoring program. Implement a monitoring program to evaluate post-construction conditions of representative projects. Develop and implement a modern archival and retrieval system for all information related to the scenic resource program. Require scenic mitigation security or bonding for projects in non-attainment and at-risk units. Update shoreline travel unit inventory. Develop and implement a scenic banking and offsite mitigation program. Amend Chapter 20, Coverage, to allow additional coverage for longer driveways to create deeper setbacks. Implement a study to analyze the basin-wide viewsheds and identify frequently viewed scenic resources that are important to maintain and protect. 						
SR-1 2006 Attainment Schedule						
See Table SR-1 of the SR-1 Environmental Compliance Form.						

SR-2: Scenic Quality (Roadway and Shoreline Scenic Resources)

Threshold Standards	SR-2 Indicator	1996 Interim Targets		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
Maintain or improve the numerical rating assigned each unit, including the rating of the individual resources within each unit, as recorded in the Scenic Resources Inventory, and the Threshold Study Report (TRPA, 1982).	Scenic quality rating as measured by a unitless total score of relative scenic quality of 202 specific scenic resources (e.g., natural features) visible from state and federal highways and Pioneer Trail, and of 184 specific scenic resources visible from Lake Tahoe looking from toward the shoreline.	Targets on Table SR-2 in Environmental Threshold Compliance Form	Roadway Travel Route Resources	Non-Attainment	Non-Attainment	Non-Attainment
			Shoreline Travel Route Resources	Non-Attainment	Non-Attainment	Non-Attainment
SR-2 2001 Monitoring Status						
<p>Roadway Scenic Resource: 2001 status is 205 identified scenic resources. 11 roadway resources realized a rating increase and 4 roadway resources realized a rating decrease from the 1996 conditions. The evaluation recommends adding 3 new roadway scenic resources to the inventory.</p> <p>Shoreline Scenic Resources: 2001 status is 185 identified scenic resources. 5 shoreline resources realized a rating increase and 6 shoreline resource realized a rating decrease from the 1996 conditions. This evaluation recommends adding 1 new shoreline resource to the inventory.</p>						
SR-2 2001 Recommendations						
<p>1. Implement recommendations 1-25 in SR-1</p> <p>2. TRPA should evaluate and add Shoreline Scenic Resource 16.8 and Roadway Scenic Resource 20.10, 20.11, 33.3 to the Lake Tahoe Basin Scenic Resource Inventory.</p>						
SR-2 2006 Attainment Schedule						
See Table SR-2 of the SR-2 Environmental Compliance Form.						

SR-3: Scenic Quality (Bike Paths and Outdoor Recreation Areas)

Threshold Standards	SR-3 Indicator	1996 Interim Targets		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
1993 scenic quality rating of individual scenic resources visible from or within public recreation areas and bicycle trails.	Scenic quality rating as measured by a unitless total subcomponent rating of relative scenic quality of specific resources visible from 37 outdoor recreation areas and from 11 Class I and II bike paths. (See 1996 Evaluation for Additional Information.	Establish permanent photographic monitoring for annual monitoring. Add Spooner Lake State Park and Tahoe Valley State Recreation Area/Washoe Meadows State Park to inventory	Bike Trails and Recreation Areas	Unknown	Attainment	Non-Attainment
SR-3 2001 Monitoring Status						
Threshold scores for recreation areas and bike trails were adopted in 1993 and were not evaluated in 1996. At the time of implementation all resources were in attainment with the threshold. The 2001 status noted improvements and degradations in threshold scores, as well as new features that have been scored and recommended for inclusion in the inventory. The 2001 status area 20 resources realizing a rating increase while 7 resources declined.						
SR-3 2001 Recommendations						
1. TRPA should update the Lake Tahoe Scenic Resource Evaluation to include new bike paths and new acquired public recreation areas.						
SR-3 2006 Attainment Schedule						
Three of seven resources or features out of threshold attainment can be improved with a remedial project planned and implemented by the recreation provider. Attainment for these resources is expected by 2006.						

SR-4: Community Design

Threshold Standards	SR-4 Indicator	1996 Interim Targets		Threshold Attainment Status		
				1991 Attain Status	1996 Attain Status	2001 Attain Status
It shall be the policy of TRPA Governing Board in development of the Regional Plan, in cooperation with local jurisdictions, to insure the height, bulk, texture, form, materials, colors, lighting, signing, and other design elements of new, remodeled and redeveloped buildings be compatible with the natural, scenic, and recreational values of the Region.	Community design is measured qualitatively by the physical design of the built environment. It is indirectly measured quantitatively through the travel route rating thresholds which are identified in SR-1	Implement Roadway Design Standards Revise height standards Revise exterior lighting Implement shoreline setback standards Removal and/or conformance of all non-conforming signs visible from threshold travel routes and public recreation areas.	Community Design	Unknown	Attainment	Non-Attainment
SR-4 2001 Monitoring Status						
None to date for community design. Refer to SR-1 for monitoring summary of portions of the threshold travel route ratings, which address the built environment.						
SR-4 2001 Recommendations						
1. TRPA should initiate a region-wide visual perception survey (VPS) in order to identify “desired” community character and revise development standards where needed to assure maintenance of the threshold. 2. TRPA should amend Code Chapter 29, Historic Resource Protection, to protect historic development patterns that create distinctive scenic features and community character. 3. TRPA should amend Code Chapter 30, Design Standards relating to exterior lighting 4. TRPA should amend Code Chapter 22, Height, to clearly identify how additional height findings area made. 5. TRPA should implement a Loop Road Workshop to address current scenic concerns with the Casino Core area.						
SR-4 2006 Attainment Schedule						
Implement the roadway design standards, revise exterior lighting standards and shoreline setback standards by December of 2002 and December 2006 for the removal and/or conformance of all non-conforming signs visible from threshold travel routes and public recreation areas.						

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

The following sections identify the methodology and evaluation criteria used during the 2001 Evaluation, as well as the areas of change and threshold status for each of the four threshold indicators.

A. SR-1: TRAVEL ROUTE RATINGS

1. Evaluation Criteria

NUMERIC STANDARD: Maintain the 1982 ratings for all roadway and shoreline units as shown in Tables 13-6 and 13-7 of the Draft Study report. Restore scenic quality in roadway units rated 15 or below and shoreline units rated 7 or below.

The travel route rating threshold is used to analyze and evaluate the visual experience of traveling the region's state and federal highways, Pioneer Trail, and Lake Tahoe itself from a short distance offshore, looking back at the land. These roadways are separated into 46 travel segments (called "travel units"), each of which represents a continuous two-directional viewshed of similar visual character. Lake Tahoe's shoreline is divided into 33 separate travel units.

Travel route ratings are measured by a numeric composite index (score) of relative scenic quality of the entire view seen from the travel routes, using the following threshold indicators:

1. Man-made features along the roadway and shoreline;
2. Physical distractions to driving along the roadways;
3. Roadway characteristics;
4. View of the Lake from the roadways;
5. General landscape views from the roadways and shoreline; and
6. Variety of scenery from the roadways and shoreline.

Roadway threshold ratings use all six indicators. Shoreline threshold ratings use criteria 1, 5, and 6. Each indicator is rated from one (low or absent) to five (high or significant feature present). In a few, very limited circumstances, unit ratings include a 0, indicating a substantial drop from an initial very low rating. A composite rating for individual roadway travel route rating units can range from 5 to 30. Shoreline travel route scores can range from 3 to 15.

Interim Targets

The Scenic Quality Improvement Program (SQIP) established interim targets for travel route rating improvements needed to assure threshold attainment within the 20 year Regional Plan timeframe. Since that time, travel route scoring has been modified to allow for half point increases/decreases. Thus, the minimum score needed to secure threshold attainment has changed; it has dropped 0.5 points for both shoreline and roadway units. Additionally, this evaluation provides for a more accurate system in three roadway units, breaking them into eleven component parts for the purposes of scoring and measuring threshold attainment. Both of these actions naturally modify the specific interim targets.

Assessment of the targets for this evaluation, therefore, recalculates the total points needed in each jurisdiction for threshold attainment in 1982, assuming the lower threshold number. It then evaluates actual point changes in 2001 against the interim targets presented in the SQIP and amended in the 1996 Threshold Evaluation. This is presented in Table 8-1, following.

Table 8-1. Interim Targets							
Jurisdiction	Total Points Needed for Complete Threshold Attainment (1989 SQIP, amended) ¹	Cumulative Change to Non-attainment Units Following 1991 Evaluation ²	Cumulative Change to Non-attainment Units Following 1996 Evaluation ²	Interim Targets for 2001 Threshold Attainment ³	Cumulative Change to Non-attainment Units in 2001 Evaluation	Total Points Needed for Complete Threshold Attainment in 2006, with new units ⁴	2001 Target Met?
El Dorado County							
Roadway	3	-2	+0.5	+6	+0	+10	No
Shoreline	1.5	-1	+0	+1	-0.5	+3	No
City of South Lake Tahoe							
Roadway	28	+1.5	+1.5	+14	+5	+20	No
Shoreline	0	+0	+0	+0	+1.5 ⁵	+0	NA
Placer County							
Roadway	31	+4	+4	+15	+7.5	+21	No
Shoreline	7.5	-1	-1.5	+5	-0.5	+10.5	No
Washoe County							
Roadway	7	-2.5	+0	+6	+2	+10	No
Shoreline	+0	-3	+0	+1	-1.5 ₀	+4.5 ₀	No
Douglas County							
Roadway	6.5	-2	+0	+4	+2.5	+6.5	No
Shoreline	+0	-1	-0.5	+0.5	-0.5	+2	No
¹ The total points needed for threshold attainment reported in the 1989 SQIP have been revised to reflect threshold attainment at 15.5 for roadway and 7.5 for shoreline units. ² Cumulative changes includes new non-attainment units. ³ Amended interim targets in the 1996 Threshold Evaluation. ⁴ The 2001 Evaluation separates three roadway units (two non-attainment units and one attainment unit) into 11 component parts and assigns each new unit a separate score (resulting in five non-attainment and four attainment units). Thus, the total points needed in Placer, Washoe, and El Dorado County for complete attainment is higher than previously reported and not directly comparable with previous scores. ⁵ Unit 31, Bijou and Unit 32, Al Tahoe are attainment units which realized rating increases due to Redevelopment and improvements at Regan and El Dorado Beach.							

2. Measurement and Monitoring

The methodology for assessing compliance with roadway and shoreline threshold requirements generally followed the procedures established in 1991 and 1996. An expert panel of scenic resource professionals was convened and visited the region during August 1-4, 2000. The team used TRPA staff assistance during fieldwork to focus on areas of change in the threshold scenic corridors. Unlike in past years, no professional, comprehensive video taping of existing conditions was completed. TRPA staff and a local scenic consultant videotaped the 2000 condition in shoreline units on September 12, 2000. Field notes and limited digital photography comprise the record upon which the assessment is based.

In addition, a targeted review of travel route ratings assessed how comparable the adopted ratings between units are as a check on the consistency of ratings. Ratings were changed in several units based on this type of evaluation.

3. Results of Measurement and Monitoring Efforts

In total, 23 roadway and 14 shoreline units experienced rating changes in 2001. Some of these changes reflect amendments to previous scores that allow better comparison between units. The score changes are shown in Table 8-2, below.

Table 8-2. Travel Route Rating Score Changes 2001	
Units with Improved Scores	Units with Reduced Scores
Roadway	
Unit 3 - Emerald Bay* (+0.5)	Unit 2 - Camp Richardson (-1.0)
Unit 7 - Meeks Bay* (+1.0)	Unit 11 - Homewood (-0.5)
Unit 9 - Tahoma* (+1.0)	Unit 17 - Cedar Flat (-1.5)
Unit 15 - Tahoe City (+2.5)	Unit 19 - Flick Point* (-0.5)
Unit 16 - Lake Forest* (+3.5)	Unit 28 - Spooner Summit (-1.5)
Unit 18 - Carnelian Bay (+1.5)	Unit 34 - El Dorado Beach (-1.0)
Unit 22 - Crystal Bay (+1.5)	Unit 40 - Brockway Cutoff (-0.5)
Unit 23 - Mt. Rose Highway (+0.5)	
Unit 25 - Ponderosa Area (+0.5)	
Unit 26 - Sand Harbor (+0.5)	
Unit 31 - Meadow (+2.0)	
Unit 32 - Casino Area (+0.5)	
Unit 33 - The Strip (+4.0)	
Unit 42 - Outlet (+0.5)	
Unit 44 - Kingsbury Grade (+1.5)	
Unit 45 - Pioneer Trail North (+1.0)	
Units 20, 30 and 36 - See note below	
Total: 16 Units (+22.5)	Total: 7 Units (-6.5)
Shoreline	
Unit 5 - Ebright (+0.5)	Unit 8 - Rubicon Point* (-0.5)
Unit 6 - Emerald Bay (+0.5)	Unit 12 - McKinney Bay* (-1.0)
Unit 19 - Carnelian Bay (+1.5)	Unit 22 - Brockway (-1.0)
Unit 31 - Bijou (+0.5)	Unit 23 - Crystal Bay (-1.0)
Unit 32 - Al Tahoe (+1.0)	Unit 24 - Sand Harbor (-0.5)
	Unit 26 - Cave Rock (-0.5)
Total: 5 Units (+4)	Total: 6 Units (-4.5)
<i>Shading indicates non-attainment units.</i>	
*The score change for these units reflects amendments to previously published scores for the most part. Some changes to the visual environment over the last five years may also be reflected. See Appendix 1 for a unit-by-unit description.	
Note: For the 2001 Evaluation, Roadway Units 20, 30 and 36 are broken into smaller units and are thus not directly comparable with previous scores. In each case, however, some positive visual change was noted.	

Examination of this information and that presented in Appendix 1 reveals:

- Overall, roadway travel route scores improved in 16 units with a total improvement of 22.5 points. Of these, 5.5 points result, in whole or in part, from reassessment of previous scores. The most dramatic improvement, four points, was realized in Unit 33-The Strip. In addition, improvements occurred in seven of the newly separated units: Units 20A-Tahoe Vista, 20B-Kings Beach, 20D-North Stateline Casino Core, 30D-Round Hill, 36A-Airport Area, 36B-Lake Valley, and 36C-Meyers. Physical improvements in three units, Unit 15-Tahoe city, Unit 18-Carnelian Bay, and Unit 31-Meadow, resulted in bringing those units into threshold attainment.

- Roadway scores declined in seven units for a total degradation of 6.5 points. These decreases created four new non-attainment units discussed further in Section III.A.5, below.
- Net roadway improvement of 10.5 points widely distributed.
- Shoreline scores improved in five units with a total improvement of four points. The most dramatic improvement occurred in Unit 19 - Carnelian Bay. This unit experienced improvements through completion of two CTC recreation access projects that included structure removal and redevelopment and a color change with an impressive mural at the marina. These improvements, however, did not result in any shoreline units coming into attainment.
- Shoreline scores declined in ~~six~~ five units for a total degradation of 4.~~5~~0 points. Decreases in ~~five~~ four of the ~~six~~ five units create new areas of non-attainment. This is discussed further in Section III.A.5 below.
- The shoreline units experienced a net degradation of 0.5 points. Most of the improvement, however, occurred in units already in attainment, while most of the degradation results from continuing negative trends that have pushed new units into non-attainment.

4. Trends

Extensive fieldwork completed for this evaluation, along with that completed during the Shorezone Ordinance development and assessment process identified several clear trends related to scenic threshold issues. The following paragraphs discuss trends important for the travel route and scenic quality rating systems.

Improvements in Commercial Districts

Beginning with the adoption of the 1987 Regional Plan, substantial public and private investment in the community plan areas of the region has occurred. Almost without exception, this investment has improved the scenic quality of the associated roadway units. Examination of Table 8-2 shown above illustrates this trend. Ten of the sixteen roadway units with improved scores fall partially or wholly within community plan areas; improvement in the newly separated units increases this to sixteen units in community plan areas with improved scores. The most dramatic of these improvements is the South Lake Tahoe Redevelopment Area. Removal of degraded structures, improvement in architectural quality of new and remodeled structures, increased landscaping and landscaped open space, decreases in highway curb cuts, and improved signage have all contributed to a remarkable transformation. This improvement affects both travel route and scenic quality ratings. Current plans for continued improvement in this unit are expected to produce threshold attainment.

While the redevelopment area of South Lake Tahoe produces the improvement with the highest visibility, upgrades in many other areas have also occurred. Since 1996, major improvements in Douglas County around the US 50/Kahle Drive intersection, Tahoe City, and Carnelian Bay have resulted in bringing three roadway units into travel route rating threshold attainment. [The North Stateline Beautification project in Washoe County has resulted in improved scenic quality in the built environment with the construction of a sidewalk and landscaping project.](#) In most of these areas, publicly funded projects that produce scenic improvement

occurred and were matched by privately funded upgrades to existing development. In the last five years throughout the region, publicly funded projects (or public-private partnerships such as redevelopment) improved roadway travel route ratings by approximately 15 points; public investment since 1991 has created approximately 19.5 points improvement. Private property upgrade that followed these projects occurred in Tahoe City, Kings Beach, Kingsbury Grade, South Lake Tahoe, and Meyers. This confirms a fundamental principle of community redevelopment and provides encouragement for continued public leadership in planning and funding improvement projects.

One note of caution is warranted, however. As discussed below, the trend to larger and larger structures can threaten the improvements seen in the commercial districts. Outside of the north and south Stateline areas, the predominant character of commercial development in Tahoe is of smaller structures or complexes. Redevelopment that replaces small, one story buildings with large two story buildings will increase the dominance of the built environment and, even when the architectural quality greatly improves, will result in loss of scenic quality.

Increase in Visibility of Residential Structures.

The Lake Tahoe Region is experiencing a dramatically increased pace of residential redevelopment and a corresponding and dramatic loss of scenic quality. First noted in 1991 and raised as a serious concern in 1996, this redevelopment is adversely affecting both shoreline and roadway units. It is particularly noteworthy that the continued drop in both travel route and scenic quality scores is occurring as a result of new projects approved by TRPA in apparent compliance with regulations intended to prevent this drop. This reduction in scenic quality, concentrated outside of the urban roadways, is occurring at a time that the developed commercial centers are improving as discussed above, and appears to be accelerating in recent years.

This evaluation identifies specific features of the new and redeveloped projects that are contributing to the increase in visibility of structures and associated loss of scenic quality. They are:

- Dramatic increase in the scale and mass of residential structures. As land values increase, property owners are proposing residential structures very much larger than existing on-site structures. While staying within maximum coverage and height allowances, new projects very often replace several small, one- or two-story cabins with large two-, three-, or four-story houses. These structures often block lake views from the roadway and are rarely adequately screened or sited to reduce visual dominance as seen from the lake.
- Reduction in structure setback. Residential rebuilds on littoral parcels are placing larger structures at the shorezone setback line, often noticeably decreasing the structure setback from the previous condition. These reduced setbacks can limit the area for effective landscape screening and sometimes force removal of existing important shoreline vegetation.
- Architectural features that increase visibility. While many of the new residences display pleasing and improved architectural design features, several current architectural trends combine to increase structure visibility and reduce the quality of natural landscape views. These include expansive use of glass, use

of reflective roof materials (including metal roofs of all types), maximizing height so that the entire roof ridgeline produces a dominant horizontal line, and use of exterior materials that are too light-colored and that fail to visually recede into the forest backdrop. The latter characteristic includes the current trend to using uncolored finishes on wood exteriors such as pine and redwood; this material is attractive and appropriate in many ways, yet it creates strong color contrasts with the dark olive green of the forest behind.

- Unauthorized removal of trees and understory vegetation are impacting scenic quality. In many cases, this results in increased visibility of structures in the roadway and shoreline scenic corridors. An alarming practice recently seen by TRPA compliance staff is the deliberate killing of trees in order to remove dead trees for view enhancement purposes.

These features combine to produce an alarming negative trend. As noted in the following section, two roadway and four shoreline units have experienced sufficient degradation related to this impact to drop threshold scores in 2001, pushing three roadway units and five shoreline units into non-attainment. This is in addition to the two shoreline units that dropped their score in 1996 due to this same impact. Additionally, 21 roadway and shoreline units are now considered at risk for future degradation, primarily from residential rebuilds.

Although this trend is affecting several north and west shore roadway units, it has the most pressing impact on shoreline units. Nearly every north and west shore shoreline unit with areas of residential development is already out of travel route rating threshold attainment or is seriously threatened by the current trends in residential rebuilds. Increasingly, this trend is also threatening residentially developed shoreline units on the east and south shores. It is clear that existing regulatory requirements are not sufficient to avoid further degradation, let alone create threshold attainment.

Residential structures in the upland and forest backdrop areas are also increasingly visible. This results from use of light colored exterior building materials, metal roofs and large window area that reflect light, and reduction in tree screening. The increased visibility reduces the continuity of the natural forest landscape and is visible from great distances, often impacting several travel routes and scenic resources. This effect is most apparent in the slopes above Incline Village. This may be the result of residential remodels that increase visibility, yet the most likely cause is recent forest health projects that decrease the amount of mature tree screening.

Incremental Loss of Lake Views

Roadway units along the north and west shores are experiencing incremental loss of lake views. Very often this loss results from residential rebuilds that increase the scale of lakeside residences. This loss also occurs, however, through construction of accessory structures such as solid fences or two story garages. The loss of small lake views can be hard to define as a significant impact when considering any individual project, yet the cumulative effect is important. Brief glimpses of lake views, interspersed with more open and dramatic longer lake views, define the notable character of most of the scenic corridor along the north and west shores. Loss of these brief lake views creates stretches of highway that are

undistinguished from many other forested roadways. This has negative implications for both travel route and scenic quality thresholds.

In several cases, loss of lake views is occurring as a result of maturing vegetation. This is an issue in Tahoe City, along SR 267 at the summit and near Kings Beach, along US 50 near Cave Rock, and at El Dorado Beach. In Tahoe City and at El Dorado Beach, maturing vegetation is improving the view from the lake, yet is growing to block lake views from the roadway. Future actions to provide improved roadway views must obviously be carefully planned to avoid creating new impacts to views from the lake.

Along SR 267, degradation of a lake view scenic resource, resulting from insensitive placement of golf course landscaping and the relocation of the cafe/pro shop, illustrates another scenic quality trend; the same features creating both improvements and degradation, depending on the specific viewpoint. In this case, redesign of the cafe/pro shop and increased landscaped area along the golf course produced travel route rating improvements from the scenic unit along SR 28 (Unit 20B - Kings Beach). Unfortunately, these same features critically alter a mapped scenic resource from Unit 40 - Brockway Cutoff (Lake View 40.4). This lake view was a spectacular view across the lake with Mt. Tallac in the center, framed by mature conifers. Golf course landscaping and the new café/pro shop block some of the lake view and alter the view frame substantially. This lake view is now a filtered view seen through tree branches and around a new structure. Eventually, this view could improve as the newly planted trees around the pro shop mature and assuming some of the trees are relocated.

Transportation Related Impacts

Adverse scenic impacts have occurred in natural roadway units related to activities on or near the scenic highways. This includes impacts associated with installation of highway appurtenances along SR 28. Specifically, some poor material choices in the NDOT erosion control project and for the guardrail replacement at Spooner Summit have resulted in scenic degradations. The upcoming safety project near Echo Summit involves activities with high potential for scenic impacts. On the other hand, improved attention to visual effects for the recent placement of the rockfall protection screen along US 50 avoided degradation, as did the erosion control project along SR 267.

Increased traffic and parking congestion have also produced score reductions in several roadway units, including at Camp Richardson, in Emerald Bay (amending the previous scores), and along Harrison Ave. in South Lake Tahoe. These impacts are somewhat temporal in nature, yet produce real changes in experience for the typical traveler on an average summer day. Reduced highway parking along SR 28, on the other hand, produced scenic improvement.

Increasing Visual Impact of Shorezone Structures

Due to the moratorium on new pier development in prime fish habitat, this trend has not yet caused widespread visual impacts; however, it is clear from recent applications, pier improvements that have been permitted, and discussion with representatives of littoral property owners, substantial visual change in the shorezone is likely. Without careful management of the unique shoreline

landscape, the cumulative effect of new and larger piers, boat lifts, and associated structures could dramatically affect the scenic character of the Lake.

Inadequate Enforcement and Permitting

Scenic impacts throughout the region occur through inadequate enforcement of existing restrictions. These vary in importance and include the following:

- Inadequate scenic assessment and TRPA permit conditions. TRPA standards for height, setback, landscaping, etc. establish a maximum building envelope for new or remodel development. A project specific evaluation is supposed to assess compliance with Code section 30.12, requiring contribution to attaining and maintaining scenic quality thresholds, and direct project modifications if necessary to meet that standard. The preceding sections of this report demonstrate the failure of this project based system in protecting the thresholds. The 1991 and 1996 Evaluations identified Code deficiencies related to design criteria (height, setback, color, etc.) and use of unclear and inappropriate scenic assessment methodology as contributing to lack of threshold attainment. The 2001 Evaluation reconfirms those conclusions. As well as concerns over ambiguities over the appropriate standards for multiple-use piers where lots are being consolidated. It is clear that lack of progress on the previous recommendations has contributed to continued threshold degradation.
- Increase in unpermitted buoys. Over time, buoy density is increasing in many areas of the lake, some of this attributable to unpermitted buoys. This is particularly noticeable offshore from public parcels that do not include permitted buoy fields. The visual effect is to eliminate the breaks in the presence of buoys that would otherwise result from public littoral ownership. This is particularly important as permitted buoy densities increase.
- Lack of sign ordinance compliance. Improvement in signage in commercial districts is occurring slowly, contrary to the amortization schedule and other requirements in Code Chapter 26. This is particularly serious in South Lake Tahoe where substantial roadway improvement (outside of the Redevelopment Area) is predicated on improvement in commercial signage. The conclusion of this evaluation (and that produced for the 1996 evaluation report) is that the substitute sign ordinance in the City is inadequate to meet the minimum improvement needs. Signage must also improve in Meyers, the north and south casino areas, along Kingsbury Grade, in Incline Village and in Kings Beach to produce threshold attainment. As future projects progress, Carnelian Bay and Tahoe City are also likely to require signage upgrade to maintain their new attainment status.
- Compliance with conditions of approval. This evaluation noted several specific projects that create scenic impacts resulting from lack of compliance with TRPA permit conditions. These individual projects represent a more substantial trend, however. It is too common that project area modifications occur after project completion and return of the TRPA security deposit. Such modifications include change of structure color, construction of view blocking fences, addition of unpermitted signage, and removal of vegetation required to remain.

Insufficient Use of TRPA Resources

TRPA continues to refine its organizational structure to improve internal efficiency and make better use of its technological and human resources. This evaluation notes a few situations that make these efforts less effective.

- Lack of access to scenic threshold information. A large body of material, including photographs, simulations, written reports, mapped information, and specific evaluations, has been developed over the years that serve as a resource for TRPA staff and members of the design profession to use. Even TRPA staff have little knowledge of the extent or location of scenic threshold information. Unfortunately, much of this information is not easy to obtain. This contributes to loss of scenic quality by reducing the ability of all parties to track changes over time and to learn from past successes and mistakes.
- Lack of on-staff expertise and general public training. The scenic threshold system relies on very specialized knowledge to adequately develop, assess, and review new projects to protect scenic resources. In the last five years, TRPA has experienced several periods without a designated scenic planner. In addition, normal turnover in other staff has occurred and specific training related to scenic resources has not fully introduced the complex scenic system. Outside of the agency, education for both the general public and the design professions has also been inadequate to keep pace with the needs of the scenic thresholds. In total, this results in projects proposed with design features that are contrary to scenic protection, scenic evaluations presented that do not recognize the full scope of impacts, and agency staff that are not prepared to adequately assess and review projects so that scenic resources are protected.

5. Threshold Attainment Status

Roadway Units

The 2001 condition includes 27 roadway units in threshold attainment and 26 units out of attainment with the travel route rating criteria. (These numbers include 11 roadway units that were separated out of three previously delineated units.) Table 8-3 identifies the units that are not in threshold attainment (score of 15.5 or lower or a reduction compared to the 1982 scores).

Table 8-3. Roadway Travel Routes: 2001 Non-Attainment Units					
Unit Number/Name	Jurisdiction	Travel Route Rating			
		1982	1991	1996	2001
Unit 1 - Tahoe Valley	City of South Lake Tahoe	11	11	12	12
Unit 2 - Camp Richardson	El Dorado County	20	19	19	18
Unit 7 - Meeks Bay	El Dorado County	13	13	13	14
Unit 9 - Tahoma	El Dorado County	13	13	13	14
Unit 10 - Quail Creek	Placer County	14	14	14	14
Unit 11 - Homewood	Placer County	12	12	12	11.5
Unit 13 - Sunnyside	Placer County	14	14	14	14
Unit 14 - Tahoe Tavern	Placer County	13	14	14.5	14.5
Unit 17 - Cedar Flat	Placer County	17	17	17	15.5
Unit 20A - Tahoe Vista	Placer County	NA	NA	NA	13
Unit 20B - Kings Beach	Placer County	NA	NA	NA	12.5
Unit 20D - North Stateline	Washoe County	NA	NA	NA	13
Unit 21 - Stateline	Washoe County	20	18.5	18.5	18.5
Unit 22 - Crystal Bay	Washoe County	12	12	12	13.5
Unit 25 - Ponderosa Area	Washoe County	12	11	11	11.5

Unit Number/Name	Jurisdiction	Travel Route Rating			
		1982	1991	1996	2001
Unit 28 - Spooner Summit	Douglas County	16	16	16	14.5
Unit 32 - Casino Area	Douglas County	11	11	11	11.5
Unit 33 - The Strip	City of South Lake Tahoe	6	7	7.5	11.5
Unit 35 - Al Tahoe	City of South Lake Tahoe	7	7.5	7.5	7.5
Unit 36A - Airport Area	El Dorado County	NA	NA	NA	10.5
Unit 36C - Meyers	El Dorado County	NA	NA	NA	14
Unit 40 - Brockway Cutoff	Placer County	15	15	15.5	15
Unit 42 - Outlet	Placer County	10	12	12	12.5
Unit 43 - Lower Truckee River	Placer County	20	19	19	19
Unit 44 - Kingsbury Grade	Douglas County	13	13	13	14.5
Unit 45 - Pioneer Trail North	City of South Lake Tahoe	10	10	10	11

Shading indicates units fallen from Threshold Attainment, in 2001.

Other changes related to threshold attainment are:

- Three roadway units that were not in attainment in 1996 improved scores sufficiently to bring them into attainment. They are: Unit 15-Tahoe City, Unit 18-Carnelian Bay, and Unit 31-Meadow. In addition, reassessment of the unchanged scenic condition in Unit 16-Lake Forest results in amended scores that recognize threshold attainment for that unit.
- In addition to those, nine more non-attainment roadway units realized travel route rating improvement for a total score increase of 11.5 (see also Table 8-2). Of these, 2.0 points result, in whole or in part, from reassessment of previous scores. The most dramatic improvement, four points, was realized in Unit 33-The Strip. In addition, noticeable improvements occurred in five of the newly separated units that are not yet in threshold attainment: Units 20A-Tahoe Vista, 20B-Kings Beach, 20D-North Stateline Casino Core, 36A-Airport Area, and 36C-Meyers. These improvements continue the impressive upgrade in commercial centers experienced in many parts of the region since adoption of the Regional Plan.
- Roadway scores declined in seven units for a total degradation of 6.5 points (see Table 8-2 & 8-3), creating four new non-attainment units. Two units dropped by 1.5 points. Unit 28-Spooner Summit dropped in part due to the recent installation of oversized, reflective guardrails. Unit 17-Cedar Flat dropped due to residential rebuilds that have cumulatively blocked lake and landscape views. The situation in Unit 19-Flick Point, requires explanation. Lake views in this unit have been generally underrated since threshold adoption. The 2001 evaluation re-rates these views, improving the score from a 1 to a 3. Unfortunately, new projects in this unit that are incrementally reducing lake views combine to drop the 2001 lake view score to 2.5.
- The 1996 Threshold Evaluation began identifying "at risk" travel routes. These areas are those that had experienced degradation in the preceding five years, although in some cases not sufficient to drop the score for the entire unit, or those that already had very low man-made features scores. In 1996, eight roadways were considered at risk. The 2001 condition related to at risk units removes two units from the 1996 at risk list and adds six more to it. The current list is shown in Table 8-4.

Table 8-4. Roadway Travel Routes At Risk	
Unit	Discussion
Units No Longer Considered At Risk	
Unit 23 - Mt. Rose	Roadside revegetation has improved this unit. No further degradation noted.
Unit 41 - Brockway Summit	No new degradation noted.
Unit 45 - Pioneer Trail, North*	Insufficient improvements to man-made features have occurred to remove this unit from the list. (The 1996 Evaluation erroneously listed Unit 46-Pioneer Trail, South as at risk instead of Unit 45.)
2001 Units Considered At Risk	
Unit 2 - Camp Richardson	Increased clutter associated with temporary and seasonal uses degrades the condition in this unit.
Unit 11 - Homewood	Residential construction blocks lake views.
Unit 17 - Cedar Flat*	Continued degradation occurred with large residential rebuilds.
Unit 18 - Carnelian Bay	Even with important improvements, the continued low man-made features score places this unit at risk.
Unit 19 - Flick Point*	Residential rebuilds block lake views and continue negative trend.
Unit 20A - Tahoe Vista	Use conversion and dramatic change in structure scale threatens the character and scenic quality in this area.
Unit 21 - Stateline*	Increased view of homes in the forest backdrop threaten views from this unit.
Unit 25 - Ponderosa Area*	Insufficient improvements to man-made features have occurred to remove this unit from the list.
Unit 28 - Spooner Summit*	This unit, considered at risk in 1996, dropped from threshold attainment in 2001.
Unit 36A - Airport Area	This unit suffers from a very low man-made features score.
Unit 42 - Outlet	This unit suffers from a very low man-made features score and is experiencing increased degradation due to recreational parking along the highway.
*These units were considered at risk in 1996 and remain at risk in 2001.	

Shoreline Units

The 2001 condition includes 19-20 shoreline units in threshold attainment and 44 13 units out of attainment with the travel route rating criteria. Compared to the 1996 situation, five-four new units fell from threshold attainment and none were raised into attainment (although minor score improvements were noted in some areas). Table 8-5 identifies the units that are not in threshold attainment (score of 7.0 or lower or a score reduction compared to the 1982 conditions).

Table 8-5. Shoreline Travel Routes: 2001 Non-Attainment Units					
Unit Number/Name	Jurisdiction	Travel Route Rating			
		1982	1991	1996	2001
Unit 8 - Rubicon Point	El Dorado County	12	12	12	11.5
Unit 9 - Rubicon Bay	El Dorado County	6	5	5	5
Unit 12 - McKinney Bay	Placer County	9	9	9	8
Unit 14 - Ward Creek	Placer County	10	10	9	9
Unit 15 - Tahoe City	Placer County	5	5	5	5
Unit 16 - Lake Forest	Placer County	5	4	4	4
Unit 18 - Cedar Flat	Placer County	8	8	7.5	7.5
Unit 19 - Carnelian Bay	Placer County	5	5	5	6.5
Unit 22 - Brockway	Placer County	10	10	10	9
Unit 23 - Crystal Bay	Washoe County	10	8	8	7
Unit 24 - Sand Harbor	Washoe County	12	12	12	11.5
Unit 26 - Cave Rock	Douglas County	10	10	10	9.5
Unit 27 - Lincoln Park	Douglas County	8	7	7	7
Unit 30 - Edgewood	Douglas County	11	11	10.5	10.5

Shading indicates units fallen from Threshold Attainment, in 2001.

Other features related to shoreline travel route rating attainment are:

- 2001 shoreline travel route scores improved in one non-attainment unit (Unit 19 - Carnelian Bay), representing a total increase of 1.5 points.
- Shoreline travel route scores declined in ~~six~~ five units for a total degradation of 4.50 points. Three units dropped their scores by one point: Unit 12 - McKinney Bay, Unit 22 - Brockway, and Unit 23 - Crystal Bay. Based on review of the information in Appendix 8-1, ten additional units experienced noticeable degradation from new projects without triggering new score decreases at this time. This is an alarming trend.
- As noted above, the 1996 Threshold Evaluation began identifying "at risk" travel routes. In 1996, 13 shoreline units were considered at risk. The 2001 condition related to at risk units removes one unit from the at risk list and adds six more to it. The current list is shown in Table 8-6.

Table 8-6. Shoreline Travel Routes At Risk	
Unit	Discussion
Units No Longer Considered At Risk	
Unit 19 - Carnelian Bay	CTC projects and work at the marina improve the man-made features score.
1996 At Risk Units that Dropped into Non-Attainment	
Unit 12 - McKinney Bay	This unit was considered at risk in 1996; construction of new large residences drops the score from threshold attainment.
Unit 22 - Brockway	This unit was considered at risk in 1996 and has subsequently fallen from threshold attainment.
Unit 26 - Cave Rock	Construction of new large residences drops the score from threshold attainment.
2001 Units Considered At Risk	
Unit 3 - Jameson Beach Unit 9 - Rubicon Bay*	Residential rebuilds continue a negative trend. No improvements to the situation for man-made features and a new very large residence continues this unit at risk.
Unit 13 - Eagle Rock*	The existing high quality of this unit is threatened by the trend to large, poorly screened lakeside residences.
Unit 14 - Ward Creek	New residential rebuilds continue a negative trend.
Unit 15 - Tahoe City*	The low man-made features score continues this unit at risk.
Unit 16 - Lake Forest*	The low man-made features score and continued degradation retains this unit at risk.
Unit 18 - Cedar Flat	New residential rebuilds continue a negative trend.
Unit 20 - Flick Point*	New residential rebuilds continue a negative trend.
Unit 21 - Agate Bay*	Rebuilds and upgrades with inadequate improvements continue this unit at risk.
Unit 23 - Crystal Bay*	Lakeside residential rebuilds and increased view of homes in the backdrop further degrade this unit.
Unit 27 - Lincoln Park*	New residential rebuilds continue a negative trend in an area with a very low man-made features score.
Unit 28 - Tahoe School	New residential rebuilds establish a negative trend in this unit.
Unit 29 - Zephyr Cove*	No new degradation noted, yet the score for man-made features continues to be threatened.
Unit 30 - Edgewood	New residential rebuilds establish a negative trend in this unit.
Unit 31 - Bijou*	Some improvement to man-made features occurred, yet not enough to remove this unit from the at risk list.
*Units considered at risk in 1996 and still at risk in 2001.	

Attainment Schedule

Roadway scenic quality in many developed commercial centers is improving. Several factors contribute including the concentration of public and private attention and funds and the planning direction and incentives provided by community plans. Considering existing trends and planning efforts, and the scope of needed improvements to reach attainment, the following roadway units are positioned to reach attainment in the fairly short-term: Unit 18, Carnelian Bay, and Unit 25, Crystal Bay. In addition, continued improvements in Unit 20B, Kings Beach and Unit 33, The Strip are underway and may produce scores much closer to attainment within the next five years.

It is difficult to predict the schedule for attainment in the shoreline and some of the urban and transitional roadway units. The trend in these units is negative and involves the cumulative effects of small actions. The scenic problems in these areas do not lend themselves to single public works or redevelopment projects that can be targeted, pursued, and then implemented. Certainly without immediate modifications to Code design allowances, the negative trends will continue and threshold attainment on any schedule will become increasingly difficult.

6. Effectiveness of Measures in Place

TRPA utilizes 17 control measures and three supplemental compliance measures to meet the scenic threshold standards. As all contribute to implementation of all four threshold indicators, their effectiveness is examined in Table 8-12 at the end of this section, and not repeated for the other indicators discussed in this chapter.

Index No.: SR-1 ENVIRONMENTAL THRESHOLD COMPLIANCE FORM

Category: scenic resources
Parameter: roadway and shoreline travel route rating (TRR)

1. STANDARD: maintain or improve the 1982 TRRs published in the Threshold Study Report (TRPA, 1982). Restore scenic quality in roadway units rated 15 or below. Restore scenic quality in shoreline units rated 7 or below.
2. INDICATOR (UNITS): Travel route rating (TRR) as measured by a unitless composite index of relative scenic quality for all viewsheds seen from state and federal highways and Pioneer Trail, and from Lake Tahoe looking toward the shoreline using the following criteria:
 - a. man-made features along roadway and shoreline;
 - b. physical distractions to driving along roadways;
 - c. roadway characteristics;
 - d. views of the lake from roadways;
 - e. general landscape views from roadways and shoreline; and
 - f. variety of scenery from roadways and shoreline.NOTE: Roadway threshold rating use all six criteria; shoreline threshold rating use criteria a), e), and f).

3. MONITORING SUMMARY: Since the 1982 adoption of the travel route rating threshold, the ratings have been updated in 1986, 1991, and 1996, and 2001. The travel route rating will be monitored every five years, as part of threshold evaluations. Annual photographic monitoring is being implemented in 2001 for non-attainment and at risk units for both shoreline and roadway threshold travel routes. Annual monitoring will track potential adverse impacts of development on the travel routes.

Considering existing trends and planning efforts, and the scope of needed improvements to reach attainment, the following roadway units are positioned to reach attainment in the fairly short-term. Unit 18, Carnelian Bay, and Unit 25 Crystal Bay. In addition, continued improvements in Unit 20B, Kings Beach and Unit 33, The Strip are underway and may produce scores much closer to attainment within the next five years.

It is difficult to predict the schedule for attainment in the shoreline and some of the urban and transition roadway units. The trend in these units is negative and involves the cumulative effects of small actions. The scenic problems in these areas do not lend themselves to single public works or redevelopment projects that can be targeted, pursued, and then implemented. Certainly without immediate modifications to Code design allowance, the negative trends will continue and threshold attainment on any schedule will become increasingly difficult.

4. ATTAINMENT STATUS: Non-attainment. TTRs for 26 roadway units are in non-attainment and 27 roadway units are in attainment. Three new roadway units dropped into non-attainment and 4

roadway units went into attainment as of 2001. In total, TRRs for nine-15 roadway units increased in the 1996-2001 ratings and 7 roadway units decreased in the 2001 ratings. An additional 11 roadway units have been added to the roadway unit inventory.

TTRs for 13 shoreline units are in non-attainment and 20 shoreline units are in attainment. This is an increase of 4 additional shoreline units dropping into non-attainment as of 2001. No shoreline unit came into threshold attainment. No shoreline unit TRRs increased as of 1996. In total, TRRs for three-five shoreline units decreased in the 1996-2001 ratings and only one non-attainment unit realized a rating increase (+1.5 pts.). No roadway unit TRRs decreased as of 1996.

23-26 of 46-53 roadway units, and 9-13 of 33 shoreline units, do not attain the threshold standard and are targeted for restoration. This is an increase of three-3 roadway units and 4 shoreline units since the 1994-1996 ratings. The status of individual units is identified in the 1996-2001 Threshold Evaluation.

5. TARGET DATE: 2006

6. EVALUATION INTERVAL: Every five years with the next evaluation date in 2004-2006. Photographic monitoring will occur annually.

7. INTERIM TARGETS: See Table SR-1.

8. COMPLIANCE MEASURES:
 - a. MEASURES IN PLACE: SCENIC RESOURCES AND COMMUNITY DESIGN - 01 through 17, inclusive
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The existing compliance measures in place are moderately effective in attaining the threshold. The compliance measures in place include the primary ordinance standards and recommended guidelines addressing physical design and site planning. All measures in place are implemented as part of the project review and approval process. Chapters 22, 26, 30, 52, 53, and 54, together with the Design Review Guidelines and the Scenic Quality Improvement Program, are the most effective compliance measures. Revisions to the measures in place are recommended to enhance threshold attainment and maintenance.
 - c. SUPPLEMENTAL MEASURES: The following measures should be implemented by TRPA to enhance threshold attainment and maintenance: SCENIC RESOURCES AND COMMUNITY DESIGN - 01, 02, and 03

Index No.: SR-1 ENVIRONMENTAL THRESHOLD COMPLIANCE FORM

d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Supplemental measures are generally expected to be highly effective to enhance threshold attainment and maintenance.

9. ADEQUACY OF COMPLIANCE MEASURES: With the addition of the recommended supplemental compliance measures and revisions to the measures in places, the compliance measures are expected to be adequate to attain and maintain the threshold.

TABLE SR-1
 INTERIM THRESHOLD ATTAINMENT TARGETS
 SCENIC RESOURCE THRESHOLDS—TRAVEL ROUTE RATINGS (TTR)
 INTERIM THRESHOLD ATTAINMENT TARGETS BY JURISDICTION BASED ON THE
 RESULTS OF THE ~~1996~~ 2001 THRESHOLD EVALUATION

Jurisdiction	Total Points Needed For Threshold Attainment of all Non-Attainment Units Following 91 <u>2001</u> Evaluation	Travel Route Rating Interim Improvement Targets for Each Five-Year Review				
		By 1996 <u>By 2001*</u>	1996 <u>Actual 2001</u>	(Revised) By 2001* <u>By 2002</u>	Actual 2001 <u>Actual 2004</u>	(Revised) By 2006*
El Dorado County						
Roadway**	13 <u>10</u>	+4 <u>+6</u>	+0.5 <u>+0</u>	+6 <u>+3</u>	<u>+3</u>	<u>+4</u>
Shoreline	3	+4 <u>+1</u>	0 <u>-0.5</u>	+1	<u>+1</u>	<u>+1</u>
City of South Lake Tahoe						
Roadway**	34.5 <u>20</u>	+8 <u>+14</u>	+2 <u>+5</u>	+14 <u>+5</u>	<u>+5</u>	<u>+10</u>
Shoreline	0	<u>0</u>	0 <u>+1.5</u>	0		
Placer County						
Roadway**	35 <u>21</u>	+8 <u>+15</u>	+2 <u>+7.5</u>	+15 <u>+7</u>	<u>+7</u>	<u>+7</u>
Shoreline	10 <u>10.5</u>	+2 <u>+5</u>	-1.5 <u>-0.5</u>	+5 <u>+3</u>	<u>+3</u>	<u>+4.5</u>
Washoe County						
Roadway**	16.5 <u>10</u>	+3 <u>+6</u>	0 <u>+2</u>	+6 <u>+3</u>	<u>+3</u>	<u>+4</u>
Shoreline	2 <u>4</u>	0 <u>+1</u>	0 <u>-1</u>	+1	<u>+1.5</u>	<u>+1.5</u>
Douglas County						
Roadway**	10 <u>6.5</u>	+2 <u>+4</u>	0 <u>+2.5</u>	+4 <u>+2</u>	<u>+2</u>	<u>+2.5</u>
Shoreline	1 <u>2</u>	0 <u>+0.5</u>	-0.5	+0.5 <u>+1</u>	<u>+0.5</u>	<u>+0.5</u>

* 2001 and 2006 Interim Targets have been revised to include the updated 1991, ~~and~~ 1996, and 2001 Travel Route Ratings.

** 8 additional units have been added to the Roadway Unit Threshold Travel Route Inventory.

B. SR-2: SCENIC QUALITY RATINGS

1. Evaluation Criteria

NUMERIC STANDARD: Maintain or improve the numerical rating assigned each unit, including the scenic quality rating of the individual resources within each unit, as recorded in the Scenic Resources Inventory and shown in Tables 13-3, 13-5, 13-8, and 13-9 of the Draft Study report.

The purpose of scenic quality thresholds is to maintain or enhance existing scenic resources. The scenic resources in the region include views of the natural landscape and distinctive natural features identified, mapped, described, and evaluated in 1982 as part of the 1982 Study Report process. There are 205 scenic resources visible from the roadway units and 185 from shoreline units, including three roadway and one shoreline resource added in 2001. They include the following types of resources:

1. Foreground, middleground, and background views from roadways of the natural landscape;
2. Views to Lake Tahoe from roadways;
3. Views of Lake Tahoe and natural landscape from roadway entry points into the region;
4. Unique landscape features such as streams, beaches, and rock formations that add interest and variety, as seen from roadways;
5. Views of the shoreline, the water's edge and the foreground as seen from the Lake;
6. Views of the backdrop landscape, including the skyline, as seen from the Lake; and
7. Visual features seen from the Lake that are points of particular visual interest on or near the shore.

Scenic quality ratings do not provide a means of evaluating urban or recreational development, but are used to ensure that development does not remove or substantially degrade individual scenic resources. The ratings are used to evaluate development only insofar as development affects natural features. This threshold is much more sensitive to change from development than the travel route rating threshold, because the view of the resource can be blocked or significantly modified by an individual project. It can, however, be difficult to accurately predict the effects of a development proposal on a specific resource during the project review process until it is too late.

Scenic quality threshold ratings are a unitless composite index of relative scenic quality of specific natural features. As defined in the 1982 Study Report, the relative quality of each resource is rated using the following indicators: unity, vividness, variety, and intactness. The indicators are well documented in academic and professional literature as useful measures of relative scenic value between resources.

Unity is the degree to which the visual resources of a scene join together to form a single, coherent, harmonious unit. Vividness is a measure of contrasting elements, such as color, line, and shape, marked differences seen as related, or repetition of similarities. It is sometimes referred to as distinctiveness. Variety is numerous or different parts seen together and can be referred to as richness. Intactness describes the degree to which a landscape retains its natural condition, or the degree to which modifications emphasize or enhance the natural condition of the landscape.

Each indicator is rated using an index from zero (absent) to three (high). Ratings for all four indicators are summed to form the threshold rating. The ratings are intended to express comparative scenic quality ratings of low (rating of one), moderate (rating of two), and high values (rating of three), between all roadway or all shoreline mapped resources and should not be mistaken for absolute measurements of scenic quality.

2. Measurement and Monitoring

The methodology for assessing compliance with scenic quality threshold requirements was the same as described above for the travel route threshold.

The 2001 Evaluation also provides assessment of new scenic resources. Description of these resources can be found in Appendix 2. Three of the new resources identified are new lake views as seen from different roadway units, all created through public redevelopment of shoreline properties. A new scenic resource has also been inventoried in a shoreline unit. This is a view of a natural feature that was not included in the original inventory work, yet identified during development of the Shorezone Ordinance and EIS as a unique feature.

3. Results of Measurement and Monitoring Efforts

Changes to 1982 Mapped Scenic Resources

Scenic quality changed for 25 mapped resources. Some of these changes reflect amendments to previous scores that allow better comparison between units. Table 8-7 lists all the resource score changes. See Appendix 2 for a complete description

Table 8-7. Scenic Quality Rating Score Changes 2001			
Unit Name/Number	View Type	Scenic Resource	1996-2001 Score Change
<i>Resources with Improved Scores: Roadway Units</i>			
15-Tahoe City	Landscape View	15.4	+2
15-Tahoe City*	Lake View	15.5	+3
18-Carnelian Bay	Lake View	18.3	+1
19-Kings Beach	Visual Feature	20.6	+2
22-Crystal Bay	Landscape View	22.3	+1
31-Meadow	Lake View	31.1	+2
32-Casino Area	Visual Feature	32.2	+1
33-The Strip	Landscape View	33.2	+2
35-Al Tahoe*	Landscape View	35.5	+1
44-Kingsbury Grade	Visual Feature	44.7	+2
46-Pioneer Trail, South	Visual Feature	46.4	+1
TOTAL		11 Resources	+8

Table 8-7. Scenic Quality Rating Score Changes 2001, continued			
Unit Name/Number	View Type	Scenic Resource	1996-2001 Score Change
Resources with Improved Scores: Shoreline Units			
5-Ebrite	Shoreline View	5.2	+1
15-Tahoe City	Visual Feature	15.4	+1
19-Carnelian Bay	Visual Feature	19.3	+1
31-Bijou	Shoreline View	31.4	+2
32-Al Tahoe	Shoreline View	32.1	+2
TOTAL		5 Resources	+7
Resources with Reduced Scores: Roadway Units			
26-Sand Harbor*	Lake View	26.5	-2
28-Spooner Summit	Entry Point View	28.2	-1
30-Zephyr Cove-Lincoln Park	Lake View	30.2	-1
40-Brockway Cutoff	Lake View	40.4	-1
TOTAL		4 Resources	-5
Resources with Reduced Scores: Shoreline Units			
12-McKinney Bay	Shoreline View	12.6	-1
14-Ward Creek	Shoreline View	14.4	-1
20-Flick Point	Shoreline View	20.1	-1
23-Crystal Bay	Backdrop View	23.6	-1
24-Sand Harbor	Visual Feature	24.3	-1
27-Lincoln Park	Shoreline View	27.6	-1
TOTAL		6 Resources	-6
*The score change for these resources reflects amendments to previously published scores for the most part. See Appendix 8-2 for a description.			

Examination of this information reveals that:

- Scenic quality scores improved for 11 roadway scenic resources and five shoreline scenic resources. Improvements along roadways were evenly split between those for landscape view, lake views, and for visual features. The most dramatic improvements were generated through redevelopment that removed or reduced the prominence of structures. Improvements along the shoreline were more often created through maturation of past shoreline and other revegetation efforts. This accounted for five points improvement.
- Scenic quality scores declined for four roadway scenic resources and six shoreline scenic resources. All of these decreases create threshold non-attainment and are described in Section III.B.5 below.
- The net improvement in roadway scenic resources, +13 points, is well dispersed and can be attributable in large measure to public investment. The net improvement, +1 point, for shoreline scenic resources is much more moderate. This situation reflects the contrasting effects of large single projects and the cumulative impacts of small scale actions.

New Scenic Resources

The 2001 Evaluation identifies new scenic resources. Lake views were added or improved at the intersection of US 50/Ski Run Blvd., along SR 28 near Agatam Beach and along SR 28 near the intersection with SR 267. Work completed for the proposed Shorezone Ordinance revisions also identified the uniqueness and sensitivity of the cliffs in Shoreline Unit 16, Lake Forest. This area is also added as a new resource. Appendix 8-2 contains the description and 2001 rating for these resources.

4. Trends

Trends affecting the scenic quality rating indicator are the same as those described above for the travel route rating indicator.

5. Threshold Attainment Status

Roadway and Shoreline Scenic Resources

The 2001 condition includes eight roadway scenic resources and 17 shoreline scenic resources out of attainment with the scenic quality rating criteria. Compared to the 1996 situation, three new roadway and five new shoreline scenic resources fell from threshold attainment. Sufficient improvement in one roadway scenic resource (Visual Feature 44.7) occurred to bring it into threshold compliance. Table 8-8 identifies the resources that are not in threshold attainment (score degraded compared to the 1982 condition).

Unit Name/Number	View Type	Scenic Resource	Threshold Scores			
			1982	1991	1996	2001
<i>Roadway Units</i>						
13-Sunnyside	Visual Feature	13.2	10	10	9	9
20-Tahoe Vista	Landscape View	20.5	12	10	10	10
26-Sand Harbor	Lake View	26.5	10	10	8	8
28-Spooner Summit	Entry Point View	28.2	7	7	7	6
30-Zephyr Cove-Lincoln Park	Lake View	30.2	12	12	12	11
40-Brockway Cutoff	Lake View	40.4	9	9	9	8
43-Lower Truckee River	Entry Point View	43.2	10	8	8	8
<i>Shoreline Units</i>						
3-Jameson Beach	Shoreline View	3.3	7	7	6	6
12-McKinney Bay	Shoreline View	12.6	9	9	9	8
14-Ward Creek	Shoreline View	14.4	9	9	9	8
16-Lake Forest	Shoreline View	16.7	7	5	5	5
20-Flick Point	Shoreline View	20.1	8	8	8	7
23-Crystal Bay	Visual Feature	23.2	11	8	8	8
23-Crystal Bay	Shoreline View	23.3	10	8	7	7
23-Crystal Bay	Shoreline View	23.5	5	4	4	4
23-Crystal Bay	Backdrop View	23.6	8	6	6	5
23-Crystal Bay	Shoreline View	23.9	11	11	10	10
24-Sand Harbor	Visual Feature	24.3	11	11	11	10
26-Cave Rock	Shoreline View	26.9	7	7	6	6
26-Cave Rock	Visual Feature	26.12	11	10	10	10
27-Lincoln Park	Visual Feature	27.3	6	5	5	5
27-Lincoln Park	Shoreline View	27.6	8	8	8	7
27-Lincoln Park	Visual Feature	27.7	7	6	6	6
30-Edgewood	Shoreline View	30.2	8	8	7	7

Shading indicates units fallen from Threshold Attainment, in 2001.

Other features related to scenic resource attainment status are:

- As noted above, the 1996 Threshold Evaluation began identifying "at risk" scenic resources. For scenic quality ratings, resources are considered at risk if they have experienced negative change, although insufficient to lower the score. Non-attainment resources are not considered "at risk". In 1996, ten roadway and 17 shoreline scenic resources were considered at risk. The 2001

condition includes seven at risk roadway resources and 12 at risk shoreline resources. The current list is shown in Table 8-9.

- Three roadway and two shoreline resources were removed from the at-risk list because no new degradation had occurred since 1996. Two resources have been removed from the at-risk list because additional degradation did occur and they fell from threshold attainment. They are: Lake view 30.2 (in Bourne Meadow), and Shoreline View 27.6 (Lincoln Park).

Table 8-9. Scenic Resources At Risk	
Resource	Discussion
Resources No Longer Considered At Risk: Roadway	
Landscape View 35.2, of Trout Creek	No additional degradation has occurred.
Landscape View 35.4, of Upper Truckee River	No additional degradation has occurred.
Landscape View 44.4, along Kingsbury Grade	No additional degradation has occurred.
Resources No Longer Considered At Risk: Shoreline	
Shoreline View 12.1, near McKinney Creek	No additional degradation noted.
Shoreline View 30.5, golf course	No additional degradation has occurred.
2001 Resources Considered At Risk: Roadway	
Landscape View 2.4, near Camp Richardson	Increased clutter and commercial activity at Camp Rich and Valhalla threatens intactness.
Landscape View 3.8, of Cascade Creek*	No additional degradation noted. Existing character and sensitivity retains this area at risk.
Landscape View 17.5, in Cedar Flat	Loss of short lake views threaten intactness and unity.
Lake View 19.2, in Flick Point*	No additional degradation noted. Elevated viewing position and extent of visible shoreline retain this at risk.
Landscape view 19.3, in Flick Point	Loss of short lake views threaten unity.
Lake View 21.2, in Crystal Bay*	Increased view of residences in forest backdrop continues this resource at risk.
Lake View 23.6, at Mt. Rose Overlook	Increased view of residences and ski runs at Ski Incline threaten intactness.
Shoreline View 9.2, Rubicon Bay*	No additional degradation noted. Exposed nature of site continues this resource at risk.
Shoreline View 9.4, north side Rubicon Bay*	New large residence under construction creates additional degradation and will likely drop the resource from threshold attainment when completed.
Shoreline View 12.3, McKinney Bay at marina*	No additional degradation noted. Exposed nature of existing scenic problems and lack of improvement retain this resource at risk.
Shoreline View 14.6, north of Sunnyside*	No additional degradation noted. Trend to larger piers and boatlifts continues this resource at risk.
Visual Feature 15.4, Tahoe City marina*	Some improvements noted, but continued low rating retains this resource at risk.
Shoreline View 15.5, north Tahoe City*	Continued increase in size and mass of pier and shoreline development has occurred, threatening unity.
Shoreline View 16.5, Lake Forest*	[to be completed]
Shoreline View 16.7, Lake Forest*	[to be completed]
Shoreline View 18.3, north Cedar Flat*	Increasing mass and visibility of shoreline development, including larger residences and piers with boatlifts continues to threaten this resource.
Shoreline View 23.7, sandy beach Crystal Bay*	A new pier on the west end of the beach, and other shoreline development continue to threaten the resource.
Shoreline View 23.10, east Crystal Bay*	Exposed nature of this site continues this resource at risk.
Visual Feature 30.4, trailer park*	Exposed nature of the site and lack of improvement continue this resource at risk.
*These units were considered at risk in 1996 and remain at risk in 2001.	

Attainment Schedule

As described for travel route ratings improvement, the threshold attainment schedule for scenic resources is difficult to predict. Only one non-attainment scenic resource, Landscape View 33.2, lies in an area that is presently improving in scenic quality. Most of the scenic quality problems have and are occurring as a result of individual small actions repeated throughout the mapped resource. Without immediate improvement in the regulatory structure, these actions will continue and move this threshold further from, not closer to, attainment.

6. Effectiveness of Measures in Place

The control measures intended to attain and maintain the scenic resource threshold are identified and assessed in Table 8-12 at the end of this section. In general, most of the control measures in place are not completely effective in protecting scenic resources.

Index No.: SR-2 ENVIRONMENTAL THRESHOLD COMPLIANCE FORM

Category: scenic quality

Parameter: roadway and shoreline resources scenic quality rating (SQR)

1. STANDARD: Maintain or improve the numerical rating assigned each unit, including the rating of the individual resources within each unit, as recorded in the Scenic Resources Inventory, and the Threshold Study Report (TRPA, 1982)
2. INDICATOR (UNITS): Scenic quality rating as measured by a unitless total score of relative scenic quality of 202 specific scenic resources (e.g., natural features) visible from state and federal highways and Pioneer Trail, and of 184 specific scenic resources visible from Lake Tahoe looking toward the shoreline. The relative value of each resource within a given travel route is measured using the following criteria:
 - a. Unity
 - b. Vividness
 - c. Variety
 - d. Intactness

Each criterion is scored using a unitless score from zero (absent) to three (high). Criterion scores are summed for each identified resources identified within each unit. The total score of the four criteria is the threshold rating.

A sensitivity to change rating using a unitless rating from one (least sensitive) to three (most sensitive) is assigned to each travel unit. It is not a part of the threshold rating. Sensitivity to change rates the relative visual vulnerability of landscape units to absorb man-induced modifications.

3. MONITORING SUMMARY: Since the 1982 adoption of the scenic quality rating threshold, the ratings have been updated in 1986, 1991, ~~and 1996,~~ and 2001. All the scenic resources are to be monitored every five years, as part of threshold evaluations. In addition, selected scenic resources are to be monitored annually. Annual photographic monitoring of selected resources is ~~recommended~~ being implemented. Annual monitoring would closely track potential adverse effects of development on resources. Data regarding the effects of incremental changes to the resources due to development activity could be used as a predictive tool in future project evaluations.
4. ATTAINMENT STATUS: Non-attainment. ~~The SQR for five scenic resources visible from roadways and one scenic resource visible from Lake Tahoe increased in the 1996 ratings.~~ Scenic Quality Ratings (SQR) improved for 11 roadway units and 5 shoreline units. SQR declined for 4 roadway units and 6 shoreline units resulting in an additional 3 roadway and 5 shoreline scenic resources falling from attainment when compared to the 1996 conditions. Only one resource made sufficient improvement to reach threshold attainment. 2001 status for SQR is 8

roadway and 17 shoreline scenic resources in non-attainment. Four new scenic resources have been inventoried and added to the scenic resource inventory. The SQR for five scenic resources visible from Lake Tahoe decreased in the 1996 ratings. The resources with decreased ratings do not attain the threshold. Two resources visible from roadways had corrections made to their 1991 SQRs. No roadway SQRs decreased in 1996. For details on ratings of individual scenic resources, see the ~~1996~~ 2001 Evaluation.

5. TARGET DATE: 2006
6. EVALUATION INTERVAL: Every five years with the next evaluation date in 2001. Photographic monitoring will occur annually.
7. INTERIM TARGETS: See Table SR-2. ~~By June 30, 1998~~ June 30, 2002, TRPA should establish permanent photographic monitoring viewpoints for annual monitoring of selected resources.
8. COMPLIANCE MEASURES:
 - a. MEASURES IN PLACE: SCENIC RESOURCES AND COMMUNITY DESIGN - 01 through 17, inclusive.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The compliance measures in place include the primary ordinance standards and recommended guidelines addressing physical design and site planning. All measures in place must be implemented as part of the project review and approval process in order to maintain the scenic quality of identified resources. Chapters 22, 26, 30, 52, 53 and 54, together with the Design Review Guidelines, the Scenic Quality Improvement Program and the Lake Tahoe Basin Scenic Resource Evaluation, are the most effective compliance measures. Revisions to the measures in place to enhance threshold attainment and maintenance.
 - c. SUPPLEMENTAL MEASURES: The following measures should be implemented by TRPA to enhance threshold attainment: SCENIC RESOURCES AND COMMUNITY DESIGN - 01, 02, and 03
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Supplemental measures are generally expected to be highly effective to enhance threshold attainment and maintenance.
9. ADEQUACY OF COMPLIANCE MEASURES: With the addition of the recommended supplemental compliance measures and revisions to the measures in places, the compliance measures are expected to be adequate to attain and maintain the threshold standard.

TABLE SR-2

INTERIM THRESHOLD ATTAINMENT TARGETS:

SCENIC RESOURCE THRESHOLDS -- SCENIC QUALITY RATINGS (SQR)

INTERIM THRESHOLD ATTAINMENT TARGETS BY JURISDICTION

~~Total Points Needed For Threshold Attainment of all NonAttainment Scenic Resources Following Travel Route Rating Interim Improvement Jurisdiction 91 Evaluation Targets For Each Five-Year Period~~

	Actual (Revised)		(Revised)	
	by 1996	1996	by 2001*	by 2006**

~~El Dorado County~~

Roadway	1	0	0	1	1 (100%)
Shoreline	1	0	1	1	1 (100%)**

~~City of South Lake Tahoe~~

Roadway	0	NA	NA	NA	NA
Shoreline	0	NA	NA	NA	NA

~~Placer County~~

Roadway	2*	0	0	1	2 (100%)
Shoreline	1	0	0	1	1 (100%)

~~Washoe County~~

Roadway	0	NA	NA	NA	NA
Shoreline	2	0	2	2	4 (100%)**

~~Douglas County~~

Roadway	0	NA	NA	NA	NA
Shoreline	1	0	2	1	3 (100%)**

~~NA Not Applicable~~

~~* Total points needed for threshold attainment includes corrected SQR for Scenic Resource 14.3.~~

~~** 2006 Interim targets have been adjusted to include resources which were found to have been degraded by the 1996 Evaluation.~~

Index No.: SR-2 ENVIRONMENTAL THRESHOLD COMPLIANCE FORM

<p align="center"><u>Table SR-2</u> <u>INTERIM THRESHOLD ATTAINMENT TARGETS:</u> <u>SCENIC RESOURCE THRESHOLD – SCENIC QUALITY RATINGS (SQR)</u> <u>ITERIM THRESHOLD ATTAINMENT TARGETS BY JURISDICTION</u></p>						
<u>Travel Route Rating Interim Improvement</u>						
<u>Jurisdiction</u>	<u>Total Points Needed For Threshold Attainment of all Non-Attainment Scenic Resources Following 2001 Evaluation*</u>	<u>By 2001</u>	<u>Actual 2001</u>	<u>Revised 2002</u>	<u>Revised 2004</u>	<u>Revised 2006</u>
<u>El Dorado County</u>						
<u>Roadway</u>	<u>0</u>	<u>+0**</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
<u>Shoreline</u>	<u>1</u>	<u>+1</u>	<u>0</u>	<u>0</u>	<u>+1</u>	<u>0</u>
<u>City of South Lake Tahoe</u>						
<u>Roadway</u>	<u>0</u>	<u>NA</u>	<u>+3</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<u>Shoreline</u>	<u>0</u>	<u>NA</u>	<u>+4</u>	<u>NA</u>	<u>NA</u>	<u>NA</u>
<u>Placer County</u>						
<u>Roadway</u>	<u>3</u>	<u>+1</u>	<u>-1</u>	<u>+1</u>	<u>+1</u>	<u>+1</u>
<u>Shoreline</u>	<u>5</u>	<u>+1</u>	<u>-3</u>	<u>+1</u>	<u>+1</u>	<u>+3</u>
<u>Washoe County</u>						
<u>Roadway</u>	<u>2</u>	<u>NA</u>	<u>-2</u>	<u>+1</u>	<u>+1</u>	<u>+0</u>
<u>Shoreline</u>	<u>9</u>	<u>+2</u>	<u>-2</u>	<u>+3</u>	<u>+3</u>	<u>+3</u>
<u>Douglas County</u>						
<u>Roadway</u>	<u>2</u>	<u>NA</u>	<u>-2</u>	<u>+1</u>	<u>+1</u>	<u>+0</u>
<u>Shoreline</u>	<u>4</u>	<u>+1</u>	<u>-1</u>	<u>+1</u>	<u>+2</u>	<u>+1</u>
<p>*Cumulative points needed for all non-attainment units evaluated in the 1991, 1996 and 2001 Threshold Evaluation. ** Correction to the 1996 Threshold Evaluation.</p>						

C. **R-3: PUBLIC RECREATION AREAS AND BIKE TRAILS**

1. **Evaluation Criteria**

NUMERIC STANDARD: Maintain or improve the numerical rating assigned to each identified scenic resource, including individual subcomponent numerical ratings, for views from bike paths and other recreation areas open to the general public as recorded in the 1993 Lake Tahoe Basin Scenic Resource Evaluation.

The Public Recreation Area and Bike Trails threshold applies to 37 public recreation areas including beaches, campgrounds, and ski areas. It also applies to 11 segments of Class I and Class II bicycle trails. Views and scenic resources visible from these areas were considered of value because they are major public gathering places, they are generally highly scenic to begin with, and they are places where people are static (compared to the travel routes) and have more time to linger and focus attention on the views and resources.

The threshold contains three general types of scenic resources: (1) views from the recreation area or bicycle trail; (2) views of natural features within the recreation area or along the trail; and (3) visual quality of man-made features within the recreation area or adjacent to the trail. For bicycle trails, lake views are also included and rated. Threshold ratings for views from the recreation area or bicycle trail, views of natural features, and lake views use the same criteria established for the scenic quality rating system. This involves ratings for unity, vividness, variety and intactness. Each of the criteria is assigned a value from one (low) to five (high). The sum of the ratings for each indicator is the threshold rating for the resource.

Man-made features are rated using different criteria than for other threshold indicators. The following criteria respond to the visual character of the built environment rather than the natural environment:

- Coherence refers to a coordinated approach to the man-made facilities in terms of possessing some unifying characteristic or quality.
- Condition refers to the general physical condition of the man-made elements.
- Compatibility is the sense of fit between the man-made features and the surrounding natural landscape. Man-made features that are highly compatible blend in to their surroundings and defer to the form, colors, and textures of the natural landscape.
- Design quality refers to the relative presence or lack of architectural qualities that make the man-made elements a visual feature in and of themselves.

Man-made features are evaluated against each of the criteria and assigned a numerical rating between one (low) and five (high). The sum of the ratings for each indicator is the threshold rating for the feature.

As with the other thresholds, the ratings are intended to express comparative scenic quality ratings of low, moderate, and high values, and should not be mistaken for absolute measurements of scenic quality.

2. Measurement and Monitoring

For the first time since adoption of threshold standards in 1993, this evaluation includes a comprehensive review of changes within and near recreation areas. Using inventories of recreation facilities, a search of project records for approvals within 1000' of recreation areas, and interviews with TRPA staff and others, a local scenic consultant visited all recreation areas that experienced change. Appendix 3 contains field notes of changes noted. These notes and digital photographs represent the record upon which the assessment is based.

Evaluation of the current condition for rated bike trails relied heavily on the field work completed for the roadway travel routes. A specific site visit was made to Al Tahoe to record changes for that trail segment.

These efforts found important and substantial changes made to many public recreation areas. These include new facilities, upgraded and repaired facilities, recreation areas expanded through public land purchase, and some examples of complete redevelopment. This evaluation includes identifying and rescoring all modifications to the recreation areas that are mapped and included in the 1982 inventory. It does not address expanded, new, or formerly omitted public recreation sites. Additionally, this evaluation did not assess conditions for new segments of bike trails. Section V, Recommendations, includes a comprehensive list of sites, areas, and trails that should be inventoried and included in the threshold.

3. Results of Measurement and Monitoring Efforts

Threshold scores for recreation areas and bike trails were first adopted in 1993 and were not evaluated for change during the 1996 threshold evaluation process. Based on the methodology followed in 2000 and described in Appendix 8-3, this evaluation noted improvements and degradations in threshold scores, as well as new features that have been scored and added to the inventory. The recreation area and bike trail resources that experienced change sufficient to alter threshold scores are included in Table 8-10, below.

Table 8-10. Recreation Area and Bike Trail Scenic Quality Changes		
Unit Number / Name	Resource Description	2001 Score Change
<i>Resources with Improved Scores</i>		
Rec Area 2 -Zephyr Cove	Man-Made Feature 2-a	+0.5
Rec Area 7-Incline Beach	Man-Made Feature 7-a	+2.0
	Man-Made Feature 7-b	+1.0
Rec Area 9-Kings Beach	Natural Feature 9-3	+1.0
Rec Area 12-Patton Beach (Carnelian Bay West)	View 12-1	+1.0
Rec Area 14- Lake Forest Campground and Boat Ramp	Man-Made Feature 14-a	+2.0
Rec Area 16-Commons Beach	Man-Made Features 16-a and 16-c	+1.0
		+1.0
Rec Area 19-Kaspian Recreation Area	View 19-1	+2.0
Rec Area 26-Vikingsholm/Emerald Bay	Man-Made Feature 26-d	+5.0
Rec Area 33-Camp Richardson	Man-Made Features 33-a	+10.0
	Man-Made Feature 33-b	+9.0

Table 8-10. Recreation Area and Bike Trail Scenic Quality Changes, continued		
Unit Number / Name	Resource Description	2001 Score Change
<i>Resources with Improved Scores, continued</i>		
Rec Area 36-El Dorado Beach and Campground	Natural Feature 36-3	+1.0
	Natural Feature 36-4,	+2.0
	Man-Made Feature 36-c	+4.0
Rec Area 37-Heavenly Valley Ski Area	Man-Made Feature 37-a	+2.0
Bike Trail 3-Tahoe Tavern	Man-Made Feature 3-a	+4.0
Bike Trail 7-City of SLT Recreation Area	Lake View 7-3,	+1.0
	Man-Made Feature 7-a	+2.0
Bike Trail 11-City of SLT to Tallac Creek	Man-Made Feature 11-d	+1.0
TOTAL	20 Resources	+75
<i>Resources with Reduced Scores</i>		
Rec Area 2-Zephyr Cove	View 2-3	-1.0
Rec Area 3-Cave Rock	Man-Made Feature 3-a	-1.0
Rec Area -Sand Harbor	View 4-2	-1.0
	Natural Feature 4-7	-4.5
Rec Area 7-Incline Beach	View 7-2	-1.0
Rec Area 8-Burnt Cedar Beach,	View 8-2	-1.0
	Man-Made Feature 8-b	-1.0
TOTAL	7 Resources	-10.5
<i>New Resources Added to the Inventory</i>		
Rec Area 4-Sand Harbor	Man-Made Feature 4-i (Festival Area)	NA
Rec Area 9-Kings Beach	Man-Made Feature 9-e (Pier)	NA
Rec Area 12-Patton Beach (Carnelian Bay West)	Man-Made Features 12-a (Entry), 12-b (Cafe and Parking), 12-c (Retention Basin/Boardwalk)	NA
Rec Area 19-Kaspian Recreation Area	View 19-1a and Man-Made Feature 19-c (Pier)	NA
Rec Area 27-Eagle Falls Picnic Area	Man-Made Feature 27-b (Restroom)	NA

Examination of this information and that presented in Appendix 8-3 reveals:

- Substantial investment in recreation areas and near bike trails in recent years greatly improved the maintenance of many facilities and added needed new facilities. By far, most of this investment created visual improvements, resulting in an impressive 75 total points increase to 20 mapped resources. Upgrades at Camp Richardson to the commercial structures at the development's core and in the beach/marina area combined to produce the largest improvement – 19 total points. Landscaping and parking lot improvements at El Dorado Beach and Campground (7 points) and at Vikingsholm/Emerald Bay (5 points) produced other noteworthy point increases.
- In some recreation areas, new development produced scenic quality degradation. These situations generally involve the same negative development trends identified for other threshold indicators: large structures with light colors and reflective surfaces sited with inadequate setbacks and/or screening. In total, seven resources experienced degradation for a total loss of 10.5 points.

4. Trends

Public Investment in Maintenance and Upgrade Produces Widespread Improvements

Since threshold adoption in 1993, important improvements to recreation areas and bike trails have been funded, resulting in upgraded and new facilities available to the general public. Nearly all the recreation areas assessed displayed good or improving maintenance conditions, and several areas offered dramatically improved facilities. The lake access projects funded by the California Tahoe Conservancy offer the best example of use of public funds to both create and improve the scenic quality of public recreation areas. Redeveloped beach parcels in Kings Beach and Carnelian Bay restore important landscape characteristics and offer built features completely in harmony with the natural landscape and high expectations of the recreational visitor. The City of South Lake Tahoe (El Dorado Beach), Nevada State Parks (Memorial Point), California State Parks (Vikingsholm parking area), and the Incline Village General Improvement District (Incline Beach) are other examples of organizations making improvements.

As with other redevelopment projects noted throughout this report, some new recreation facilities produce both positive and negative change. At Burnt Cedar Beach and Sand Harbor in the festival area, new facilities offer improved visitor services and display pleasing design characteristics, yet are too large for their settings and include design elements out of character with the natural environment.

Impacts From Changing Off site Conditions

The primary concern related to recreation areas and bike trails are changing scenic conditions occurring off site. Table 8-10 and the field notes provided in Appendix `3 demonstrate that declining scenic quality of Lake Tahoe's shoreline and forested backdrop is creating degradation for views from recreation areas. The primary off site feature creating concern is shoreline and littoral parcel development. Trends related to construction of large shoreline residences are discussed in detail above. Increased length of piers and spread of use of boat lifts also decrease view of the natural landscape and increase shoreline clutter. In fact, shorezone development (i.e. piers, buoys and boatlifts) impacts views from the recreation areas as much or more than views from any other rated resource or travel route.

Changes in the forest backdrop are visible from many recreation areas, although scores for the affected views rarely decline. View of the new gondola cut for Heavenly Valley, of the new Embassy Suites structure at Ski Run Blvd., and increased view of residential development above Incline Village are examples. While these changes are distinct, often from many viewpoints, they are usually part of a large panorama and do not alter the score for the entire view.

Public Recreation Areas and Bike Trails Not Protected

This evaluation notes a high number of developed public recreation and bikeway facilities that are not included in the 1993 Lake Tahoe Basin Scenic Resource Evaluation inventory. This includes recent expansion of existing areas as well as developed recreation facilities within noted units, but not included in the inventory. It also includes property more recently acquired for public recreation purposes or

simply overlooked during earlier inventory processes. This growing list exposes recreation sites important to residents and visitors to inadvertent loss of scenic quality.

5. Threshold Attainment Status

Public Recreation Areas and Bike Trails

The threshold ratings for public recreation areas and bike trails were adopted in 1993 and not updated until this evaluation. In consequence, the only resources or features out of attainment with threshold standards are those listed in Table 8-10 that have experienced score reductions since 1993. In summary, seven of the 386 public recreation area and bike trail scenic resources are now no longer in threshold attainment.

Attainment Schedule

Three of seven resources or features out of threshold attainment can be improved with a remedial project planned and implemented by the recreation provider. Attainment for these resources is expected by 2006.

The improvement schedule for the rest of the non-attainment resources is more difficult to predict.

6. Effectiveness of Measures in Place

The control measures intended to attain and maintain the public recreation area and bikeways scenic threshold are identified and assessed in Table 8-12 at the end of this section. In general, most of the control measures in place are not completely effective in protecting scenic resources.

Category: scenic quality

Parameter: bike paths and outdoor recreation areas scenic quality rating (SQR)

1. STANDARD: 1993 scenic quality rating of individual scenic resources visible from or within public recreation areas and bicycle trails

2. INDICATOR (UNITS): Scenic quality rating as measured by a unitless total subcomponent rating of relative scenic quality of specific resources (also referred to as subcomponents) visible from ~~37-39~~ public outdoor recreation areas and from 11 Class I and II – bike paths. Resource components include: views of the Lake and natural landscape from the recreation area or bike path; special landscape features, such as streams, beaches, rock formations, topographical features and special vegetation patterns; and man-made features within the recreation area. The relative value of views of the Lake, views of the natural landscape, and special landscape features visible from a given recreation area or bike path are measured using the following criteria:

- a. Unity
- b. Vividness
- c. Variety
- d. Intactness

The relative value of man-made features within the recreation area is measured using the following criteria:

- a. Coherence
- b. Condition
- c. Compatibility
- d. Design Quality

Each criterion is scored for each resource using a unitless index from one (poor) to five (high). The threshold rating for the resource is the sum (i.e., subcomponent total) of criteria scores with a possible range of four to 20. Threshold ratings for all resources are contained in the LAKE TAHOE BASIN SCENIC RESOURCE EVALUATION, 1993 and associated worksheets.

3. MONITORING SUMMARY: ~~None to date.~~ Threshold scores for recreation areas and bike trails were first adopted in 1993 and were not evaluated for change during the 1996 Threshold Evaluation. The 2001 Threshold Evaluation noted improvements and degradations in threshold scores, as well as new features that have been scored and added to the inventory. The SQRs for 20 resources improved while 7 resources declined in 2001. An additional 5 new resources have been inventoried added to

the scenic resource inventory. Annual photographic monitoring of selected resources is recommended. Annual monitoring would closely track potential adverse effects of development on resources. Data regarding the effects of incremental changes to the resources due to development activity could be used as a predictive tool in future project evaluations.

4. ATTAINMENT STATUS: ~~Attainment~~Non-Attainment. The SQR for resources covered by the threshold have not been monitored since their adoption in 1993. At the time of implementation all resources were in attainment with the threshold. At this time, no degradation to the resources is known to have occurred.

5. TARGET DATE: Not applicable

6. EVALUATION INTERVAL: Comprehensive reevaluation of all roadway and shoreline scenic resources every five years with the next evaluation in ~~2004~~2006.

7. INTERIM TARGETS: ~~By December 31, 1997 June 30, 1998~~June 30, 2002, TRPA should establish permanent photographic monitoring and viewpoints for annual monitoring of selected resources. ~~By June 30, 1998, TRPA should add the Spooner Lake Unit of the Lake Tahoe Nevada State Park (Nevada), and Tahoe Valley State Recreation Area/ Washoe Meadows State Park (California), to the inventory of facilities covered by the threshold. In cooperation with the Nevada Division of State Parks and the California Department of Parks and Recreation, respectively, TRPA should prepare inventories of both facilities. By March 31, 2002, TRPA should update the following recreation areas to add new identified resources: Sand Harbor Feature-4-I, Kings Beach-Feature 9-9, Patton Beach-Feature 12-a, 12-b, and 12-c, Kaspian Recreation Area-Feature 19-1a and 19-c, and Eagle Falls Picnic Area-Feature 27-b.~~

8. COMPLIANCE MEASURES:

- a. MEASURES IN PLACE: Scenic Resources And Community Design - 01 through 17, inclusive.
- b. EFFECTIVENESS OF MEASURES IN PLACE: The compliance measures in place include the primary ordinance standards and recommended guidelines addressing physical design and site planning. All measures in place must be

Index No.: SR-3 ENVIRONMENTAL THRESHOLD COMPLIANCE FORM

implemented as part of the project review and approval process in order to maintain the scenic quality of identified resources. Chapters 22, 26, 30, 52, 53 and 54, together with the Design Review Guidelines, the Scenic Quality Improvement Program and the Lake Tahoe Basin Scenic Resource Evaluation, are the most effective compliance measures.

Revisions to the measures in place are recommended to enhance threshold attainment and maintenance.

- c. SUPPLEMENTAL MEASURES: The following measures should be implemented by TRPA to enhance threshold attainment and maintenance: Scenic Resources And Community Design- (02)
- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Supplemental measures are generally expected to be highly effective to enhance threshold attainment and maintenance.

- 9. ADEQUACY OF COMPLIANCE MEASURES: Threshold attainment and maintenance will be enhanced by implementing the recommended revisions to the measures in place and the supplemental compliance measures. Recommendations contained in the section of each recreation area and bike path evaluation entitled "Recommendations for Preserving the Scenic Quality" must be implemented as part of the project review process in order to maintain scenic quality ratings. Since the majority of resources are located on recreation lands managed by public agencies, many of the activities may be carried out in the operations and management of the facilities not subject to TRPA review (i.e., exempted under Chapter 4). It is incumbent upon them and their concessionaires not to inadvertently degrade the resources through operations and management activities.

<u>TABLE SR-3</u>					
<u>INTERIM THRESHOLD ATTAINMENT TARGETS</u>					
<u>BIKE PATHS AND OUTDOOR RECREATION AREAS SCENIC QUALITY RATINGS</u>					
<u>INTERIM THRESHOLD ATTAINMENT TARGETS BASED ON THE RESULTS OF THE 2001 THRESHOLD EVALUATION</u>					
<u>Scenic Resources</u>		<u>Scenic Quality Interim Improvement Targets</u>			
		<u>Total Points Needed For Threshold Attainment of all Non-Attainment Units Following 2001 Evaluation</u>	<u>By 2002</u>	<u>By 2004</u>	<u>By 2006*</u>
<u>Washoe County</u>					
<u>Sand Harbor</u>					
<u>View 4-2</u>		<u>1.0</u>	<u>1.0</u>		
<u>Natural Feature 4-7</u>		<u>4.5</u>	<u>2.0</u>	<u>2.0</u>	<u>0.5</u>
<u>Incline Beach</u>					
<u>View 7-2</u>		<u>1.0</u>	<u>1.0</u>		
<u>Burnt Cedar Beach</u>					
<u>View 8-2</u>		<u>1.0</u>	<u>1.0</u>		
<u>Man-made Feature 8-b</u>		<u>1.0</u>	<u>1.0</u>		
<u>Douglas County</u>					
<u>Zephyr Cove</u>					
<u>View 2-3</u>		<u>1.0</u>	<u>1.0</u>		
<u>Cave Rock</u>					
<u>Man-made Feature 3-a</u>		<u>1.0</u>	<u>1.0</u>		

D. SR-4: COMMUNITY DESIGN

1. Evaluation Criteria

POLICY STATEMENT: It shall be the policy of the TRPA Governing Board in the development of the Regional Plan, in cooperation with local jurisdictions, to insure the height, bulk, texture, form, materials, colors, lighting, signing and other design elements of new, remodeled and redeveloped buildings be compatible with the natural, scenic and recreational values of the region.

The Community Design threshold is a policy statement, which applies to the built environment, and is not restricted to roadways or shoreline units. The Goals and Policies contain a Community Design Subelement within the Land Use Element, which sets forth policies for new and existing development. The following goals in the Regional Plan guide implementation of the threshold.

Goal #1 - Insure preservation and enhancement of the natural features and qualities of the region, provide public access to scenic views, and enhance the quality of the built environment.

Goal #2 - Regional building and community design criteria shall be established to ensure attainment of the scenic thresholds, maintenance of desired community character, compatibility of land uses, and the coordinated project review.

Following the direction established in the threshold and the Goals and Policies Plan, TRPA adopted the Scenic Resources Management Plan in 1989. The Plan included the SQIP, region-wide design standards (Code Chapter 30), sign standards (Code Chapter 26), the Design Review Guidelines manual, and scenic highway corridor designations (Code Chapter 30). Other standards considered part of the community design program include height standards (Code Chapter 22), land coverage standards (Code Chapter 20), driveway and parking standards (Code Chapter 24), grading standards (Code Chapter 64), and vegetation protection standards (Code Chapters 71 and 74).

The community design threshold is implemented in two ways. First, the community plan and redevelopment plan process has been used to develop design standards and guidelines that are tailored to the needs and desires of individual communities. The standards are considered “substitute” standards because they replace all or portions of TRPA ordinances adopted to regulate the same subject. This process has been used extensively throughout the region to provide community-specific sign standards, yet has also addressed issues such as building height and architectural design guidelines.

Secondly, the site planning and design principles contained in the ordinances and guidelines are implemented as part of individual development or redevelopment projects, and are reviewed and approved, by TRPA and local governments.

2. Measurement and Monitoring

Evaluation of this threshold grew out of work produced for the other thresholds. First, 2001 changes to specific criteria relevant to the built environment of the roadway and shoreline travel routes were identified; these included the man-made features, lake views and landscape views (when view blockage was an issue), and

roadway distractions subcomponents. Table 8-11 in the next section includes the list of all the roadway and shoreline travel routes that experienced change to these subcomponents, as well as those units considered at risk due to the current ratings or trends for these subcomponents. It is assumed that these types of changes to the built environment are also representative of properties covered by SR-4, but outside the travel route rating corridors.

Secondly, the reasons for score change or at risk status for each unit were then assessed compared to the requirements of the Scenic Resources Management Plan. As the primary elements of this plan are presented in the Design Review guidelines, Table 8-11 uses the main headings of the Guidelines as the organizational framework for the analysis.

The analysis assigns a “P” to those design elements that are contributing to positive change in the relevant scenic unit. This does not necessarily indicate that any given project is fully implementing the design standards or guidelines for that element, however. It merely identifies what type of design improvements are contributing to score increases. The analysis assigns an “N” to those design elements that are contributing to negative change in the relevant scenic unit. In this case, the negative change could result from failure to follow a design standard or guideline, or could reflect the effects of inadequate standards and guidelines to prevent negative change. It should be noted that overall building mass and general historic development character, two design elements with important implications in this evaluations, are not explicitly addressed in the Scenic Resources Management Plan and are, therefore, not evaluated in Table 8-11.

3. Results of Measurement and Monitoring Efforts

The effects of changes to the built environment, central to the evaluation of the community design threshold, are identified and discussed throughout this report. Table 8-11 uses field observations and document review to assess the 2001 condition relative to producing buildings compatible with the natural, scenic and recreational values of the region.

Examination of Table 8-11 illustrates the following:

- New landscaping and successful erosion control revegetation are making widespread improvements in developed areas. Unfortunately, loss of native vegetation and inadequate screening of new and existing structures and uses are contributing to degradation throughout the region.
- The commercial areas of the region that are making the most impressive gains are doing so by creating improvements to many of the community’s design elements. Improved architectural details, building siting, parking, landscaping, and pedestrian amenities all contribute.
- The elements of the Scenic Quality Management Plan that are producing the most serious concerns are obvious: structure height, structure materials and color, inadequate screening and loss/lack of native vegetative screening, and large and more numerous shorezone structures. This confirms information presented in other sections of this chapter.

Table 8-11. Community Design Evaluation

Travel Route	Site Design (Code Chpts. 22, 30, 64)				Building Design (Chpts. 22, 29, 30)				Setbacks (Chpt. 30)		Parking and Circulation (Chpts. 24, 30)		Snow Storage (Chpt. 30)	Landscaping (Chpt. 30)	Exterior Lighting (Chpt. 30)	Signs (Chpt. 26)	Water Conservation (Chpt. 30)	Scenic Highway Corridors (Chpt. 30)	Shorezone (Chpts. 53, 54)
	Site as Design Determinant	Designing for Views	Grading and Drainage	Screening Methods	Building Design	Structure Heights	Materials and Colors	Historic Buildings	Commercial Setbacks	Residential Setbacks	Parking Areas	On Site Circulation							
Travel Routes with Improved Scores																			
Roadway 3 - Emerald Bay					P									P					
Roadway 9 - Tahoma																			
Roadway 15 - Tahoe City										P	P			P					
Roadway 18 - Carmelian Bay		P	P		P					P	P			P					
Roadway 20A - Tahoe Vista					P*									P					
Roadway 20B - Kings Beach					P		P			P				P					
Roadway 20D - N. Stataline Casino																			
Roadway 22 - Crystal Bay										P	P								
Roadway 23 - Mt. Rose Highway																			
Roadway 25 - Ponderosa Area														P					
Roadway 26 - Sand Harbor										P									
Roadway 30D - Round Hill					P					P									
Roadway 31 - Meadow																			
Roadway 32 - Casino Area														P					
Roadway 33 - The Strip	P	P	P		P*					P	P	P		P					
Roadway 36A - Airport Area					P*														
Roadway 36B - Lake Valley					P*														
Roadway 42 - Outlet							P												
Roadway 44 - Kingsbury Grade														P					
Roadway 45 - Pioneer Trail, North			P											P					
Shoreline 5 - Ebright																			
Shoreline 6 - Emerald Bay																			
Shoreline 19 - Carmelian Bay				P	P	P	P												
Shoreline 31 - Bijou																			
Shoreline 32 - Al Tahoe														P					
Travel Routes with Reduced Scores or At Risk Travel Routes																			
Roadway 2 - Camp Richardson												N							
Roadway 11 - Homewood		N			N	N	N												
Roadway 17 - Cedar Flat		N																	
Roadway 18 - Carmelian Bay				N					N					N					N
Roadway 19 - Flick Point		N					N												
Roadway 20A - Tahoe Vista		N					N												N
Roadway 21 - Stataline				N			N												
Roadway 25 - Ponderosa Area				N															
Roadway 28 - Spooner Summit				N															N
Roadway 36A - Airport Area							N							N					N
Roadway 40 - Brockway Cutoff		N																	
Roadway 42 - Outlet				N			N							N					
Roadway 45 - Pioneer Trail, North					N					N	N	N		N					
Shoreline 3 - Jameson Beach																			
Shoreline 8 - Rubicon Point						N	N												N
Shoreline 9 - Rubicon Bay							N												
Shoreline 12 - McKinney Bay				N			N												
Shoreline 13 - Eagle Rock							N												
Shoreline 14 - Ward Creek							N			N									
Shoreline 15 - Tahoe City				N			N												
Shoreline 16 - Lake Forest							N												N
Shoreline 18 - Cedar Flat							N												N
Shoreline 20 - Flick Point							N			N									N
Shoreline 21 - Agate Bay							N			N									N
Shoreline 22 - Brockway							N			N									N
Shoreline 23 - Crystal Bay							N			N									N
Shoreline 24 - Sand Harbor																			
Shoreline 26 - Cave Rock							N												N
Shoreline 27 - Lincoln Park							N												N
Shoreline 28 - Tahoe School							N												N
Shoreline 29 - Zephyr Cove							N												N
Shoreline 30 - Edgewood							N												N
Shoreline 31 - Bijou							N			N									N

(A) indicates Community Design element contributes to positive change; (N) indicates Community Design element has not been implemented or otherwise fails to prevent negative change.

* Indicates positive change occurred, in part, through removal of poor quality structures or signs.

4. Trends

The fieldwork and assessment completed for this evaluation noted several important trends related to community design standards. They are described below.

Increased Use of Regionally Appropriate Architectural Elements and Other Design Changes

As noted previously, substantial public and private investment in redevelopment has and is occurring in the Lake Tahoe Region. Almost without exception, new projects introduce high quality materials and involve superior design elements. Both commercial and residential redeveloped properties often include design characteristics commonly called "Tahoe rustic" or "Old Tahoe" or "National Park". This includes use of peeled logs, natural wood and stone exterior siding, and steeply pitched roofs with dormer windows. Many projects also include paned glass for windows and richly detailed garden areas. These design elements often create regionally appropriate architectural improvements compared to the structures they replace.

Not all of the features of these redeveloped structures produce positive effects on the scenic quality or community design thresholds, however. As noted in other sections of this report, decreased setbacks, substantially larger and more massive structures, use of large window area and other reflective materials such as metal roofs, and the use of lighter exterior siding materials all combine to increase the visual dominance and visibility of man-made elements. Thus, while each new structure may have many pleasing and interesting elements, very often they combine to create negative effects on appreciation of the area's natural character.

Public/Private Projects Making Substantial Improvements

Throughout the region, public and joint public/private investments have produced substantial improvements to community character. These projects include several sidewalk/landscaping projects, erosion control and water quality improvement projects, land buy-out by public agencies that involves removal of decrepit structures, and the numerous projects involved in the South Lake Tahoe redevelopment area. Without exception, investment made in these projects has resulted in improving the sense of place and the functionality of core community areas. As noted in other sections of this chapter, public leadership in these projects has often encouraged private investment on nearby properties, expanding the benefits beyond the public project area boundaries.

Another benefit of these public projects is the degree of public involvement in their planning and design. Even in communities that lack strong statements of desired community character, the public nature of the design process often, though not always, produced projects that reflect such character. For example, design of the amenity package for the sidewalk project in Tahoe City was the result of years of community meetings and community fundraising to produce a specific desired result. On the other hand, community interest in the design for the pedestrian connection between Kingsbury Grade and the South Stateline Casino Core failed to secure a design that reflected a specific desired character.

Change in Community Character

The substantial redevelopment discussed throughout this report produces noticeable change in community character. This is both a positive and negative trend.

Goal #2 included above states, “Regional building and community design criteria shall be established to ensure...maintenance of desired community character...” The Regional Plan defines community character very broadly; that which respects the recreational and natural values of the region. Some community plans and the South Lake Tahoe Redevelopment Plan provide more specific direction. These plans use a combination of descriptive themes, allowed heights and densities, and allowed uses to define the desired future for the commercial areas. Even with this level of detail, however, many of the current community plans do not define community character specifically. They do not include description of the specific features, either those currently in place or planned for the future, that make a given area distinct.

It is possible to identify many areas in the region that have made positive improvements related to community character. The commercial centers in South Lake Tahoe (from the state line to Ski Run Blvd), Tahoe City, and Kings Beach have all experienced substantial improvements to the developed community character. In general, these areas have encouraged improved architectural design, greatly enhanced the pedestrian environment, improved the visibility and function of non-auto transportation systems, and supported regionally appropriate, compact, and functional commercial areas. These areas have also identified and restored or enhanced natural and cultural features that define community character. This includes improving lake access, restoring natural appearing open spaces, and upgrading or redeveloping structures with consistent design themes that reinforce community character. These features implement provisions of the community plans intended to establish or maintain desired community character.

Most areas of the region, however, lack a definitive statement concerning community character or a clearly articulated set of guidelines. These areas may, in fact, lack a broad community consensus about what such a character is or should be. In the absence of such a statement, it is possible to identify a change in character, but not to definitively assess the effect of that change relative to the requirements of Goal #2. How can one “maintain desired community character” if that is not well defined?

This is particularly acute along the shoreline and in the transition and rural roadway units. As established in other sections of this report, existing development trends are replacing small structures with very much larger ones. These redeveloped properties are also altering site design characteristics such as structure clustering, setbacks, and retention of native vegetation areas. In sum total, these changes are making a transition from a historically based, small scale, natural retreat” development type, to a more suburban or urban, large scale, resort” development type. This trend certainly changes community character. It can be assumed that, at the extreme, it fails to meet the requirement to maintain desired community character. Exactly how these areas could upgrade and expand while meeting the goal statement is not clear, however.

Loss of Historical Resources and Historical Development Patterns

This trend is integrally related to that described above, yet is sufficiently distinct to require additional discussion. Throughout this report, the negative scenic effects of removing small structures and replacing them with very much larger structures has been identified. Another feature of that development trend is the loss of historical structures and historical development patterns. Together these resources create community and landscape characters distinct in different parts of the region, but also unique to Tahoe. Structures constructed at different times in the region's history display changing technologies, resident and visitor interests, and environmental values. Changing economic and social trends over time brought about development patterns, including size of parcel, structure setbacks, and landscape treatment, which create the story of the built environment in Tahoe. This story includes transition from summer estate retreats, to small summer cabin tracts, and to the modern year-round mixed community we have today. The resulting landscape constitutes a scenic tourist draw and provides continuity with the past and a strong emotional attachment to repeat visitors.

It is important to note that most of the affected properties do not contain historical resources protected under current TRPA, state and federal programs. Table 8-11 did not identify loss of any structure protected by Code Chapter 29 as contributing to degradation of community design standards. The historical resources noted in this trend fall outside of the more narrow definitions provided by historic preservation statutes. There is no inventory of traditional Tahoe development patterns and structures, which provides authentic precedents for improved, regionally appropriate new design. The type of protection and standards needed to prevent the loss noted in this trend are different from those required by historical preservation programs. Refer to Section VI, Recommendations.

As noted previously, not all past development practices or "old" structures produce positive community character. From a scenic or community design standpoint, the important trend to note relative to historic resources is the broad extent to which they are being lost in Tahoe. The features, which create a distinct historic character in a given community, are being lost to the overall trend to maximize the size and height of new structures, and minimize both setbacks and natural open space.

Lack of Sign Compliance

Improvement to the region's signage has been considered a key feature in creating desirable commercial districts and attaining threshold standards. Since adoption of the TRPA sign ordinance (Chapter 26) in 1989, the quality, size and placement of signs has steadily improved. However, this evaluation concludes that signage continues to contribute to scenic problems. Specifically, signage continues to produce levels of clutter that is inconsistent with appreciation of the area's natural values. This includes signs that are too large, too close to the road, too high, and with colors and materials that compete to such an extent as to cause confusion.

Many jurisdictions and community plan areas have adopted substitute sign ordinance standards that allow variations in regulations, intending to produce equal or superior scenic results. The 1996 Evaluation included a detailed assessment of the strengths and weaknesses of many of these ordinances. In summary, it found all the ordinances produced some improvement in signage, particularly in the south

Stateline casino area. It also found the substitute ordinances included provisions that allowed some sign types or sizes out of conformance and lacked adequate improvement or amortization schedules. The 2001 Evaluation finds all the previously noted concerns still relevant. In addition, a steadily increasing use of temporary signage and banners is occurring. This is particularly noted at Camp Richardson and Zephyr Cove, both USFS properties operated by concessionaires, although it generally occurs throughout the commercial areas of the region. Without improvement in the pace of sign conformance and enforcement of sign restrictions, many areas of the region are unlikely to reach threshold attainment.

Loss of Native Landscape Material and Use of Non-native Plants

An important element in creating communities that respect the natural values of the Tahoe Region is maintaining the character of the native vegetation community. Increasingly, new projects throughout the region are introducing larger areas of non-native vegetation. This is particularly noticeable along the shoreline where areas of native underbrush are replaced by lawn bordered with flowers and introduced shrub species. It also occurs, however, with the increased use of frontage lawn strips and bedding plant type flower borders in commercial areas and associated with residential areas along transitional roadways. In some cases, the change in vegetation type greatly decreases vegetative screening for structures. In most cases, the loss of undeveloped open space and the increase in specialty plantings begins a transformation from a native mountain landscape to more of a suburban landscape that could exist nearly anywhere.

5. Threshold Attainment Status

Community Design

Although a numerical standard to assess threshold attainment for community design does not exist, it is possible to draw conclusions from other numerical ratings. Overall, the contribution from the built environment to non-attainment for travel route and scenic quality ratings precludes meeting the requirement to produce buildings compatible with the natural, scenic, and recreational values of the region. Specifically, while the quality of the built environment is being enhanced in some areas, there is an overall trend towards increased view blockage by buildings and loss of traditional community character. The goal of maintaining desired character cannot be attained because of the failure to specify desired community character in many communities. This threshold is not in attainment.

Attainment Schedule

As described for other scenic resource thresholds, threshold attainment is difficult to predict. The trends are generally positive in most developed commercial centers, although implementation of improvement projects is slow. Outside of these areas, existing trends are either stationary or negative. The evaluation illustrates that some important criteria of this threshold policy statement are not clearly defined and have only indirect standards in place by which to assess attainment.

6. Effectiveness of Measures in Place

Control measures intended to attain the community design threshold are identified and assessed in Table 8-12. The measures are not effective in many communities.

Category: community design

Parameter: design of the built environment

1. STANDARD: It shall be the policy of the TRPA Governing Board in development of the Regional Plan, in cooperation with local jurisdictions, to insure the height, bulk, texture, form, materials, colors, lighting, signing, and other design elements of new, remodeled and redeveloped buildings be compatible with the natural, scenic, and recreational values of the Region.
2. INDICATOR (UNITS): Community design is measured qualitatively by the physical design of the built environment. It is indirectly measured quantitatively through the travel route rating thresholds which are identified in SR-1.
3. MONITORING SUMMARY: ~~None to date for community design.~~ Evaluation of this threshold grew out of the work produced for the other thresholds. The 2001 findings are listed below:

New landscaping and successful erosion control revegetation are making widespread improvements in developed areas. However, loss of native vegetation and inadequate screening of new and existing structures and uses are contributing to degradation throughout the Region.

The commercial areas of the Region that are making the most impressive gains are doing so by creating improvements to many of the community's design elements. Improved architectural details, building siting, parking, landscaping, and pedestrian amenities all contribute.

The elements of the Scenic Quality Management Plan that are producing the most serious concerns are obvious: structure height, structure mass, structure materials and color, inadequate screening, and loss/lack of native vegetative screening, inadequate setbacks, and shorezone structures. Refer to SR-1 for monitoring summary of portions of the threshold travel route ratings which address the built environment.
4. ATTAINMENT STATUS: Non-attainment. The primary reasons for non-attainment are

the lack of progress toward amortization of non-conforming signs visible from threshold travel routes and public recreation areas, and the ~~lack-slow~~ of progress toward meeting interim targets for improving threshold travel route ratings. Refer also to SR-1. The trends are generally positive in most developed commercial areas, although implementation of improvement projects is progressing slowly. Most of the buildings and sites which have been developed or redeveloped since 1989 contribute to threshold attainment. Outside of these areas, existing trends are either stationary or negative. Many older buildings and sites predate the threshold and do not positively assist in attaining the threshold. ~~Most of the buildings and sites which have been developed or redeveloped since 1989 contribute to threshold attainment.~~

5. TARGET DATE: 2006
6. EVALUATION INTERVAL: Comprehensive reevaluation of regional design review program elements ~~with the next evaluation in 1996~~ are recommended in the 2001 Threshold Evaluation. ~~More focused evaluations may occur if substitute sign or design standards are presented to TRPA for consideration.~~
7. INTERIM TARGETS: ~~July 1, December 31, 1997~~ The Community Design Threshold is linked to the Threshold Travel Route (SR-1). No interim targets are established for community design; however, it is possible to draw conclusions from other numerical ratings. Overall, the contribution from the built environment to non-attainment for travel route and scenic quality ratings precludes meeting the requirement to produce buildings compatible with the natural, scenic and recreational values of the region.

By July 31, 2003, TRPA should ~~for the implementation of~~ implement the roadway design standards, revised height standards, revised exterior lighting and shoreline setback standards; ~~July 1, 2004~~ December 31, 2006 for the removal and/or conformance of all non-conforming signs visible from threshold travel routes and public recreation areas.

8. COMPLIANCE MEASURES:
 - a. MEASURES IN PLACE: Scenic Resource And Community Design - 01 through 15, inclusive identified for SR-1 and SR-2.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The compliance measures in place include the primary ordinance standards and recommended guidelines addressing physical design, site planning and signage. All measures in place must be implemented as part of the project review and approval process in order to maintain the scenic quality of identified resources. Chapters 22, 26, 30, 52, 53 and 54, together with the Design Review Guidelines, are the most effective compliance measures. Revisions to the measures in place are recommended to enhance threshold attainment and maintenance.
 - c. SUPPLEMENTAL MEASURES: The following measures should be implemented by TRPA to enhance threshold attainment and maintenance: Scenic Resource And Community Design - 01 and 03
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Generally expected to be highly effective to enhance threshold attainment and maintenance.

9. ADEQUACY OF COMPLIANCE MEASURES: With the addition of the recommended supplemental compliance measures and revisions to the measures in places, the compliance measures are expected to be adequate to attain and maintain the threshold.

Table 8-12. Effectiveness of Measures in Place for the Scenic Resources and Community Design Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(227) Chapter 4, Project Review and Exempt Activities: Exempts certain painting and re-roofing activities and the construction of certain fences from TRPA review.	Not entirely	Threshold rating decreases have occurred through exterior painting and reroofing that increases structure visibility from threshold scenic units.	A.5 A.7 A.8
(228) Chapter 20, Land Coverage Limitations: places limitations on land coverage in the Tahoe Region, pursuant to the soil conservation threshold standard.	Not entirely	Coverage limitations can work contrary to providing adequate scenic setbacks.	A.24
(229) Chapter 22, Height Standards: Regulates building heights based on roof pitch, building site slopes, and other factors. Establishes special height districts for certain areas. Regulates height of structures other than buildings. Findings required for additional height for buildings and other structures include that ridgeline views are not obstructed, that buildings visually remain within the forest canopy, and that buildings are adequately screened using distance, color and materials from threshold viewpoints.	No	Unclear definition exists as to the findings required for additional height, particularly in relation to establishing tree canopy height. Also, new structures that exceed 26' along the shoreline and in some roadway units are creating threshold degradation. There is no control over building mass, which can be just as important as height.	A.1 A.4 A.9 C.4
(230) Chapter 24, Driveway and Parking Standards: Regulates the amount of driveway entries and related curb cuts along highways thereby minimizing impacts to thresholds related to the number of roadway distractions.	Yes	None needed.	None needed.
(231) Chapter 26, Signs: Regulates the amount and location of temporary and permanent signage based on plan area type. In addition, Chapter 26 establishes minimum sign standards applicable to all signs, including an amortization schedule for non-conforming signs visible from threshold travel routes.	Not entirely	The pace of sign conformance, and the allowances of some provisions in the substitute sign standard ordinances, prevents some areas from making adequate scenic improvements.	A.13 A.17
(232) Chapter 29, Historic Resources: Regulates the construction, reconstruction, repair and maintenance of structures identified on TRPA's Historic Resources map overlay. Provides sign guidelines for those activities using the Secretary of Interior's Guidelines for Rehabilitation of Historic Buildings.	Not entirely	Chapter 29 does not include a process for identifying and protecting historical development other than those that meet the narrow state and federal criteria for significant. As a result, areas and individual buildings that display distinct community character based on historical trends are being lost.	C.2

Table 8-7. Effectiveness of Measures in Place for the Scenic Resources and Community Design Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(233) Chapter 30, Design Standards: Regulates physical site planning and design for all uses within the region, including site design, snow storage, screening, setback of structures, building design, landscaping, and exterior lighting.	Not entirely	Threshold degradation is occurring due to development trends that increase structure dominance. New or remodeled structures: increase size and mass, increase use of reflective materials such as large areas of glass and metal roofs, decrease structure setbacks, increase use of non-recessive exterior colors, introduce non-native landscaping materials, and change community character.	A.1 – A.5 A.8 A.9 A.19 A.20 C.1 C.4 C.5
(234) Chapter 53, Shorezone Tolerance Districts and Development Standards: Regulates the color on all applicable structures located within the shorezone in order to minimize the apparent visual contrast with the natural landscape. Also regulates roofing materials and fencing materials on applicable structures located within the shorezone.	No	Increasing number and size of piers and number of boatlifts are contributing to scenic degradation. Additionally, growth in unpermitted buoys adds to growth of buoy fields reducing the shoreline that remains uncluttered with buoys.	Adopt the Shorezone Ordinance. A.4 A.16
(235) Chapter 54, Development Standards Lakeward of High Water: Regulates the physical design and location of certain structures lakeward of high water including piers, boat amps, floating dock and platforms, multiple use facilities, jetty and breakwaters, marinas, and shoreline protective structures.	No	Increasing size of piers and number of boatlifts is contributing to scenic degradation.	Adopt the Shorezone Ordinance. A.4
(236) Chapter 64, Grading Standards: Regulates the amount and location of physical site disturbance and grading. Requires minimum standards for cutting and filling activities and setbacks thereof in conjunction with the Uniform Building Code.	Yes	None needed.	None needed.
(237) Chapter 65, Vegetation Protection during Construction: Regulates the type and location of vegetation protection disturbance activities that may occur during site development. Requires protection of existing vegetation outside of the construction area and revegetation of areas disturbed during construction.	Yes	None needed.	None needed.

Table 8-7. Effectiveness of Measures in Place for the Scenic Resources and Community Design Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(238) Chapter 77, Revegetation: Regulates revegetation, soil stabilization and improvement activities on disturbed sites. Establishes minimum standards for acceptable plant materials, fertilizer use, soil stabilization and materials, and grading.	Yes	None needed.	None needed.
(239) Chapter 81, Water Quality Control: Regulates snow removal and snow disposal locations for all public and private snow removal operations.	Yes	None needed.	None needed.
(240) Design Review Guidelines: The guidelines are a comprehensive manual of design and site planning recommendations to assist project proponents in meeting adopted design standards and attaining threshold standards. Application of Design Review Guidelines on individual projects will help to maintain and improve the overall visual quality of the region's built environment. The guidelines provide specific solutions in 11 different areas of adopted design standards in TRPA's Code of Ordinances.	Not entirely	The Design Review Guidelines contain many features that are contributing to positive improvements. However, scenic degradation continues as properties develop and redevelop, thus the primary TRPA design outreach tool is obviously ineffective. Revisions will be necessary as recommendations for standards modification occur. In addition, all information related to current scenic quality status, development trends, and improved use of design techniques is not easily available to either TRPA staff or the general public or design professions.	A.1 – A.25 C.1 – C.5
(241) Scenic Quality Improvement Program: The Scenic Quality Improvement Program (SQIP) is the regional scenic threshold attainment program. Included in the SQIP are updated scenic quality threshold ratings for all roadway and shoreline travel routes in both scenic threshold rating categories. The SQIP focuses on the roadway and shoreline travel routes and scenic resources, which currently are not in attainment with the threshold standards and are targeted for restoration. Special visual inventories for each unit and resource are included along with a set of design and site planning recommendations necessary for each to attain the threshold standard. Possible funding sources and other incentives, which could be offered in order to stimulate physical improvements, are identified.	Not entirely	Scenic quality is improving in response to many SQIP features. However, as continued scenic degradation is also occurring, inadequacies in the scenic threshold attainment program exist. Lack of funding and the slow pace of some specific improvement projects contribute, as does inadequate protections related to new and redevelopment projects.	A.11 A.23

Table 8-7. Effectiveness of Measures in Place for the Scenic Resources and Community Design Threshold (continued)

Compliance Measure	Effectiveness	Explanation	Recommendation
(242) Project Review Information Packet: The project review process involves making Article V(g) findings for threshold attainment and maintenance. Photomontage or other visual simulations are generally used to assess a proposed project's potential scenic impacts.~	Not entirely	Information available to the general public related to scenic impacts is often not readily available or easy to understand. In addition, lack of specific requirements for scenic assessments, including report and simulation requirements, limits the application and effectiveness of a critical evaluation tool.	A.2 A.18 A.21
(243) Scenic Quality Ratings -- Features Visible from Bike Paths and Outdoor Recreation Areas Open to the General Public: TRPA threshold standards include a requirement to maintain or improve the visual quality of views from bike paths and outdoor recreation areas open to the general public.	Not entirely	Some public recreation areas and bike trails are not included under the current system. Additionally, broad appreciation of the current system is lacking.	B.1
(Supplemental Measure 244) Nevada-side Utility Line Undergrounding Program: This compliance measure would develop a new program on the Nevada side including funding and implementation schedules to place underground overhead utility lines and related structures along state and federal highways, wherever possible. The program could be developed and administered in a manner similar to California Public Utilities Commission's Rule 20/32 utility undergrounding programs.	No	TRPA presented this concept to the Nevada Interim Finance Committee to a poor reception. The program does not currently exist.	Additional outreach to Nevada officials is possible.
(Supplemental Measure 245) Real Time Monitoring Program: Integrate monitoring of selected scenic resources into the program so data can be more readily gathered on a continual basis. This measure is expected to be highly effective.	No	This program has yet to be implemented.	A.18 A.19
(Supplemental Measure 246) Integrate projects identified in the SQIP, which restore scenic quality into the Environmental Improvement Program. This measure is expected to be highly effective.	Yes	Although somewhat slow progress on EIP projects has occurred, they have generally produced high scenic benefits as predicted.	None needed.

IV. STATUS OF 1996 RECOMMENDATIONS

The 1996 Threshold Evaluation found both improvements and increasingly troublesome trends for the scenic quality thresholds. It identified a total of 32 recommendations needed to reverse negative trends and move the region toward threshold attainment. Of these, six have been accomplished. Over half of the recommendations have yet to be initiated. This situation provides clear explanation for the continued scenic degradation noted in this chapter.

The following discussion refers to recommendations included in the 1996 Evaluation for all four threshold indicators. The references cited identify the specific recommendations as follows: SR-1 (travel route ratings), SR-2 (scenic quality ratings), SR-3 (recreation areas and bike trails), and SR-4 (community design), followed by the recommendation number indicated in the 1996 Evaluation text.

- A. Several 1996 recommendations addressed the need to amend the Code to create design standards that are more clear and that improve the ability of the agency to protect scenic resources. (SR-1 #3, 4, 7, 10; SR-2 #4, 6; SR-4 #2, 3, 5, 6, 7, and 9) The proposed Code amendments would address color, height, setback, and window area allowed for structures within view of scenic corridors, including those along Lake Tahoe's shore. (The recommendations for shorezone structures specifically delegate development of new design standards to the Shorezone Ordinance process.) Several Code amendment recommendations would strengthen provisions of the sign ordinance, and the substitute ordinances already approved, particularly related to sign conformance and size and placement of certain sign types. Other Code amendment recommendations include restrictions on sports field and other uses lighting requirements, development of transportation corridor design standards, and increased coverage allowances for longer driveways to increase setback from scenic corridors.

Status: None of these recommendations have been completed. Some staff and consultant work initiated development of amendments to the sign ordinance and creation of transportation corridor design standards. The Shorezone Ordinance process provided substantial work on design standards for shorezone structures, as well as development of a scenic BMP program for littoral parcels. None of this work has progressed far enough to be adopted. No substantive work has been initiated on new standards for setbacks, height, or mass issues.

- B. Several 1996 recommendations included amendments to the Code or other TRPA plans that improve the permitting process or internal staff coordination to use the existing regulatory structure better. (SR-1 #1, 2, 9, 13; SR-2 #1, 3, 5, 6; SR-3 #1; SR-4 #1, and 4) These include amendments to the regional Plan, EIP, and SQIP to reflect rating changes and specific improvement proposals. (Aggressive implementation of improvement programs, including securing additional funds, was also recommended.) Several recommendations address improved internal staff training and coordination, increased use of the TEGIS and GIS systems, integrating scenic into the real time monitoring program, and increased use of the TRPA boat to assess and monitor shoreline changes. Three recommendations address clarifications in the Code to assure that design standards are applied to all projects, to establish a process for determining additional height allowances, and to add findings language for effects on scenic resources.

Status: Several of these items are accomplished. Updates to the SQIP and EIP program routinely occur to include scenic improvement proposals. Internal staff training and coordination have been addressed, yet as staff members turn over, it is a difficult task to assure new staff are sufficiently trained in this complicated system. TRPA has also spent periods of time in the last five years without a designated scenic planner; this seriously compromises the leadership needed to aggressively implement many scenic program elements. To date, effective use of coordinated advanced technology to monitor, evaluate, and promote improved scenic quality protection has not occurred. Code amendments to Chapters 4 (definition of a project), 22 (height standards), and 30 (scenic resources) have not occurred.

- C. The 1996 recommendations included two recommendations for new mitigation programs. These would allow off-site mitigation for scenic impacts and banking scenic improvement credit. (SR-1 #2 and 11)

Status: These programs are currently being developed. Individual projects are allowed to consider off site improvements for scenic impacts, yet these are proposed and evaluated on a project by project basis. Without a specifically developed program, the effectiveness of these measures cannot be assessed.

- D. Several 1996 recommendations addressed needs for specific projects or actions. These include removing the billboards in Roadway Unit 36 (SR-1 #8), developing design alternatives for problems associated with the Caltrans viaduct project in Emerald Bay (SR-2 #2), and improvements in the South Stateline area (SR-4 #8). The recommendations also identify adding two public recreation areas to the threshold program, as well as developing a policy to add bike trail segments as they are built (SR-3 #3 and 4).

Status: The billboards have been removed. Ongoing discussions related to design alternatives for the South Stateline and Emerald Bay areas have occurred, although no specific agreements have been reached. No work related to adding public recreation areas to the threshold or developing a policy for adding new bike trail segments has been done.

- E. Three 1996 recommendations address TRPA work with other organizations to continue or improve programs geared to scenic improvements. Specifically, the recommendations required TRPA to work with both California and Nevada to strengthen and promote development of utility undergrounding programs (SR-1 #5 and 6). Coordination with recreation providers to improve knowledge and use of the threshold scenic system for public recreation areas was also included. (SR-3 #2)

Status: Most of these recommendations have been implemented, although their effectiveness has been less than hoped for. The Nevada Interim Finance Committee was not interested in pursuing the TRPA proposal for development of an utility undergrounding program. Working through the Tahoe Coalition of Outdoor Recreation Providers (TCORP) has increased awareness of public recreation area scenic quality, yet a true understanding and participation in the program has yet to develop. In the face of deregulation, TRPA has not lobbied California agencies or organizations related to utility undergrounding. (It should be noted that, due to staff persistence on a project specific basis, utility undergrounding continues to occur and has made noticeable improvement in several units.)

V. 2001 RECOMMENDATIONS

A. SR-1. Roadway and Shoreline Travel Route and SR-2. Scenic Quality Ratings

This evaluation is charged with recommending actions necessary to attain scenic thresholds. As discussed previously, current trends in most commercial districts are positive; assuming continued public and private investment following the vision in the community plans, few additional recommendations are needed. Highway projects and traffic and parking congestion, particularly in the natural roadway areas, have produced some impacts requiring additional recommendations. Serious concern about the deteriorating situation along the shoreline and some of the transition roadway units, however, prompts the most extensive development of new recommendations. The following discussion summarizes trends noted in previous sections and proposes specific actions needed to attain or maintain thresholds. The references noted in parentheses refer to the section of this chapter in which the trend is discussed in detail.

This evaluation notes the impacts associated with increased visibility of new structures, particularly, though not exclusively, residential structures along the shoreline. The features of this trend that produce impacts are:

- new residences that increase size and scale, reduce setbacks, increase color contrast, and include reflective surfaces such as windows and metal roofs.
- new structures that increase size and scale and resulting visual dominance.
- residential remodel and tree thinning that increases residential visibility in the forested backdrop.
- unauthorized removal of trees, vegetation, for view enhancement that increases residential visibility.
- the deliberate poisoning of trees in order to claim the need to remove a dead and dying tree for public health and safety reasons.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~To address the impacts identified, the following measures should be implemented:~~

~~A.1. Code amendments for Chapter 30, Design Standards.~~

~~Responsible Entity: TRPA~~

~~Funding Cost: \$30,000~~

~~Completion Date: June 2002~~

~~Threshold Indicator: SR-1, SR-2, SR-3~~

~~**Recommendation:** Develop a new section of Code Chapter 30, Design Standards that creates limits on the size and scale of new structures using a floor area ratio or other equivalent quantitative measure. These limits should be specific to the different landscape types (urban, transition, natural), the degree of visibility of the proposed project, and setback from scenic corridors and viewpoints. (For example, increased mass would be allowed for structures in urban areas with good vegetative screening and generous setbacks.) This would also require amendments to Chapter 22, Height Standards, to reflect a different approach to determining maximum height. (EIP #537)~~

~~**Product:** Code amendments to protect the scenic quality of scenic corridors.~~

A.2. Standardize scenic requirement for project applications and develop scenic requirement checklist.

Responsible Entity: ~~TRPA~~
Funding Cost: ~~Staff Time~~
Completion Date: ~~February 2002~~
Threshold Indicator: ~~SR-1~~

Recommendation: ~~Immediately improve the ability of the TRPA Project Review staff to adequately apply existing requirements to protect scenic resources. This includes scenic evaluations, which include simulations and a visual magnitude analysis for all projects visible from non-attainment and at risk roadway and shoreline units; and implement a scenic requirement checklist for use throughout the region that addresses color, roof material, setback, siting and mass, height, and window area. Additionally, TRPA should develop specific standards for scenic evaluation reports and simulations.~~

Product: ~~Amendments will be presented to the Governing Board for a scenic review process and a scenic requirement checklist process will be developed for use in Project Review.~~

A.3. Complete and adopt proposed scenic shorezone ordinances

Responsible Entity: ~~TRPA~~
Funding Cost: ~~\$55,000~~
Completion Date: ~~April 2002~~
Threshold Indicator: ~~SR-1~~

Recommendation: ~~Adopt the proposed Shorezone Ordinance with the new shorezone scenic system. Until these provisions are adopted, TRPA should use the determination of visual landscape type, the adopted visual magnitude system outlined in the SQIP and Design Review Guidelines, and the provisions of the Scenic BMP program as tools to assess potential for significant impact and as a guide for effects of proposed mitigation.~~

Product: ~~Shorezone EIS and Code amendments will be presented to Governing Board for consideration.~~

A.4. Develop new design standards for development on littoral parcels

Responsible Entity: ~~TRPA~~
Funding Cost: ~~\$30,000~~
Completion Date: ~~April 2002~~
Threshold Indicator: ~~SR-1~~

Recommendation: ~~For all littoral parcels, develop a new approach to design standards that allows a streamlined review process for adherence to protective standards and a more flexible process with increased review and evaluation. The streamlined process should include establishing bulk/massing limits that allow some increase in structure size, yet avoid the greatly increased mass and scale described in the previous sections. (These bulk/mass limits would be established by the Chapter 30 amendments). This process should also include specific requirements for color, setback, landscaping, roof material, and window area. A more flexible process should include improved design standards, yet could allow a wider field of design choices based on inherent characteristics of a particular site or neighborhood. The more flexible system should also allow for certain tradeoffs, such as increased height for increased setback. Until this is completed, development should be limited in non-attainment areas. (EIP #537)~~

~~**Product:** Code amendments and new design standards will be presented to Governing Board for consideration.~~

~~**A.5. Amend Code to prohibit the use of metal roofs visible from the scenic roadway and shoreline corridors.**~~

~~Responsible Entity: — TRPA
Funding Cost: — Staff Time
Completion Date: — February 2002
Threshold Indicator: — SR-1~~

~~**Recommendation:** Metal roofs reflect light, even those that are dark colored and have a matte finish. Amend Chapter 30 to prohibit metal roofs on structures visible from a scenic roadway and shoreline corridors. This provision would apply to all structures visible from the shorezone and all structure visible from natural roadway scenic corridors.~~

~~**Product:** Code amendments will be presented to Governing Board for consideration.~~

~~**A.6. Code amendment of Chapter 71, Forest Health**~~

~~Responsible Entity: — TRPA
Funding Cost: — Staff Time
Completion Date: — February 2003
Threshold Indicator: — SR-1~~

~~**Recommendation:** Amend Chapter 71 to require a scenic professional be consulted prior to approval of all forest health projects. The thinning prescription should take into account the potential for increasing view of structures from scenic corridors. This should include a reduced cut prescription in situations with light colored structures, large amounts of glass, and reflective roof materials.~~

~~**Product:** Chapter 71 Code amendments.~~

~~**A.7. Amend Code Chapter 4, Exemptions**~~

~~Responsible Entity: — TRPA
Funding Cost: — Staff Time
Completion Date: — February 2002
Threshold Indicator: — SR-1, SR-2, SR-3, SR-4~~

~~**Recommendation:** Amend Code Chapter 4 (Exemptions) to allow alteration in structure color and roof materials visible from scenic corridors and recreation areas/bike trails, provided they meet the TRPA Design Standards.~~

~~**Product:** Chapter 4 Code amendments.~~

~~**A.8. Develop a demonstration painting project**~~

~~Responsible Entity: — TRPA
Funding Cost: — \$5,000
Completion Date: — December 2003
Threshold Indicator: — SR-1, SR-4~~

~~**Recommendation:** Develop a demonstration painting project or a widely dispersed simulation that illustrates the benefits of minimizing color contrast when choosing exterior building colors.~~

~~**Product:** Present demonstration project to Governing Board and produce a brochure for distribution to the general public.~~

~~This evaluation identifies loss of lake views as a critical negative trend. Factors contributing to this trend include incremental loss of lake views from redeveloped residential properties and from maturing natural or planted vegetation (II.A.4.c). To avoid further loss of lake views from the roadway, the following recommendations should be implemented:~~

~~**A.9. Amend Code Chapter 30, Design Standards, to protect lake views from the roadway**~~

~~Responsible Entity: TRPA
Funding Cost: Staff Time
Completion Date: July 2003
Threshold Indicator: SR-1~~

~~**Recommendation:** Amend the Code to specifically require all new projects along the roadways to avoid net loss of lake views, even if that means reducing the structure mass or height otherwise allowed. Project assessment must consider the effects of all aspects of the project, including primary and accessory structures and proposed landscaping.~~

~~**Product:** Code amendments to protect lake views.~~

~~**A.10. Region wide view enhancement and development of scenic turnouts**~~

~~Responsible Entity: TRPA, CALTRANS, NDOT
Funding Cost: Staff Time
Completion Date: March 2003
Threshold Indicator: SR-1, SR-2~~

~~**Recommendation:** Targeted vegetative clearing, thinning, or pruning should be accomplished to maintain or improve lake views from certain roadway units. This must be carefully planned and executed to avoid creating new scenic impacts from other viewing points.~~

~~**Product:** Code amendments will be presented to Governing Board for consideration~~

~~**A.11. Identify and pursue scenic conservation easements**~~

~~Responsible Entity: TRPA, CTC, USFS, CA STATE PARKS, NV STATE PARKS
Funding Cost: Staff Time
Completion Date: December 2003
Threshold Indicator: SR-1, SR-2~~

~~**Recommendation:** Identify and pursue the opportunity to use scenic conservation easements, to mitigate potential impacts from development in visually sensitive areas, particularly to preserve lake views.~~

~~**Product:** Update Scenic EIP chapter to add identified scenic conservation easements.~~

~~This evaluation notes scenic degradation occurring along the transition and natural roadways due to increasing parking, signage clutter at USFS concession sites, and use of inappropriately designed highway appurtenances. To avoid scenic degradation along the highways, particularly though not exclusively in the natural roadway areas, the following recommendations should be implemented:~~

A.12. Highway design standards and guidelines

~~Responsible Entity: TRPA, CALTRANS, NDOT
Funding Cost: Staff Time
Completion Date: March 2002
Threshold Indicator: SR-1~~

~~**Recommendation:** TRPA should complete the task of completing the highway design standards. Coordination with Caltrans and NDOT has occurred, and initial concepts developed.~~

~~**Product:** Highway Design Standards and Guidelines.~~

A.13. Enforcement program

~~Responsible Entity: TRPA, USFS, CA STATE PARKS, NV STATE PARKS.
Funding Cost: Staff Time
Completion Date: September 2002
Threshold Indicator: SR-1, SR-3~~

~~**Recommendation:** TRPA should work with the USFS and State Parks of both states to enforce restrictions on temporary and seasonal uses so that undesignated parking, unpermitted signage, and other uses near recreation areas and bike trails and within the scenic corridor viewshed do not occur. (EIP #503, #10001)~~

~~**Product:** Enforcement program implemented.~~

A.14. Parking program

~~Responsible Entity: TRPA, USFS, CALTRANS.
Funding Cost: Staff Time
Completion Date: September 2004
Threshold Indicator: SR-1, SR-3~~

~~**Recommendation:** TRPA should continue to pursue coordinated plans to reduce highway parking and congestion along SR 28 and in Emerald Bay.~~

~~**Product:** Reduced parking and visual clutter along SR 28 and Emerald Bay.~~

A.15. Review and revise Scenic Resource Thresholds

~~Responsible Entity: TRPA
Funding/Cost: \$75,000
Completion Date: March 2004
Threshold Indicator: SR-1, SR-2~~

~~**Recommendation:** Based on the Visual Perception Survey for Lake Tahoe and the adopted evaluations, assess existing TRPA threshold standards and indicators for consistency with desired future conditions and make recommendations for revising threshold standards and indicators consistent with environmental threshold carrying capacities. Consideration should be given to developing a quantifiable system to~~

~~measure scenic quality and changes in the landscape. Consideration for this assessment should include 1) classification of different landscape character types and absorption capacities, 2) development of a measurable system that can quantify effects of human activities, 3) evaluation protocols that ensure attributes are measured accurately and precisely.~~

~~**Product:** Document that contains a thorough review of existing TRPA threshold standards and indicators and recommendations for improving standards and indicators.~~

~~Some impacts occur through inadequate enforcement and permitting, or insufficient use of TRPA resources. This includes:~~

- ~~• inadequate scenic assessment and permit conditions that allow development with impacts to proceed~~
- ~~• increase in unpermitted buoys, particularly along publicly owned shoreline~~
- ~~• lack of sign ordinance compliance, particularly regarding the schedule of improvements~~
- ~~• lack of compliance with conditions of approval, particularly an enforcement issue after project completion~~
- ~~• lack of knowledge of and access to archival information to improve project design and review~~
- ~~• lack of staff and public training related to the specialized knowledge needs of the scenic system~~

~~Specific areas of improved permitting and enforcement include:~~

~~**A.16. Buoy sticker program**~~

~~Responsible Entity: TRPA, CA STATE LANDS, NV STATE LANDS~~

~~Funding Cost: Staff Time~~

~~Completion Date: July 2002~~

~~Threshold Indicator: SR-1~~

~~**Recommendation:** Implement the proposed buoy sticker program to better identify buoys with permits and allow easier removal of those without.~~

~~**Product:** Buoy Sticker Program.~~

~~**A.17. Signage program**~~

~~Responsible Entity: TRPA, CSLT, USFS, CA STATE PARKS, NV STATE PARKS~~

~~Funding Cost: Staff Time~~

~~Completion Date: July 2003~~

~~Threshold Indicator: SR-1, SR-4~~

~~**Recommendation:** Work with the City of South Lake Tahoe and Placer County to revise and then consistently enforce a substitute sign ordinance that meets the requirements of Code Chapter 26. Work with other jurisdictions, including the USFS related to concession areas, to improve the pace of signage replacement and compliance. (EIP #545, #546, and #875)~~

~~**Product:** Improved signage replacement and compliance program.~~

A.18. Institute a scenic monitoring program

Responsible Entity: ~~TRPA~~
Funding Cost: ~~\$40,000~~
Completion Date: ~~December 2003~~
Threshold Indicator: ~~SR-1, SR-2, SR-3~~

Recommendation: ~~Develop and institute a comprehensive scenic monitoring system that allows more frequent field visits and annual assessments of scenic conditions. In part, this system should identify the critical viewing periods to standardize the assessment methodology. It should also include photo documentation and be integrated into the GIS system in such a way as to allow easy access by staff and members of the public. (EIP # 609)~~

Product: ~~Scenic monitoring program~~

A.19. Monitoring program

Responsible Entity: ~~LRPD, PR, COMPLIANCE~~
Funding Cost: ~~Staff Time~~
Completion Date: ~~February 2002~~
Threshold Indicator: ~~SR-1, SR-2, SR-3, SR-4~~

Recommendation: ~~To improve assessment of current programs and mitigation measures, all project proponents with projects visible from scenic corridors should provide before and after photos from approved viewpoints. TRPA should conduct annual post-construction evaluations of representative projects and propose and implement remedial actions if necessary. (EIP # 609)~~

Product: ~~Established protocols for scenic monitoring of projects visible from scenic corridors.~~

A.20. Data information system

Responsible Entity: ~~TRPA~~
Funding Cost: ~~\$50,000~~
Completion Date: ~~December 2004~~
Threshold Indicator: ~~SR-1, SR-2, SR-3, SR-4~~

Recommendation: ~~Develop a modern data archive and retrieval system that allows easy access by TRPA staff and the public to information critical to protection of scenic resources. This system should be GIS based and available on line. It should allow query from a map and by other metadata elements (e.g., date, location, name, content), and include the following:~~

- ~~• All past and current scenic resource and travel route rating scores;~~
- ~~• Landscape types for roadway and shoreline units;~~
- ~~• Archival and recent photos of all mapped scenic resources;~~
- ~~• Links to selected reports, visual simulations, and photos that represent critical monitoring components (including background information and project specific evaluations); and~~
- ~~• Comprehensive standards for monitoring, data and metadata creation, and updating should be implemented based on available research precedents.~~

~~Appropriate data connections to other TRPA databases should be developed to avoid duplication and enhance the scientific basis for scenic resource data.~~

~~**Product:** Updated TEGIS~~

~~**A.21. Scenic mitigation security**~~

~~Responsible Entity: TRPA, APPLICANTS~~

~~Funding Cost: Staff Time~~

~~Completion Date: June 2002~~

~~Threshold Indicator: SR-1, SR-4~~

~~**Recommendation:** For projects visible from non-attainment and at risk areas, require security equal to the cost of scenic mitigation measures and a five-year check on their continued presence.~~

~~**Product:** Code amendments requiring scenic securities.~~

~~**A.22. Update shoreline travel unit inventory**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: Staff Time~~

~~Completion Date: July 2002~~

~~Threshold Indicator: SR-1, SR-2~~

~~**Recommendation:** Bisect Shoreline Unit #26, Cave Rock, south of Glenbrook Bay and create two new shoreline travel units. Re-rate the units based on the threshold criteria.~~

~~**Product:** Present updated shoreline travel unit to Governing Board for adoption.~~

~~Many recommendations from the 1996 Threshold Evaluation have not been implemented. Many of those that remain applicable, and are not included in the EIP or other implementation strategies, have been incorporated into the recommendations found in this section. The following measures from the previous report require recommendation:~~

~~**A.23. Develop scenic banking and offsite mitigation program**~~

~~Responsible Entity: TRPA~~

~~Funding Cost: \$30,000 (contract signed)~~

~~Completion Date: March 2004~~

~~Threshold Indicator: SR-1, SR-4~~

~~**Recommendation:** TRPA should develop a system to bank scenic credit. This system should address the problem of removing structures in advance of a specific project proposal for redevelopment of the site. Dr. Stephen Sheppard is currently working on this program. (EIP #542)~~

~~**Product:** Scenic Banking and Offsite Mitigation Program will be developed to present to the Governing Board for consideration.~~

~~**A.24. Amend Code Chapter 20, Coverage**~~

~~Responsible Entity: TRPA~~

~~Funding Cost: Staff Time~~

~~Completion Date: September 2003~~

~~Threshold Indicator: SR-1~~

~~**Recommendation:** TRPA should amend Chapter 20 of the Code to permit additional coverage to be used on driveways when the coverage will lengthen a driveway to create a deeper setback.~~

~~**Product:** Code amendments will be presented to Governing Board for consideration.~~

~~**A.25. Basin-wide viewshed/scenic resource identification and protection study**~~

~~Responsible Entity: TRPA~~

~~Funding Cost: \$15,000~~

~~Completion Date: January 2004~~

~~Threshold Indicator: SR-1, SR-2~~

~~**Recommendation:** TRPA should implement a study to identify specific resources that are more important to maintain and protect on a basin-wide scale. Two critical elements of this study are the resources seen most frequently and those seen for longer periods of time from scenic corridors and turn-outs.~~

~~**Product:** Basin-wide viewshed analysis and scenic resource identification and protection study.~~

B. SR-3 RECREATION AREAS AND BIKE TRAILS

As noted in this report, investment in maintenance and upgrade of recreation areas has resulted in widespread improvements to on site facilities. Some recreation areas have suffered from construction of new facilities out of scale or character with their sites and some areas have yet to make recommended improvements, although the overall trend is positive. Views from the recreation areas have suffered in a way similar to that noted for the roadway and shoreline units outside of the developed commercial centers. The following recommendations address specific concerns noted in the previous sections. Section numbers provided in parentheses are references to more complete discussion of the trends identified.

Many public recreation areas, areas of public recreation access and bike trails are not protected by threshold status. Threshold protection should be extended to encompass all the developed public recreation areas and public bike trails, including new publicly owned recreation areas, developed overlook sites, and major trail connections between and within recreation areas. These are listed below. To complete the inventory and scoring process necessary for these areas, TRPA should require, as a condition of approval, the public recreation area or bike trail provider to update the inventory and scores for new facilities. Also, master plans developed for large recreation properties (such as for Burton Creek State Park and the Whittell Castle property) should include an inventory and score for natural site features. To assure timely threshold protection, TRPA may need to prepare the inventory and scores for these sites. (EIP #539)

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~**B.1. Update Lake Tahoe Scenic Resource Evaluation**~~

~~Responsible Entity: TRPA~~

~~Funding Cost: Staff Time~~

~~Completion Date: December 2003~~

~~Threshold Indicator: SR-3~~

~~**Recommendation:** TRPA should update the Lake Tahoe Scenic Resource Evaluation to add newly acquired public recreation sites, developed scenic overlooks, major public gathering areas, extensions of existing bike trails, and new bike trails to assure timely threshold protection.~~

~~**Product:** Lake Tahoe Scenic Resource Evaluation~~

Public Recreation Sites

- ~~Cove East (only that portion open to public recreation).~~
- ~~64 Acres~~
- ~~Gatekeeper's Cabin and beach access (This is a museum site, but offers public lake access near the dam unlike any other in Tahoe. Also includes keyhole views of downtown Tahoe City along the shoreline.)~~
- ~~Burton Creek State Park (Currently undeveloped, California State Parks is preparing a master plan now.)~~
- ~~CTC North Tahoe Beach Center~~
- ~~Chimney Beach and Skunk Harbor~~
- ~~Whittell Estate~~
- ~~Spooner Lake Unit of Lake Tahoe Nevada State Park~~
- ~~Round Hill Pines Beach~~
- ~~Van Sickle Unit of Lake Tahoe Nevada State Park (Currently undeveloped, Nevada State Parks is preparing a master plan now.) Tahoe Meadows Recreation Area~~
- ~~Washoe Meadows State Park and Lake Valley State Recreation Area~~
- ~~Chimney Beach overlook~~
- ~~Memorial Point~~
- ~~Inspiration Point~~
- ~~USFS Overlook near Cave Rock~~
- ~~Mt. Rose Overlook~~

Public Gathering Areas

- ~~Area #1, Nevada Beach. Add in trail between trailhead and Nevada Beach campground through Jennings Casino site restoration site.~~
- ~~Area #2, Zephyr Cove. Inventory should include campground and lodge/cabins. (Also should include Dreyfus Estate area.)~~
- ~~Unit #4, Sand Harbor. Add in the Flume Trail, trail to Marlette Lake, and new ADA trail from Sand Harbor to Memorial Point.~~
- ~~Area #9, Kings Beach. Inventory should include all publicly owned land between state beach and boat ramp.~~
- ~~Area #11, Agatam Beach. Change the name to Tahoe Vista Recreation Area and expand inventory to include all NTPUD parcels, including boat ramp.~~
- ~~Area #12, Patton Beach. Change the name to Carnelian Bay West and expand the inventory to include Carnelian Bay East.~~

- ~~Area #25-26. Expand inventory to include existing trail connecting Bliss and Emerald Bay.~~
- ~~Area #33, Camp Richardson. Expanded inventory should include campground area, stables, and commercial development.~~

Bike Trails

- ~~Extend Bike Trail 6. Extension of trail from Tahoma to Ehrman Mansion (and on to Meeks Bay when that link is completed)~~
- ~~Inventory and add all existing built and signed public bike trails, including Class I, II, and III facilities. These include, but are not limited to: bike trails along Village Blvd. and Lakeshore Drive in Incline Village, trail from Kingsbury to Round Hill, trail from Al Tahoe to Industrial Tract in South Lake Tahoe and along the full length of Al Tahoe Blvd., and the Meyers bike trail.~~

This evaluation found a few instances of new recreation area facility development that produces impacts related to larger structures and poor material/color choices. The TRPA should continue to increase knowledge of the threshold among recreation area providers. To meet this need specific training should augment the improved data access recommended in Recommendation SR-1.4.E.

SR-4 COMMUNITY DESIGN

This evaluation noted positive trends in use of regionally appropriate architectural details in many commercial districts throughout the region. Other areas, however, suffer from loss of community character through transition from smaller, often historic structures to very much larger and more dominant structures. The following recommendations are needed to protect community character and improve community design features. Section numbers provided in parentheses are references to more complete discussion of the trends identified.

Loss of community character is occurring as redeveloped properties maximize building allowances without respect for existing and distinct development patterns.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~Specific recommendations to avoid this loss include:~~

~~**C.1. Initiate region-wide visual perception survey (VSP)**~~

~~Responsible Entity: TRPA~~

~~Funding Cost: \$50,000~~

~~Completion Date: July 2003~~

~~Threshold Indicator: SR-1, SR-2, SR-3, SR-4~~

~~**Recommendation:** TRPA should initiate a region-wide survey to identify “desired” community character and revise development standards where needed to assure its creation or maintenance. This should be used to define a more precise threshold measure for Community Design and to amend the Community Design Threshold Policy Statement to include compatibility with historic values (see below). Community-based processes are commonly used throughout the country to develop site appropriate design standards; they include use of visual preference surveys and community workshops.~~

~~Some areas of the region, particularly some of the community plan areas, already utilize this tailored approach to design standards. The rest of the region, including the shoreline properties and some urban and transitional roadways, need this same attention to community character. Benefits to improved public awareness of scenic thresholds can also be expected from this process.~~

~~**Product:** Community based Visual Preference Survey. Present findings and proposed amendments to the Community Design and Design Standards to the Governing Board for consideration.~~

~~As properties redevelop to the maximum allowances, historical development patterns and structures are lost. Specific recommendations to avoid this loss include:~~

~~**C.2. Amend Code Chapter 29, Historic Resource Protection**~~

~~Responsible Entity: TRPA
Funding Cost: Staff Time
Completion Date: December 2004
Threshold Indicator: SR-4~~

~~**Recommendation:** TRPA should amend Code Chapter 29, Historic Resource Protection, to include a region-wide inventory of historic structures, historic places and historic development patterns that create distinctive scenic features and community character. The structures and areas inventoried would establish the important architectural and landscape architectural features necessary to consider when planning redevelopment or reuse of affected properties. It will usually be possible to protect these features and accommodate redevelopment if their details and patterns direct the manner and style of redevelopment activities.~~

~~**Product:** Code amendments will be presented to Governing Board for consideration.~~

~~This evaluation notes impacts to the community design threshold resulting from the current implementation of Chapter 26 and the substitute sign ordinances. Improvements needed to Chapter 26 and the various substitute sign ordinances are noted above.~~

~~This evaluation identifies negative effects associated with loss of native vegetation and increased use of non-native plant species. These activities decrease screening value of mature vegetation and subtly alter the native landscape character. Recommendations to reverse these trends include implementing Recommendation A.19.~~

~~Many recommendations from the 1996 Threshold Evaluation have not yet been implemented. Many of those that remain applicable, and are not included in the EIP or other implementation strategies, have been incorporated into the recommendations found in this section. The following measures from the previous report require repeated recommendation:~~

~~**C.3. Code amendment Chapter 30, Design Standards**~~

~~Responsible Entity: TRPA
Funding Cost: Staff Time
Completion Date: July 2003
Threshold Indicator: SR-4~~

~~**Recommendation:** Amend Chapter 30 of the Code to strengthen restrictions on new spots field and ski area lighting which would be visible from threshold travel routes, threshold recreation areas and bike trails, and the region's wilderness areas. TRPA should clarify the existing exterior lighting standards relative to location and direction of light sources and acceptable levels of building and landscape area lighting. TRPA should also add standards to establish specific maximum lighting levels for parking lots and garages, and more general standards for commercial, recreation and tourist accommodation uses. (EIP #537)~~

~~**Product:** Chapter 30 code amendments.~~

~~**C.4. Code amendment Chapter 22, Height**~~

~~Responsible Entity: TRPA~~

~~Funding Cost: Staff Time~~

~~Completion Date: July 2003~~

~~Threshold Indicator: SR-4~~

~~**Recommendation:** Until such time as a new approach to permitting size and mass of structure is approved, TRPA should amend Chapter 22 of the Code to clearly identify how additional height findings are made, particularly with respect to establishing a tree canopy height. It will be important to include trees that will be used to provide the screening of the building or structure from the sensitive viewpoint.~~

~~**Product:** Chapter 22 code amendments.~~

~~**C.5. Loop Road design workshop**~~

~~Responsible Entity: TRPA, NDOT, CALTRANS, GAMING ALLIANCE~~

~~Funding Cost: \$500,000~~

~~Completion Date: September 2003~~

~~Threshold Indicator: SR-1, SR-4~~

~~**Recommendation:** To address the current conditions related to the Loop Road project, TRPA should host a design workshop and include the properties within the South Stateline area (Park Avenue to the Loop Road). The workshop should discuss the need to install public design improvements, the time schedule established in the Community Plan's US 50 scenic improvement package, and the possibilities of urban improvement given the delayed Loop Road project. A special improvement district or similar method should be investigated as an implementation strategy. (EIP #541)~~

~~**Product:** Amendment of the Stateline Community Plan~~

NEXT FIVE YEARS WORKPLAN

Data Needs and Recommendations for 2006 Regional Plan Revision

Since the first threshold evaluation in 1991, scenic resource professionals have provided substantial comment on the Tahoe Region's scenic threshold system. These professionals, both on the TRPA staff and noted consultants, concluded that the current system embodies both positive and negative features. On the whole, the current system is difficult to use as a practical planning and implementing tool to assure maintenance of and access to the region's valuable scenic qualities.

The region benefits from a fairly well documented scenic condition, beginning with the first roadway and shoreline travel route ratings produced in 1971 and extending to

comprehensive evaluation completed in 2000. This represents an internationally unique dataset for scenic monitoring. Region-wide community efforts have occurred to develop design standards and guidelines and community plans, representing the input of a cross section of residents and stakeholders. Additionally, extensive research and program development exists considering the scenic condition in the shorezone.

This documentation history will prove valuable as the current system is revised, although it does not include several vital pieces of information. The following specific information or techniques must be available to create a revised scenic system that overcomes the limitations of the current system:

- Considerable work needs to be completed to update and incorporate public perceptions about both the natural and built visual environments. No recent comprehensive visual perception survey is available to direct development of the numerous components needed in a revised scenic system.
- As part of developing a system that addresses public perception, it is important to be able to identify those specific scenic resources that are more important to maintain and protect on a Basin-wide scale. Two critical elements of this are identifying those resources seen more frequently (i.e. visible from numerous scenic viewing locations) and those seen for longer periods of time (e.g. those seen from a scenic turnout or recreation area where the viewer stops for a period of time). Combining the topographic, vegetative cover, and scenic corridor and viewpoint information in the GIS produces a map identifying frequency of views. This information can easily be sorted to identify those views seen for longer periods of time. Public preference information can then be assessed in relation to this information to produce a sense of priority or urgency for scenic resource protection.
- Development of a revised system that can include flexible design standards based on numerous variables will require advanced technological tools. At minimum, project specific data from TEGIS, an expanded GIS database that includes the various elements of the current scenic system, and digital imaging must all work as a coordinated tool.

VI. EIP INTEGRATION

A. COMPLETED EIP PROJECTS AND CONTRIBUTION TO THRESHOLDS

TRPA records indicate six scenic resource EIP projects have been completed to date, committing \$7,013,135.00 to the effort. They are:

- US 50 Utility Undergrounding, Elks Club Dr. Area (EIP #58). This project contributed to the 2001 score improvement for Roadway Unit 36B - Lake Valley.
- North Stateline CP Urban Design Project (EIP #60). This project, including scape and façade improvements, contributed to the 2001 score improvement for Roadway Unit 20D - North Stateline Casino.
- Scenic Roadway #40 Brockway Cutoff Improvement (EIP #104). This project involved replacing cyclone fencing with a wooden fence and increasing landscaping along the golf course, among other things. As noted above, this landscaping actually produces adverse impacts on a mapped lake view scenic resource. In addition, although the new cafe/pro shop at the golf course improves architectural quality, it also encroaches on the same lake view. See Section VI.C, below, for a new EIP project added to offset the effects of these actions.
- Tahoe City Utility Undergrounding, Phase 2 (EIP #134). The undergrounding project was an element of a more extensive community beautification project (EIP #89) that has raised the score sufficiently to produce threshold attainment in Tahoe City. EIP #89 is not complete without signage and other architectural upgrade; sign improvements have generally not occurred, although improvements to existing commercial structures are occurring.
- Tahoe Meadows Linear Park (EIP #336). This project adds to the success of the drainage projects, architectural upgrades, and redevelopment to make the single largest roadway unit score improvement during the last five years. Many of these features are contained in Scenic Road Unit #33 The Strip (EIP #98), which is in progress though not yet complete.
- US 50/Ski Run Utility Undergrounding (EIP #872). This project contributes to the improvements noted above.

In addition to these, noticeable progress has been made on several other EIP projects resulting in score improvements. Scenic Road Unit #15 Tahoe City (EIP #89) and Scenic Road Unit #33 The Strip (EIP #98) are identified above. Incline Village SR 28 Downtown (EIP #94) produced most of the 1.5 points increase for Roadway Unit 23, although without landscaping it is not complete. A start on the landscaping necessary for Scenic Road Unit #25 Ponderosa (EIP #95) created a 0.5 points increase. Limited signage and landscaping improvements included in Scenic Road Unit #36 Airport (EIP #100) also made a small improvement. Most of the elements of the following EIP projects are now completed: Scenic Road Unit #44 Kingsbury Grade (EIP #102), Scenic Shore Unit #15 Tahoe City (EIP #106), and Scenic Shore Unit #19 Carnelian Bay (EIP #108). Of these, the CTC and marina projects in Carnelian Bay produced threshold attainment for the roadway unit and brought the shoreline unit to within one point of threshold attainment.

B. MOST CRITICAL EIP PROJECTS

The Scenic Resources EIP (10/30/00) contains 93 projects. Most of these projects involve public or private investment in physical improvements. Some of them, however, are modifications to the regulations that will reduce the negative effects of new projects. Considering the current trends presented in this report, these Code of Ordinance related projects, augmented with those listed below, are the most critical to complete very quickly. After that, projects listed that fall within non-attainment units or resources should receive implementation.

C. RECOMMENDATIONS FOR EIP UPDATE

Work completed for this evaluation identified resource specific improvements needed to restore or enhance scenic quality. Many of the items recorded by TRPA staff or the consultants are already contained in the EIP. (Where appropriate, the recommendations listed in Section VI of this chapter are followed by a notation of the existing EIP project that addresses the recommendation.) The following list captures the remainder of the needed improvements.

1. The following recommendations noted above in Section V should be added:

A.1	A.16	A.24
A.5	A.18	B.1
A.10	A.19	C.1
A.12	A.20	C.2
A.15	A.21	

2. Scenic Road Unit #2 Camp Richardson Roadside Parking. Sign and enforce “no parking” along the roadway within 1/2 mile of the entrance of Camp Richardson and Valhalla. Remove all undesignated parking areas at these two developments within the roadway viewshed. (This should amend EIP #10001)
3. Scenic Road Unit #3 Emerald Bay Dead Tree Removal. TRPA, USFS and California State Parks should collaborate to plan a dead tree removal project in Emerald Bay that reduces the number and visibility of standing dead trees without creating new scenic impacts.
4. Scenic Road Unit #11 Homewood Lake View Access. Identify the extent of lake view lost through recent residential development and open up similar amounts of lake view elsewhere.
5. Scenic Road Unit #11 Homewood Ski Area. Visual improvements to the Homewood Ski Area include removing the “temporary” modular building, increasing parking lot landscaping including screening of the mechanical area, and upgrading the lodge structure.
6. Scenic Road Unit #18 Marina Improvements. Continue to articulate the other marina building faces with paint (as begun with a mural on one side) and introduce landscaping along the roadway.
7. Scenic Road Unit #20B Kings Beach Scenic Improvements. Implement the community plan elements of sidewalks, street trees, reduced on street parking and curb cuts, signage conformance, and architectural upgrades.

8. Scenic Road Unit #20C Brockway Landscaping. Introduce landscape screening carefully to screen view of residences without blocking lake views.
9. Scenic Road Unit #20D North Stateline Casino Area Upgrade Final Phase. Continue architectural upgrades including darkening the Cal-Neva tower and implement community plan sign ordinance provisions. The new Harrah's dark green color establishes an excellent visual standard for large structures such as the Cal-Neva tower. (This amends EIP #10004 in part.)
10. Scenic Road Unit #22 Incline Village Improvements Final Phase. Complete the urban streetscape project by introducing landscaping and parking lot definition and providing restoration for the wide disturbed road shoulders at the west entrance to the commercial area. (This amends EIP #94 and #871, in part)
11. Scenic Road Unit #24 Mt Rose Highway. Selectively thin trees to open up a lake view at the turnout located just south of scenic resource 24-5.
12. Scenic Road Unit #32 Casino Area Structure Color. Darken the structure color at Caesar's, Bill's, Horizon, and the tall communications tower on Kingsbury Grade. The new Harrah's dark green color establishes an excellent visual standard for such large structures. (This amends EIP #10010. That EIP is incorrectly named and its Roadway Unit number incorrectly noted.)
13. Scenic Road Unit #35 Lake Tahoe Unified School District. Reduce the visual dominance of the campus by using non-reflective roof material on the new structures, darken the structure color throughout, and provide landscape screening for the tennis courts.
14. Scenic Road Unit #35 Al Tahoe Historic Neighborhood. The Al Tahoe and American Legion neighborhoods need protection for their historic characteristics.
15. Scenic Road Unit #40 Brockway Cutoff Lake View Project. Relocate the landscaping on the east side of the fairway that blocks the lake view from Scenic Resource 40.4. Place screening vegetation around the cafe/pro shop to screen both the structure and the cart/snow mobile storage area. Choose vegetation species that do not exceed 25' in height to avoid blocking additional lake view.
16. Scenic Road Unit #41 Brockway Summit Scenic Overlook. Selectively thin trees to create a new lake view near the summit and develop a scenic overlook.
17. Scenic Road Unit #44 Chimney Rock Road. Darken the color on the rock revetment at Chimney Rock Road. [Is this EIP #10012]
18. Public Parking and Scenic Shore Units. Redesign, relocate or screen public beach parking at Nevada Beach, Pope Beach, and Bliss State Park. [Some of these may be included as EIP # 10013 and #10016]
19. Scenic Shore Unit #19 Sierra Boat Company. Continue the mural treatment to create articulation for large marina structure with paint on other building surfaces.

20. Scenic Shore Unit #23 Burnt Cedar Beach Color Modification. The new structures at Burnt Cedar Beach need to be painted a recessive color and the copper roof should be modified to reduce its reflectivity.
21. Scenic Shore Unit #23 Residential Color Modifications. The color of many structures along the shoreline, in the forested backdrop and at the ridgeline could be made recessive if darkened.
22. Scenic Shore Unit #24 Sand Harbor Amphitheater. Mitigation for the amphitheater structure needs to be modified to increase the number and size of vegetative material planted between the amphitheater wall and the boardwalk.
23. Scenic Shore Unit #31 Bijou. The bin wall at Heavenly Valley should be replaced or repainted a darker color and screened with vegetation.
24. Scenic Easements. Develop a packet of information and forms necessary to secure scenic conservation easements to facilitate their use. Seek easement donations, but also pursue public, foundation, and other grant sources to purchase easements where necessary.

VII. SUPPLEMENTAL INFORMATION

Appendix 1 – Travel Route Ratings

Appendix 2 – Scenic Quality Rating Changes (including new scenic quality resources)

Appendix 3 – Recreation Area and Bike Trail Ratings Changes

Appendix 4 – New Roadway Units

Appendix 5 – Scenic Shoreline Units and Scenic Roadway Units Maps

Appendix 1. TRAVEL ROUTE RATINGS

Roadway Units

Unit 1. Tahoe Valley (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	11	2	2	2	1	2	2
1991	11	2	2	2	1	2	2
1996	12	3	2	2	1	2	2
2001	12	3	2	2	1	2	2

1996 Comments: The man-made features subcomponent has improved with the addition of several new and several remodeled buildings of improved architecture. The addition of a new nursery and other landscaping along the corridor has contributed to the improved condition, as well as new or remodeled signs which conform to TRPA's sign ordinance.

2001 Comments: No change to the scenic condition occurred. The scores for lake views and variety have been switched to reflect correction of a long standing typographical error. This unit is not in threshold attainment.

Unit 2. Camp Richardson (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	20	4	4	4	2	3	3
1991	19	4	3	4	2	3	3
1996	19	4	3	4	2	3	3
2001	18	3.5	2.5	4	2	3	3

1991 Comments: Decrease in roadway distraction subcomponent due to added congestion with other users including mopeds, horses, cyclist; added roadside sales, rentals.

1996 Comments: There was no change to the unit's ratings during the past five years; however, an addition to the SQIP is needed to reflect the change in the 1991 Evaluation rating.

2001 Comments: Both man-made features and roadway distractions drop due to the increase in congestion and impacts from temporary and seasonal uses. This includes temporary sign and banner clutter, increased on and off street parking visible from the roadway, and outdoor storage of recreational equipment. This has occurred at Camp Richardson and at the entrance to Valhalla. This unit is not in threshold attainment and is at risk.

Unit 3. Emerald Bay (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	26	5	3	3	5	5	5
1991	26	5	3	3	5	5	5
1996	26	5	3	3	5	5	5
2001	26.5	5	3.5	3	5	5	5

1996 Comments: No comments.

2001 Comments: This evaluation includes correction of the roadway distractions score for the period 1982-2001, reflecting on highway parking and roadway pedestrian and vehicle congestion. Building a designated trail and improving the parking at the Vikingsholm parking lot have made improvements. Landscape quality is negatively affected by standing dead trees, although this is insufficient to lower the score. Some improvement related to bare slope revegetation is noted.

Unit 4. Bliss State Park (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	21	5	5	3	3	2	3
1991	21	5	5	3	3	2	3
1996	21	5	5	3	3	2	3
2001	21	5	5	3	3	2	3

1996 Comments: No comments.

2001 Comments: A new driveway entrance is noticeable, but not sufficient to degrade scores.

Unit 5. Rubicon Bay (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	17	2	3	1	4	4	3
1991	18	2	3	2	4	4	3
1996	18	2	3	2	4	4	3
2001	18	2	3	2	4	4	3

1991 Comments: Increase in road structure subcomponent due to addition of erosion control and rock slope protection of cut slope.

1996 Comments: No comments.

2001 Comments: No comments.

Unit 6. Lonely Gulch (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	17	2	3	2	4	4	2
1991	17	2	3	2	4	4	2
1996	18	2	3	3	4	4	2
2001	18	2	3	3	4	4	2

1996 Comments: Added rock slope protection and curb and gutter along most of this unit's length have improved the road structure subcomponent.

2001 Comments: Revegetation establishment is noticeable along the cut slopes and strengthens the score improvement noted in 1996.

Unit 7. Meeks Bay (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	13	3	2	3	2	1	2
1991	13	3	2	3	2	1	2
1996	13	3	2	3	2	1	2
2001	14	3	2	3	2	2	2

1996 Comments: No comments.

2001 Comments: This evaluation includes an amended score to reflect view of Meeks Creek and its meadow. Roadside parking continues to be a distraction. This unit is not in threshold attainment.

Unit 8. Sugar Pine Point (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	23	4	5	4	3	4	3
1991	23	4	5	4	3	4	3
1996	23	4	5	4	3	4	3
2001	23	4	5	4	3	4	3

1996 Comments: No comments.

2001 Comments: Debris remaining in General Creek after the 1997 flood has not been removed. The debris is not highly noticeable.

Unit 9. Tahoma (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	13	2	2	3	1	3	2
1991	13	2	2	3	1	3	2
1996	13	2	2	3	1	3	2
2001	14	3	2	3	1	3	2

1996 Comments: No comments.

2001 Comments: The increase in man-made features reflects both improved structure maintenance (primarily structure painting), and an adjustment to previous ratings to reflect the generally better scenic quality in the commercial area than previously credited. This unit is not in threshold attainment.

Unit 10. Quail Creek (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	14	2	2	3	2	2	3
1991	14	2	2	3	2	2	3
1996	14	2	2	3	2	2	3
2001	14	2	2	3	2	2	3

1996 Comments: No comments.

2001 Comments: No comments. This unit is not in threshold attainment.

Unit 11. Homewood (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	13	2	1	3	3	2	2
1991	12	2	1	3	2	2	2
1996	12	2	1	3	2	2	2
2001	11.5	2	1	3	1.5	2	2

1996 Comments: No comments.

2001 Comments: Reduction in lake views due to new large residences at the north end of the unit. The unscreened modular structure at Homewood Mountain Resort produces negative effects on man-made features, although it is not sufficient to drop the score. This unit is not in threshold attainment and is at risk.

Unit 12. Tahoe Pines (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	17	2	2	4	3	3	3
1991	17	2	2	4	3	3	3
1996	17.5	2.5	2	4	3	3	3
2001	17.5	2.5	2	4	3	3	3

1996 Comments: The utility undergrounding project along the roadway near Cherry Street has slightly improved the man-made features subcomponent.

2001 Comments: The addition of several new fences continues a trend identified as a problem in the SQIP. Continuation of this trend will adversely affect the man-made features rating.

Unit 13. Sunnyside (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	14	2	2	4	1	2	3
1991	14	2	2	4	1	2	3
1996	14	2	2	4	1	2	3
2001	14	2	2	4	1	2	3

1996 Comments: No comments.

2001 Comments: Several large rebuilds on the lake are visible from the roadway, but generally avoid scenic degradation. However, new fences continue a generally negative trend. This unit is not in threshold attainment.

Unit 14. Tahoe Tavern (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	13	2	2	4	1	2	2
1991	14	2.5	2	4	1	2.5	2
1996	14.5	3	2	4	1	2.5	2
2001	14.5	3	2	4	1	2.5	2

1991 Comments: Increase in man-made features and landscape views subcomponents due to redevelopment of 64-acre tract and removal of structures; organized entry and parking.

1996 Comments: The utility undergrounding project near the meadow combined with redevelopment in and near 64-Acre Tract (e.g., Tahoe Tree Co.) slightly improved the man-made features subcomponent.

2001 Comments: Parking lot redesign at the Bridgetender improves roadway distractions in that area, but the spaces left on the highway continue to add to the congestion and confusion at the bridge and prevent improvement in the score. This unit is not in threshold attainment.

Unit 15. Tahoe City (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	12	1	1	2	3	3	2
1991	13	2	1	2	3	3	3
1996	13	2	1	2	3	3	3
2001	16.5	3	2	2	3.5	3	3

1996 Comments: No comments.

2001 Comments: Big improvement results from the downtown project due to streetscape improvements, improved access to lake views, and reduction in roadway distractions. Some commercial facade improvements have also been made, although the loss of landscape screening in the Safeway parking lot produces unnecessary degradation. This unit is now in threshold attainment.

Unit 16. Lake Forest (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	13	1	1	4	2	3	2
1991	13	1	1	4	2	3	2
1996	13	1	1	4	2	3	2
2001	16.5	2.5	3	4	2	3	2

1996 Comments: No comments.

2001 Comments: Amendment to previous scores notes improved conditions related to developed areas. New homes and new office building noted, but they avoid degradation. Unit is in threshold attainment.

Unit 17. Cedar Flat (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	17	2	2	3	4	3	3
1991	17	2	2	3	4	3	3
1996	17	2	2	3	4	3	3
2001	15.5	2	2	3	3	2.5	3

1996 Comments: No comments.

2001 Comments: Residential rebuilds, garages close to roadway and new fences result in important loss of lake views, reduction of landscape screening and views of native landscapes. This unit was considered at risk in 1996 and has realized a substantial drop since then. This unit is not in threshold attainment and continues to be at risk.

Unit 18. Carnelian Bay (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	14	1	1	3	4	3	2
1991	14	1	1	3	4	3	2
1996	14	1	1	3	4	3	2
2001	15.5	1.5	1	3	4	4	2

1996 Comments: No comments.

2001 Comments: Improvements due to landscape restoration on both sides of Sierra Boat Company and painting large marina structure. The mural on the east side provides visual interest without detracting from natural setting and produces improvement to a large flat surface. These changes improve man-made features and landscape views. The new, large commercial structure currently under construction, with no mature vegetative screening, threatens these improvements. The low man-made features score places this unit at risk. This unit is now in threshold attainment.

Unit 19. Flick Point (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	14	2	2	4	1	3	2
1991	14	2	2	4	1	3	2
1996	16	2	2	4	3	3	2
2001	15.5	2	2	4	2.5	3	2

1996 Comments: No comments. (See below for explanation of the amended 1996 score.)

2001 Comments: The quality of the lake views available in this unit are higher than scored previously, so the 1996 score is amended accordingly. Changes noted in 2001 include loss of some of the lake views due to large residential rebuilds that block lake views. This unit is in threshold attainment, yet will remain at risk.

Unit 20 A-D (Placer and Washoe Counties)

Unit 20, Tahoe Vista, is recommended to be separated into four units due to its length and diversity of character. The following scores reflect those proposed in 2001 for each new unit.

Unit 20A. Tahoe Vista (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	13	3	1	1.5	2.5	3	2

1996 Comments: No comments made for this section.

2001 Comments: This unit extends approximately 1.1 miles from Stage Drive to Beach St. Improvement since 1996 includes removal of a restaurant and expansion of the lake view at Agatam Beach. Increase in mass and scale of new lakeside structures affects lake views and landscape views, but has not yet produced decreases in the score. This unit is not in threshold attainment and is at risk.

Unit 20B. Kings Beach (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	12.5	2	2	1	3	2.5	2

1996 Comments: Improvements in this area noted in 1996 are: completion of the California Tahoe Conservancy lakefront access project, several commercial remodels in Kings Beach, and completion of utility undergrounding have collectively improved the man-made features subcomponent.

2001 Comments: This unit extends approximately 1.2 miles from Beach St. to lakeside part of Chipmunk Dr. Improvements noted since 1996 include remodel of Safeway and landscaping and structure upgrade at the golf course, and the California Tahoe Conservancy removal of fence and spa building at North Tahoe Beach Center site. Some sign and facade improvements have also occurred in Kings Beach. The new fish mural is an improvement to a large blank wall without creating distraction from natural setting. This unit is not in threshold attainment.

Unit 20C. Brockway (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	16	3	3	1.5	3	3	2.5

1996 Comments: Improvements in this area noted in 1996 are: The Brockway Hill erosion control project, with added rock slope protection, rock-lined channels and curb and gutter, has improved the road structure subcomponent.

2001 Comments: This unit extends approximately .7 miles from the lakeside part of Chipmunk Dr. to the state line.

Unit 20D. North Stateline Casino Core (Washoe County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	13	2.5	2.5	3	1	1	3

1996 Comments: No comments.

2001 Comments: This unit extends approximately .3 miles from the state line to the boundary of Unit 21. Important improvements realized with the sidewalk/landscaping project. This decreases roadside distractions and improves variety. This unit is not in threshold attainment.

Unit 21. Stateline (Washoe County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	20	2	2	4	5	4	3
1991	18.5	1.5	2	4	5	3	3
1996	18.5	1.5	2	4	5	3	3
2001	18.5	1.5	2	4	5	3	3

1991 Comments: Decrease in man-made features and landscape views subcomponent due to poorly sited new structures; new colors on condominium project; reduced views to landscape features from road.

1996 Comments: There was no change to the unit's ratings during the previous five years; however, an addition to the SQIP is needed to reflect the change in the 1991 Evaluation rating.

2001 Comments: View of large, light colored homes on the slopes above Incline Village threatens to degrade the landscape view from this roadway unit. This view increased by tree removal resulting from forest health improvement projects. This unit is not in threshold attainment and is at risk.

Unit 22. Crystal Bay (Washoe County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	12	1	1	2	2	3	3
1991	12	1	1	2	2	3	3
1996	12	1	1	2	2	3	3
2001	13.5	1.5	2	2	2	3	3

1996 Comments: No comments.

2001 Comments: Improvements include new sidewalks that benefit roadway distractions, although the lack of other urban streetscape amenities limits improvement. Some in-fill structures with good setbacks and design features, and some facade improvements raise the score for man-made features. This improvement is threatened, however, by color changes to several large condo developments that are too light. This unit is not in threshold attainment.

Unit 23. Mt. Rose Highway (Washoe County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	25	3	5	2	5	5	5
1991	25	3	5	2	5	5	5
1996	25	3	5	2	5	5	5
2001	25.5	3	5	3.5	5	4	5

1996 Comments: No comments.

2001 Comments: Improvements in road structure result from landscape restoration along roadcuts with good treatments.

Unit 25. Ponderosa Area (Washoe County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	12	1	2	3	3	2	1
1991	11	1	1	3	3	2	1
1996	11	1	1	3	3	2	1
2001	11.5	1.5	1	3	3	2	1

1991 Comments: Decrease in roadway distractions subcomponent due to addition of scattered farm machinery and unscreened outdoor vehicle storage; unapproved billboard-scale image.

1996 Comments: No change.

2001 Comments: A slight improvement to man-made features results from highway landscaping improvements along the Ponderosa parking lot and maturing vegetation in the frontage at the transfer station. More substantial improvement at the Ponderosa is prevented by the narrow width of the planted area and the vast expanse of asphalt, some of it used as an unscreened outdoor equipment storage area. This unit is not in threshold attainment and continues at risk.

Unit 26. Sand Harbor (Washoe County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	26	4	3	4	5	5	5
1991	26	4	3	4	5	5	5
1996	26	4	3	4	5	5	5
2001	26.5	4	4	3.5	5	5	5

1996 Comments: No comments.

2001 Comments: Roadway distraction improvement resulting from removal of some roadside parking is somewhat offset by the poor material/color choice for the rockwork in the 1998 erosion control project (the rock is too angular and too light). Standing dead tree removal has improved landscape views and lake views in some areas. The new performance amphitheater on Sand Point is visible from the highway; completion of the mitigation measures will help it blend into the background. The new Memorial Point overlook and boundary fence at the State Park entrance represent improved conditions.

Unit 27. Prey Meadow (Washoe County, Carson City and Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	27	4	5	4	5	5	4
1991	27	4	5	4	5	5	4
1996	27	4	5	4	5	5	4
2001	27	4	5	4	5	5	4

1996 Comments: No comments

2001 Comments: The 2000 erosion control project includes better material/color choice (the rock is a better color and less angular). The salvage cut in this area generally avoided creating visual concerns in the roadway viewshed. The new guardrails placed at the approach to the Spooner Summit intersection are too large, a poor color, and create a sense of enclosure both inappropriate and unnecessary.

Unit 28. Spooner Summit (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	16	3	3	3	4	1	2
1991	16	3	3	3	4	1	2
1996	16	3	3	3	4	1	2
2001	14.5	2	3	2.5	4	1	2

1996 Comments: No comments.

2001 Comments: Work completed at the US 50/SR 28 intersection reduces the scores in a unit already at risk. The new guardrails are too large, a poor color, and create a sense of enclosure both inappropriate and unnecessary. The new snow play parking lot, while an improvement for circulation and recreation use purposes, lacks screening in a highly sensitive visual location. No progress has been made for visual improvements for the NDOT maintenance facility, the highway road cut, or the degraded roadside pull out (used as a construction staging area in 2000). This unit was considered at risk in 1996 and has since fallen out of threshold attainment. This unit remains at risk.

Unit 29. Cave Rock (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	23	3	4	3	5	5	3
1991	23	3	4	3	5	5	3
1996	23	3	4	3	5	5	3
2001	23	3	4	3	5	5	3

1996 Comments: No comments.

2001 Comments: Changes in this unit produce minor improvements and degradations without altering the unit's composite score. These include neutral or positive actions related to new structures in Uppaway Estates, and use of a good color choice for the wire mesh rock fall protection (otherwise a potentially negative feature). Generally negative features include use of a red metal roof at the fire station, new road cuts, and the new retaining wall near the entrance to Glenbrook.

Unit 30A. Lincoln Park-Skyland (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	16	2.5	2	3.5	4	2	2

1996 Comments: No comments.

2001 Comments: This unit extends approximately 1.65 miles from just south of Cave Rock to the southern end of the Skyland subdivision. Changes note in 2001 include two new residences on the east side of the highway, a new water treatment structure near Cave Rock with inadequate landscaping, and a well executed salvage cut.

Unit 30b. Tahoe School (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	16.5	3	3.5	2	2.5	3	2.5

1996 Comments: No comments.

2001 Comments: This unit extends approximately .8 miles from Skyland to and including the stream zone north of the entrance to Zephyr Cove Resort. No substantial changes noted, yet increasing roadside parking near the Zephyr Cove resort exists and could threaten roadway distractions in the future.

Unit 30C. Zephyr Cove (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	15.5	2	3	3	3.5	2	2

1996 Comments: No comments.

2001 Comments: This unit extends approximately 1.3 miles from Zephyr Cove Resort to the southern end of the Pinewild condominium development. Degradation to roadway distractions has occurred due to the growing clutter associated with the Zephyr Cove Resort: banner signs, outdoor storage in the campground area, and on street parking. Increased view of the tennis courts in Marla Bay also detracts.

Unit 30D. Round Hill (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	18	3	3	3	3	3	3

1996 Comments: No comments.

2001 Comments: This unit extends approximately 1.0 miles from Pinewild to Elks Point Road. Improvement to man-made features results from redevelopment of the shopping area in Roundhill with improved architecture and landscape features.

Unit 31. Meadow (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	14	1	2	3	3	1	4
1991	14	1	2	3	3	1	4
1996	14	1	2	3	3	1	4
2001	16	2	2	3	3	2	4

1996 Comments: No comments.

2001 Comments: Improvement to man-made features results from redevelopment of the former Nugget casino. Landscape views have improved as the vegetation in the Jennings casino site restoration project has matured. It now provides increased interest in the meadow and better screens the residential development along Kahle Drive. This unit is now in threshold attainment.

Unit 32. Casino Area (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	13	3	1	2	2	1	4
1991	11	2	1	2	2	1	3
1996	11	2	1	2	2	1	3
2001	11.5	2.5	1	2	2	1	3

1996 Comments: No comments.

2001 Comments: Man-made feature improvements result from better landscape screening and rehabilitation at the Douglas County government site, and painting and landscape improvements in the casino core. The casino core improvements include the dark green color for Harrah's tower and the Horizon parking garage, and landscaping along the street and at casino entries. The man-made features score would be improved to a 3 as a result of these features, except the new view of the gondola cut drops the score here by 0.5. As the Van Sickle cut is revegetated, it is expected that the score will improve by 0.5. Construction at the Prim site near the US 50/SH 207 intersection creates a temporary visual problem. This unit is not in threshold attainment.

Unit 33. The Strip (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	6	1	1	1	1	1	1
1991	7	1	1	1	1	2	1
1996	7.5	1	1.5	1	1	2	1
2001	11.5	3	3	1	1.5	2	1

1991 Comments: Increase in landscape views subcomponent due to demolition of unsightly foreground structures permitting visual access to mountain backdrop.

1996 Comments: The site design and architectural quality of several remodeled and redeveloped uses (e.g. McDonald's, Fantasy Inn), combined with the removal of several older structures and related cur cuts and signs, have slightly improved the roadway distractions subcomponent.

2001 Comments: Major improvements in this unit have occurred in the last five years. Improvements that increase both the man-made features and roadway distractions scores include: beginning implementation of the Park Ave. Project, completion of the Embassy Suites Vacation Resort and marina buildings, several hotel remodels along the strip, and completion of the linear park and the drainage features with their park-like appearance. The lake view near the marina is improved with better view access due to improved site design. This unit is not in threshold attainment.

Unit 34. El Dorado Beach (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	16	4	1	2	4	3	2
1991	16	4	1	2	4	3	2
1996	17	4	2	2	4	3	2
2001	16	3.5	1.5	2	4	3	2

1996 Comments: The redesign of the public park and open space at El Dorado Beach has reduced the roadway distractions along the unit.

2001 Comments: Increased commercial activity along Harrison Ave., accompanied by increased signage and increased unscreened parking and parking congestion, reduce both the made-made features and roadway distractions scores in this unit.

Unit 35. Al Tahoe (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	7	2	1	1	1	1	1
1991	7.5	2.5	1	1	1	1	1
1996	7.5	2.5	1	1	1	1	1
2001	7.5	2.5	1	1	1	1	1

1991 Comments: Increase in man-made features subcomponent due to incremental remodeling and improvements to built environment.

1996 Comments: No comments.

2001 Comments: This review notes the overall lack of improvement throughout this unit, particularly compared to other commercial districts in the Region. Specific improvements and degradations have occurred in this unit without changing the scores. Improvements include some new structures with improved design at the southern end of the unit and some frontage landscaping improvements. Several new signs produce new visual problems. With a better structure color, modifications at the middle school could produce an improvement. This unit is not in threshold attainment.

Unit 36A. Airport Area (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	10.5	1.5	2	2	1	2	2

1996 Comments: Changes noted for this area in 1996 are: Commercial improvements near the south end of US 50 in South Lake Tahoe have slightly improved the man-made features subcomponent.

2001 Comments: This unit extends approximately 1.65 miles from D Street in South Lake Tahoe to the southern end of the industrial development. Although most of the developed uses in this unit continue their degraded scenic condition, removal of the clutter, disturbance and signage associated with Sunset Ranch and the associated site restoration produces noticeable improvements to man-made features and a more limited improvement to landscape views. Tree growth on the slope above the airport is better screening view of the development, while also blocking view of distant ridges.

Unit 36B. Lake Valley (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	19	3	4	3	1	4	4

1996 Comments: No comments.

2001 Comments: Significant improvements have resulted from the removal of billboards, utility undergrounding, and removal of two abandoned model homes.

Unit 36C. Meyers (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	NA						
1991	NA						
1996	NA						
2001	14	2.5	2.5	2	1	3	3

1996 Comments: Improvements noted for this area in 1996 are: Commercial improvements in Meyers have slightly improved the man-made features subcomponent.

2001 Comments: Redevelopment of Yanks Station property includes upgrade of the motel tower and extensive remodel of an old restaurant and retail shop area. This creates improved man-made features, yet would have been improved with more space devoted to landscaping. Lack of sign compliance continues to be a major scenic problem throughout Meyers.

Unit 37. Echo Summit (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	26	4	5	5	4	3	5
1991	26	4	5	5	4	3	5
1996	26	4	5	5	4	3	5
2001	26	4	5	5	4	3	5

1996 Comments: No comments.

2001 Comments: No comments.

Unit 38. Upper Truckee River (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	18	3	4	4	1	3	3
1991	18	3	4	4	1	3	3
1996	18	3	4	4	1	3	3
2001	18	3	4	4	1	3	3

1996 Comments: No comments.

2001 Comments: No change noted. The scores for lake views and landscape views have been switched to reflect correction of a long standing typographical error.

Unit 39. Alpine Summit. (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	24	4	5	4	1	5	5
1991	24	4	5	4	1	5	5
1996	24	4	5	4	1	5	5
2001	24	4	5	4	1	5	5

1996 Comments: No comments.

2001 Comments: No change noted. The scores for lake views and landscape views have been switched to reflect correction of a long standing typographical error.

Unit 40. Brockway Cutoff (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	15	2	3	3	3	2	2
1991	15	2	3	3	3	2	2
1996	15.5	2.5	3	3	3	2	2
2001	15	2.5	3	3	2.5	2	2

1996 Comments: The man-made features subcomponent has been slightly increased due to the completion of a utility undergrounding project along the roadway.

2001 Comments: The focused lake view down the golf course has been degraded through addition and maturation of landscaping in the fairway and placement of new cafe/pro shop structure. This is true even though the terminus of the view at the lake has improved with removal of structure and fence at Tahoe Beach Center site. The golf course cafe/pro shop displays improved architectural features compared to the previous structure, yet is more visible from this unit. Required landscaping mitigation will likely, over time, allow an improvement in the man-made features score. This unit is not in threshold attainment.

Unit 41. Brockway Summit (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	21	3	5	3	3	4	3
1991	21	3	5	3	3	4	3
1996	21	3	5	3	3	4	3
2001	21	3	5	3	3	4	3

1996 Comments: No comments.

2001 Comments: Although completion of the Caltrans erosion control project near the summit produces some benefits for road structure, the rating for this criteria is sufficiently high to reflect the 2001 condition.

Unit 42. Outlet (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	10	1	2	3	1	1	2
1991	12	1	2	3	1	2	3
1996	12	1	2	3	1	2	3
2001	12.5	1.5	2	3	1	2	3

1991 Comments: Correction to 1986 ratings in landscape views and variety subcomponents.

1996 Comments: No comments.

2001 Comments: Painting the structures at the Caltrans maintenance facility and completion of the drainage pond/SEZ restoration project have slightly improved the man-made features element in this unit. An increase in river related recreation congestion could threaten roadway distractions. This unit is not in threshold attainment and is at risk.

Unit 43. Lower Truckee River (Placer County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	20	3	3	4	1	4	5
1991	19	3	2.5	3.5	1	4	5
1996	19	3	2.5	3.5	1	4	5
2001	19	3	2.5	3.5	1	4	5

1996 Comments: There was no change to the unit's ratings during the past five years; however, an addition to the SQIP is needed to reflect the change in the 1991 Evaluation rating.

2001 Comments: Limited building and landscaping improvements have been made, although the man-made features score is sufficiently high to reflect the 2001 condition. An increase in river related recreation congestion could threaten roadway distractions. This unit is not in threshold attainment.

Unit 44. Kingsbury Grade (Douglas County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	13	1	1	1	3	3	4
1991	13	1	1	1	3	3	4
1996	13	1	1	1	3	3	4
2001	14.5	1.5	2	1	3	3	4

1996 Comments: No comments.

2001 Comments: Improvements to both man-made features and roadway distractions have resulted from new and remodeled buildings, sidewalks and landscaping along the street and landscape restoration of the former disturbed condo site. Sign improvements have also occurred. New projects that are visible but avoid degradation include the water tower and Kahle Park structures. This unit is not in threshold attainment.

Unit 45. Pioneer Trail North (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	10	1	1	3	2	2	1
1991	10	1	1	3	2	2	1
1996	10	1	1	3	2	2	1
2001	11	1.5	1	3	2.5	2	1

1996 Comments: No comments.

2001 Comments: The removal of a motel near the northern end of the unit and construction of the erosion control project that placed curb/gutter along the roadway improve man-made features in this unit. The expanded lake view at the intersection of Pioneer Trail/Ski Run Blvd. produces improvement, although the traffic volumes at the intersection itself and the distance limit the viewers' appreciation of this feature. This unit is not in threshold attainment and is at risk.

Unit 46. Pioneer Trail South (El Dorado County)

	Threshold Composite	Man-Made Features	Roadway Distractions	Road Structure	Lake Views	Landscape Views	Variety
1982	20	4	4	3	1	4	4
1991	21	4	4	4	1	4	4
1996	21	4	4	4	1	4	4
2001	21	4	4	4	1	4	4

1991 Comments: Increase in road structure subcomponent due to erosion control, revegetation and bike trail project.

1996 Comments: No comments.

2001 Comments: Changes include the effects of the salvage cut at mid-unit and in the south end. Generally, the tree thinning improves view penetration without changing the character of the forested view. At the south end, extensive tree death opens view to residences at the intersection of Vanderhoof Rd. This is a small area, however, and does not reduce the rating for the unit.

Shoreline Units

Unit 1. Tahoe Keys (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	9	1	5	3
1991	9	1	5	3
1996	9	1	5	3
2001	9	1	5	3
1996 Comments: No comments.				
2001 Comments: No comments.				

Unit 2. Pope Beach (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	8	2	3	3
1991	8	2	3	3
1996	8	2	3	3
2001	8	2	3	3
1996 Comments: No comments.				
2001 Comments: No comments.				

Unit 3. Jameson Beach (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	8	3	2	3
1991	8	3	2	3
1996	8	3	2	3
2001	8	3	2	3
1996 Comments: No comments.				
2001 Comments: Two large residential rebuilds in this unit continue the poor situation related to man-made features. The new pier at Camp Richardson include good design features and is adequately mitigated with on shore improvements. This unit continues to be at risk.				

Unit 4. Taylor Creek Meadow (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	13	3	5	5
1991	13	3	5	5
1996	13	3	5	5
2001	13	3	5	5
1996 Comments: No comments.				
2001 Comments: Fire kill of small trees and unscreened view of parked cars noted, but not sufficient to reduce the score.				

Unit 5. Ebright (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	9	2	4	3
1991	9	2	4	3
1996	9	2	4	3
2001	9.5	2.5	4	3
1996 Comments: No comments.				
2001 Comments: New foot trail is visible for a short distance, but does not create a major impact. Revegetation along the road helps reduce view of the road scar and improves man-made features.				

Unit 6. Emerald Bay (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	12	2	5	5
1991	12	2	5	5
1996	12	2	5	5
2001	12.5	2.5	5	5

1996 Comments: No comments.

2001 Comments: Continuing vegetation establishment and maturation in the avalanche scar and above the retaining walls along the viaduct is improving the view of man-made features. The retaining walls continue to produce too much color contrast, however. The new foot trail around the Bay avoids new significant degradation.

Unit 7. Bliss State Park (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	12	5	4	3
1991	12	5	4	3
1996	12	5	4	3
2001	12	5	4	3

1996 Comments: No comments.

2001 Comments: No comments.

Unit 8. Rubicon Point (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	12	3	5	4
1991	12	3	5	4
1996	12	3	5	4
2001	11.5	2.5	5	4

1996 Comments: No comments.

2001 Comments: The score for man-made features is amended to reflect the high visibility of parking along the beach at the state park and the clutter of beach equipment at the south end. A new large residence adjacent to the state park avoids degradation through good use of architectural design, setbacks, and vegetative screening. This unit is not in threshold attainment.

Unit 9. Rubicon Bay (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	6	1	3	2
1991	5	1	3	1
1996	5	1	3	1
2001	5	1	3	1

1991 Comments: Decrease in variety subcomponent due to reduction in variety caused by addition of highly contrasting structures on hillside; bright, linear rip rap without vegetation; numerous additional piers.

1996 Comments: No comments.

2001 Comments: A new, large lakeside residence with poor setbacks and screening is under construction in this unit, further degrading the already rock-bottom man-made features score. This unit is not in threshold attainment and remains at risk.

Unit 10. Meeks Bay (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	9	2	4	3
1991	9	2	4	3
1996	9	2	4	3
2001	9	2	4	3

1996 Comments: No comments.

2001 Comments: Beach clutter was noted here, but insufficient to lower the score.

Unit 11. Sugar Pine Point (El Dorado County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	11	4	4	3
1991	11	4	4	3
1996	11	4	4	3
2001	11	4	4	3

1996 Comments: No comments.

2001 Comments: No comments.

Unit 12. McKinney Bay (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	9	3	3	3
1991	9	3	3	3
1996	9	3	3	3
2001	8	2	3	3

1996 Comments: No comments.

2001 Comments: The reduction in the man-made features score reflects both an amendment to the previous scores and the construction of two large new residences, both with poor setbacks, screening and color, at the north end of the unit. The amendment results from the clutter and scale of boat storage at the Homewood Marina, the amphitheater tent structure, and the high density of structures at the south end of the unit. This unit was considered at risk in 1996 and has since fallen out of threshold attainment. It remains at risk.

Unit 13. Eagle Rock (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	11	2	5	4
1991	11	2	5	4
1996	11	2	5	4
2001	11	2	5	4

1996 Comments: No comments.

2001 Comments: Several large residential rebuilds have occurred in this unit and threaten the threshold rating. The existing pattern of development in many parts of this unit retains significant vegetative screening and is particularly vulnerable to the type of residential rebuilds seen in other areas of the lake. This unit remains at risk.

Unit 14. Ward Creek (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	10	3	3	4
1991	10	3	3	4
1996	9	2	3	4
2001	9	2	3	4

1996 Comments: The man-made features subcomponent was reduced due to several new large, highly contrasting homes with little or no visual screening or setback from the water's edge. Additional clutter along the shoreline from added piers (or extensions) and clutter on piers, have contributed to the degradation.

2001 Comments: Several large residential rebuilds south of Sunnyside with extensive glass area and poor screening further threaten man-made features. Additional development of this type will lower the score. This unit is not in threshold attainment and is at risk.

Unit 15. Tahoe City (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	5	1	2	2
1991	5	1	2	2
1996	5	1	2	2
2001	5	1	2	2

1996 Comments: No comments.

2001 Comments: The rehabilitation of the large metal warehouse at the Tahoe City Marina produces improvement, but it is not sufficient on its own to improve the man-made features score in this unit. The new structure at the Cobblestone property, with its light colored facade, is distinct from the lake; this color choice should not be repeated. Larger piers with boatlifts are noticeable. This unit is not in threshold attainment and remains at risk.

Unit 16. Lake Forest (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	5	1	2	2
1991	4	1	2	1
1996	4	1	2	1
2001	4	1	2	1

1991 Comments: Decrease in variety due to addition of many structures that do not blend with setting.

1996 Comments: No comments.

2001 Comments: The revegetation project along the road cut at Dollar Hill is beginning to reduce the color contrast in this area. A residential rebuild and use of rock rip-rap without adequate planting pockets along the sewer line alignment both produce negative effects. This unit is not in threshold attainment and remains at risk.

Unit 17. Dollar Point (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	10	3	4	3
1991	10	3	4	3
1996	10	3	4	3
2001	10	3	4	3

1996 Comments: No comments.

2001 Comments: No comments.

Unit 18. Cedar Flat (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	8	2	3	3
1991	8	2	3	3
1996	7.5	1.5	3	3
2001	7.5	1.5	3	3

1996 Comments: The man-made features subcomponent has been reduced due to additional development along the shoreline of piers and pier extensions, and several new or remodeled residences visible along the shoreline which are poorly sited and not well screened in relation to their setting.

2001 Comments: Large residential rebuilds with poor setbacks, inadequate screening, and poor color and material choices continue to produce visual concerns in this unit, although the unit's score will not drop again at this time. Larger piers with boatlifts are noticeable. This unit is not in threshold attainment and is at risk.

Unit 19. Carnelian Bay (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	5	1	3	1
1991	5	1	3	1
1996	5	1	3	1
2001	6.5	2	3	1.5

1996 Comments: No comments.

2001 Comments: With completion of the two CTC restoration projects and painting the marina structure (including the mural on the east side), the man-made features score improves. (The marina structure color should have been darker; the gray sand color misses an opportunity for more improvement.) The restoration projects also increase shoreline vegetation variety, producing a small improvement in the rating for that subcomponent. This unit is not in threshold attainment.

Unit 20. Flick Point (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	8	2	3	3
1991	8	2	3	3
1996	8	2	3	3
2001	8	2	3	3

1996 Comments: No comments.

2001 Comments: New residential rebuilds in this unit provide examples of both good and poor results. Two projects avoid degradation with good structure color, varied roof ridgeline elevation, and adequate vegetative screening. Two projects that produce large structures with inadequate setbacks and screening, dominant roof ridgelines, and very large window area threaten to reduce the man-made features score in this unit. Larger piers with boatlifts are noticeable. This unit is at risk.

Unit 21. Agate Bay (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	8	1	4	3
1991	8	1	4	3
1996	8	1	4	3
2001	8	1	4	3

1996 Comments: No comments.

2001 Comments: The low man-made features rating reflects, in part, the number of boats and beach equipment clutter found along the beach throughout this unit. Several residential rebuilds include poor setback and screening characteristics. Two tourist accommodation upgrade projects fail to make scenic improvements. This unit remains at risk.

Unit 22. Brockway (Placer County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	10	2	4	4
1991	10	2	4	4
1996	10	2	4	4
2001	9	1.5	4	3.5

1996 Comments: No comments.

2001 Comments: New medium large houses with inadequate screening and large window area reduce the man-made features score. The reduction in variety reflects an amendment in previous scores and the loss of some native shoreline vegetation. This unit is not in threshold attainment and is at risk.

Unit 23. Crystal Bay (Washoe County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	11	2	5	4
1991	8	1	4	3
1996	8	1	4	3
2001	7	1	3	3

1991 Comments: Decreased in background views and variety subcomponent due to addition of new structures along Crystal Bay hillside and in Incline Village background which highly contrast with setting; new ski run clearings consisting of highly contrasting straight lines; new, bright colors on major multi-residential projects along shoreline.

1996 Comments: No comments.

2001 Comments: The background views subcomponent score is reduced due to the increased visibility of residences in the forested backdrop and the addition of new, large residences very close to the water's edge, some with poor color choices and all with inadequate screening. Increased visibility of homes in the backdrop include both new homes and existing homes that have been painted light colors with reflective roof materials, and large amounts of visible glass. Some of this visibility is a result of tree thinning for forest health. Other changes in this unit with negative effects include: the light green water tank high up the ridge, the roof material and structure color of the new buildings at Burnt Cedar beach, and the new pier with boatlift at the west end of the sandy beach area and other larger piers with boatlifts. The Hyatt pier includes good design features and avoids creating impacts. This unit was considered at risk for continued degradation in 1996 and has since experienced a further decrease in the threshold rating. This unit is not in threshold attainment and remains at risk.

Unit 24. Sand Harbor (Washoe County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	12	4	5	3
1991	12	4	5	3
1996	12	4	5	3
2001	11.5 12	3.5 4	5	3

1996 Comments: No comments.

2001 Comments: The new stage facility on Sand ~~Point Harbor~~ is larger and more visible ~~and the lifeguard tower is an inappropriate size and color for its setting than anticipated.~~ However, it is anticipated that ~~C~~completion of the amphitheater mitigation measures ~~may will~~ contribute to ~~restoring the man-made features score in this unit. This unit is not in threshold attainment.~~ ~~improvement of temporary, degraded scenic quality conditions and the man-made environment.~~

Unit 25. Skunk Harbor (Carson City, Douglas County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	13	5	4	4
1991	13	5	4	4
1996	13	5	4	4
2001	13	5	4	4

1996 Comments: No comments.

2001 Comments: Placement of unscreened metal monitoring equipment on the shoreline at Thunderbird Lodge produces unnecessary glare and color contrasts.

Unit 26. Cave Rock (Douglas County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	10	3	4	3
1991	10	3	4	3
1996	10	3	4	3
2001	9.5	2.5	4	3

1996 Comments: No comments.

2001 Comments: Three large new houses with poor screening, too much window area, reflective metal roofs and inadequate setbacks are highly visible. A rebuilt boat house fails to produce substantial improvement. Piers with boatlifts are noticeable. These features combine with the past development practices to reduce the score for man-made features. This unit is not in threshold attainment and is at risk.

Unit 27. Lincoln Park (Douglas County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	8	1	4	3
1991	7	1	4	2
1996	7	1	4	2
2001	7	1	4	2

1991 Comments: Decrease in variety subcomponent due to addition of new structures which dominate the shoreline and highly contrast with forested setting.

1996 Comments: No comments.

2001 Comments: Three new residential rebuilds that are noticeably larger with poor setbacks and screening and too much window area create additional scenic problems. These projects further threaten the score in this unit. This unit is not in threshold attainment and remains at risk.

Unit 28. Tahoe School (Douglas County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	11	4	4	3
1991	11	4	4	3
1996	11	4	4	3
2001	11	4	4	3

1996 Comments: No comments.

2001 Comments: Two new residential rebuilds in the south end of the unit create additional scenic problems and threaten the score in this unit. This unit is at risk.

Unit 29. Zephyr Cove (Douglas County)

y	Threshold Composite	Man-Made Features	Background Views	Variety
1982	9	2	3	4
1991	9	2	3	4
1996	9	2	3	4
2001	9	2	3	4

1996 Comments: No comments.

2001 Comments: One residential rebuild underway and larger piers with boatlifts create new distractions and threaten man-made features, although not sufficient to reduce the score at this time. This unit remains at risk.

Unit 30. Edgewood (Douglas County)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	11	4	4	3
1991	11	4	4	3
1996	10.5	3.5	4	3
2001	10.5	3.5	4	3

1996 Comments: The man-made features subcomponent of this unit has been reduced due to the addition of new unscreened structures sited too close to the water's edge (including new pump house building near the south end of the unit and a massive residence north of Nevada Beach).

2001 Comments: Two new residences at the north end of this unit are visible; one of these is very boxy with extensive glass and little screening. This unit is not in threshold attainment and is at risk.

Unit 31. Bijou (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	9	1	4	4
1991	9	1	4	4
1996	9	1	4	4
2001	9.5	1.5	4	4

1996 Comments: No comments.

2001 Comments: Redevelopment of the Embassy Suites Vacation Resort removes several poor quality structures and replaces them with structures of higher design value. These features improve man-made features in this unit. Additional improvement could have been possible with an improved roof material/color choice for the Embassy structure. This unit remains at risk.

Unit 32. Al Tahoe (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	9	2	4	3
1991	9	2	4	3
1996	9	2	4	3
2001	10	3	4	3

1996 Comments: No comments.

2001 Comments: Improved shoreline revetment and revegetation exists along El Dorado and Regan Beaches. New office building demonstrates improved articulation and color, but continues poor setback and revegetation opportunities. These actions improve the man-made features score.

Unit 33. Truckee Marsh (City of South Lake Tahoe)

	Threshold Composite	Man-Made Features	Background Views	Variety
1982	14	4	5	5
1991	14	4	5	5
1996	14	4	5	5
2001	14	4	5	5

1996 Comments: No comments.

2001 Comments: No comments.

Appendix 2. SCENIC QUALITY RATINGS 2001 CHANGES

NAME	JURD.	UNIT	SCENIC RESOURCES	VIEW TYPES	UNITY	VIVIDNESS	VARIETY	INTACTNESS	2001 THRESHOLD RATING	1991	1996
SCORE CHANGES TO RATED VIEWS											
Shoreline											
Ebrite	EL	5	5.2	View of Shoreline	2	2	2	2	8	7	7
Comments: Road scar revegetation has improved intactness for this shoreline view.											
McKinney Bay	PL	12	12.6	View of Shoreline	2	2	2	2	8	9	9
Comments: Construction of new homes with poor setbacks and color add to view of the amphitheater canopy to increase prominence of shoreline development and decrease unity.											
Ward Creek	PL	14	14.4	View of Shoreline	2	2	2	2	8	9	9
Comments: Remodeled homes south of Sunnyside with expansive glass area creates interruption in view of the forested backshore, reducing unity.											
Tahoe City	PL	15	15.4	Visual Feature	1	2	3	1	7	6	6
Comments: Façade improvements to a large metal warehouse better integrate the structure in its setting, improving intactness.											
Carnelian Bay	PL	19	19.3	Visual Feature	1	3	2	1	7	6	6
Comments: Repainting the marina structure and adding a mural to one side slightly improve this structure's integration into its setting, improving intactness; a darker paint color would have made a more substantial improvement.											
Flick Point	PL	20	20.1	View of Shoreline	2	2	2	1	7	8	8
Comments: Several new residential rebuilds with inadequate setbacks and expansive glass area add to the existing developed character of the shoreline to reduce variety.											
Crystal Bay	WA	23	23.6	Backdrop View	1	1	2	1	5	6	6
Comments: Tree removal, change in structure and roof colors, and additional structures in the backdrop all contribute to increased view of residences throughout the forest uplands. Specifically, one white residence with a bright blue roof and a light green water tank are visible.											
Sand Harbor	WA	24	24.3	Visual Feature	2	3	3	2	10	11	11
Comments: Construction of the new amphitheater includes an unscreened large rock wall that is too light as viewed against the sand color. The addition of the boardwalk also contributes to loss of unity.											
Lincoln Park	DG	27	27.6	View of Shoreline	2	2	2	1	7	8	8
Comments: Continual redevelopment of residences with poor setbacks, color, height, and reflective quality add to the existing overdeveloped character of this shoreline to reduce intactness.											
Bijou	CSLT	31	31.4	View of Shoreline	2	2	1	2	7	5	5
Comments: Stabilization of the bank with successful revegetation and replacement of an office building with improved architectural qualities improves unity and intactness.											
Al Tahoe	CSLT	32	32.1	View of Shoreline	2	2	1	2	7	5	5
Comments: Maturing vegetation along the shoreline improves unity and intactness.											

Appendix 2. SCENIC QUALITY RATINGS 2001 CHANGES

NAME	JURD.	UNIT	SCENIC RESOURCES	VIEW TYPES	UNITY	VIVIDNESS	VARIETY	INTACTNESS	2001 THRESHOLD RATING	1991	1996
SCORE CHANGES TO RATED VIEWS, continued											
Roadway											
Tahoe City	PL	15	15.4	Landscape View	2	2	2	1	7	5	5
Comments: Completion of the Tahoe City streetscape project undergirds utilities, introduces sidewalks, street trees and street lights, and provides new planter box areas. This increases unity and vividness; with increased use of native species, particularly conifers, intactness could also increase.											
Tahoe City	PL	15	15.5	View to Lake	2	3	2	2	9	6	6
Comments: This is a correction to the 1996 score, recognizing the improved view afforded by the pedestrian boardwalk and restriction of lake side parking along the highway.											
Carnelian Bay	PL	18	18.3	View to Lake	3	3	2	2	10	8	9
Comments: Completion of the CTC restoration/access projects on both sides of the marina greatly enhance the quality of the lake view from the roadway. The projects improve unity; with vegetation establishment, variety could also increase.											
Kings Beach	PL	20B	20.6	Visual Feature	2	2	3	2	9	7	7
Comments: Moving the café/pro shop away from the intersection and the addition of frontage landscaping and mounding improves view of the golf course.											
Crystal Bay	WA	22	22.3	Landscape View	2	2	2	1	7	6	6
Comments: Some cutslope revegetation and installation of sidewalks has occurred, producing improvement to unity.											
Sand Harbor	WA	26	26.5	View to Lake	2	2	3	1	8	10	10
Comments: This is a correction to previous scores, reflecting the addition of piers, boathouses, and large, visible residences that have occurred since 1986.											
Spooner Summit	DG	28	28.2	Entry Point View	2	1	2	1	6	7	7
Comments: Placement of large, reflective guardrails adds to other existing features to reduce the scenic quality of a major entry point into the basin. The new guardrails limit the foreground view, further reducing the distinctiveness of the view.											
Zephyr Cove-Lincoln Park	DG	30	30.2	View to Lake	3	3	3	2	11	12	12
Comments: The increase in fencing within the meadow appears excessive and imposes a rigidity to a sweeping natural element.											
Meadow	DG	31	31.1	View to Lake	2	3	3	2	10	8	8
Comments: Maturation of the Jennings casino site restoration project has advanced to the stage of screening existing development and providing a distinctive meadow view, complete with pond and meandering stream vegetation.											
Casino Area	DG	32	32.2	Visual Feature	1	1	1	1	4	3	3
Comments: Façade improvements at Horizon and Harrahs, landscaping improvements at Horizon, and some marginal sign improvements help this heavily impacted area better integrate into its setting, producing a small improvement in intactness.											

Appendix 2. SCENIC QUALITY RATINGS 2001 CHANGES

NAME	JURD.	UNIT	SCENIC RESOURCES	VIEW TYPES	UNITY	VIVIDNESS	VARIETY	INTACTNESS	2001 THRESHOLD RATING	1991	1996
SCORE CHANGES TO RATED VIEWS, continued											
Roadway, continued											
The Strip	CSLT	33	33.2	Landscape View	2	2	3	2	9	7	7
Comments: Completion of the linear park, drainage facilities, and other redevelopment features in this area has greatly improved the foreground of the view of Mt. Tallac. These features have produced improvement in unity and variety. The new gondola cut is very visible from this area, yet it is not in the foreground of the Mt. Tallac view, thus its importance for this resource is reduced.											
Al Tahoe	CSLT	35	35.5	Landscape View	2	2	2	2	8	7	7
Comments: This is an amendment to previous scores to reflect the improved setbacks, less signage, and retention of mature pines compared to other areas in this scenic unit.											
Kingsbury Grade	DG	44	44.7	Visual Feature	2	2	2	2	8	6	6
Comments: Landscape restoration has been successful. This resource is now in threshold attainment.											
Brockway Cutoff	PL	40	40.4	Views to Lake	2	2	2	2	8	9	9
Comments: The addition of landscaping along the fairway blocks this targeted view. In addition, construction of the relocated café/pro shop at the golf course narrows the frame of the view and changes its character.											
Pioneer Trail, South	EL	46	46.4	Visual Feature	3	2	3	3	11	10	10
Comments: Completion and maturation of the CTC Cold Creek restoration project returns the stream to a meandering course and removes the artificial reservoir. Conifer tree growth, however, threatens to completely block this view without immediate thinning.											
NEW SCENIC QUALITY RESOURCES											
Shoreline											
Lake Forest	PL	16	16.8	View of Shoreline	2	3	2	1	8	NA	NA
Comments: Exposed verticle rock walls form a unique landscape type, marred by construction of stairways and pathways from development on the bluff to piers.											
Roadway											
The Strip	CSLT	33	33.3	View to Lake	2	2	2	1	7	NA	NA
Comments: A short lake view has opened through redevelopment at the base of Ski Run Blvd. This view contains an urbanized space in the foreground, with vehicle, tour boat and pedestrian features, and extends to distant and undistinctive east and north shore ridgelines.											
Tahoe Vista	PL	20A	20.10	View to Lake	2	2	1	2	7	NA	NA
Comments: A short lake view at Agatam Beach has been expanded through removal of a residence and restaurant. The restaurant will be replaced with other uses that will likely retain most of this expanded view. The view itself is filtered through trees and offers limited sight of the slopes and ridgeline of Flick Point.											
Kings Beach	PL	20B	20.11	View to Lake	2	3	2	2	9	NA	NA
Comments: A short lake view at the base of SR 267 has opened through CTC removal of a structure and view-blocking fence. A framed view of Mt. Tallac is offered, blocked in some areas with residual non-native vegetation.											

Appendix 2. SCENIC QUALITY RATINGS 2001 CHANGES

NAME	JURD.	UNIT	SCENIC RESOURCES	VIEW TYPES	UNITY	VIVIDNESS	VARIETY	INTACTNESS	2001 THRESHOLD RATING	1991	1996
RESOURCE CHANGES NOTED WITHOUT IMPROVING OR REDUCING SCORES											
Shoreline											
Emerald Bay	EL	6	6.4	Visual Feature	1	3	3	0	7	7	7
Comments: Continued vegetation establishment is decreasing the prominence of the avalanche scar, yet insufficient to improve the score at this time.											
Rubicon Bay	EL	9	9.4	View of Shoreline	0	2	2	1	5	5	5
Comment: New large residence on point is very visible and threatens further degradation.											
Tahoe City	PL	15	15.5	View of Shoreline	1	2	3	1	7	7	7
Comments: Continued increase in size and mass of residential and shorezone development, including larger piers and boatlifts, threatens degradation.											
Dollar Point	PL	17	17.3	View of Shoreline	2	2	1	1	6	6	6
Comments: Revegetation on the highway road scar is beginning to be visible, although insufficient at this time to alter the view.											
Cedar Flat	PL	18	18.3	View of Shoreline	1	2	2	1	6	6	6
Comments: Increasing visibility of shoreline development, including residences and piers with boatlifts, has occurred, although not sufficient to degrade the score at this time.											
Crystal Bay	WA	23	23.7	View of Shoreline	2	2	3	2	9	9	9
Comments: Construction of a new pier with boatlift in the middle of an unspoiled stretch of sandy beach, along with other increases in structure visibility, place this resource very close to degradation.											
Edgewood	DG	30	30.2	View of Shoreline	3	2	1	1	7	8	7
Comments: Vegetative screening has matured around the pump house noted in 1996, reducing its prominence. This is not sufficient improvement to alter the score.											
Roadway											
Camp Richardson	EL	2	2.4	Landscape View	3	2	2	3	10	10	10
Comments: Development clutter and congestion around Camp Richardson and the entrance to Valhalla is increasing and expanding and threatens intactness.											
Cedar Flat	PL	17	17.5	Landscape View	2	2	2	2	8	8	8
Comments: Loss of lake views through residential rebuilds has occurred, although the existing scores are sufficient to reflect the current condition. Continued loss could affect intactness and unity.											
Flick Point	PL	19	19.3	Landscape View	2	2	2	1	7	7	7
Comments: Loss of lake views through residential rebuilds has occurred, although the existing scores are sufficient to reflect the current condition. Continued loss could affect unity.											
Tahoe Vista	PL	20A	20.7	Landscape View							
Comments: The CTC Snow Creek Restoration Project will likely improve the quality of the view as soon as construction ends and the vegetation begins to mature.											
Stateline	WA	21	21.2	Landscape View	2	3	3	1	9	9	9
Comments: Increased view of residences in the backdrop is evident, yet the intactness rating for this view is already low enough to reflect the current condition.											
Mt. Rose	WA	23	23.6	View to Lake	3	3	3	3	12	12	12
Comments: Tree removal and residential modification make view of residences more prominent for the most expansive panorama in the entire basin. However, the existing intactness rating is sufficient to reflect this condition.											
Airport Area	EL	36A	36.6	Landscape View	1	2	2	2	7	7	7
Comments: Tree growth on the slope above the airport has reduced view of the near and distant ridelines, reducing variety. This growth also improves intactness as it screens view of the airport development.											

Appendix 3: 2001 RECREATION AREA AND BIKE TRAIL RATINGS CHANGES

A. Recreation Areas

The following notes and comments accompany the recreation area inventory worksheets.

1. Areas not visited, based on the following criteria: interviewing TRPA staff (re: recent on site and nearby off site projects), and a GIS identification of the number of projects within 1000' of a recreation area.
 - Moondunes
 - Granlibakken
 - Bliss State Park (The Green residence is visible from the north end of the beach, but is set well back from the edge of the water and does not affect the lake view. Also, house design and colors are appropriate and vegetative screening exists between the parking area and the house to reduce its prominence.)
 - Eagle Point Campground
 - Fallen Leaf Lake Campground
 - Baldwin Beach
 - Taylor Creek
 - Kiva and Tallac
 - Pope Beach
 - Reagan Beach

2. Visited, but no changes sufficient to alter scores or require additional notes/recommendations:
 - Hidden Beach
 - Ski Incline (Changes here were noted in the 1993 report)
 - Lake Forest Beach
 - William Kent Beach and Campground
 - Sugar Pine Point State Park (One new small structure was added to the historic grouping around the boathouse and the new cut at Heavenly is obvious from the beach. Neither of these changes should drop the applicable scores.)
 - Meeks Bay Resort/Meeks Bay Campground (One new, very large house is under construction to the south of the resort and will be very visible from the beach. It's too soon to determine the visual effects.)

3. The Field Inventory Worksheets update information found in the 1993 Lake Tahoe Basin Scenic Resource Evaluation. The "Description of Changes" relates to the text description of the elements that contribute or detract from the area's scenic quality. The "Progress on Recommendations" reports on the 2001 status of the recommendations made in 1993. Year 2001 scenic quality ratings are then provided and explained. Where necessary, additional recommendations appropriate to current conditions are noted. The photo inventory includes both the 1983 slide number (where applicable) and the 2000 digital image file name. Other information about the new images is provided.

Recreation Area Number	1						
Recreation Area Name	Nevada Beach						
Day/Date	Tuesday, 11/28/2000						
Description of Changes (Contribute to or Deduct from)							
On site	None.						
Off site	New residential development on the Bitler property results in a new, large residence visible directly to the north. Good building design and some existing screening, but more needed. Minor modifications to the existing boat house slightly improve its appearance.						
Progress on Recommendations							
A	New development more prominent, but with better design. No improvement for cluttered appearance in rest of the area.						
B.1-2	No apparent progress on recommendations for trailer park or 4H camp.						
B.3	Utility building increased in size, but landscape screening producing some benefit. Overall no noticeable improvement.						
C.1-3	Some increase in structure visibility along the shoreline, mostly in the mid or distant view. Visibility related to glare from windows and some light building colors. Not a substantial effect.						
D.1-3	No noticeable progress on recommendations. Severe mistletoe infestation and attempts to address it have reduced the mature tree cover and reduced the limbs on the trees remaining.						
Scenic Quality Ratings Changes							
<i>Views from Recreation Area</i>							
No change.							
<i>Natural Features</i>							
No change							
<i>Man-Made Features</i>							
No change.							
Notes: New residence to north produces small improvement in unity and small degradation in intactness for View 1-4, but probably not enough to add/drop a point. The new gondola cut produces a drop in intactness and unity for view of ridgeline to the southeast behind and above the recreation area, but this is not a rated view. The text indicates this ridge is not visible (and the slides don't illustrate it) nor do the scores include it. It is visible, however, through the trees at places along the entire beach.							
2001 Recommendations: Needs aggressive replanting in the picnic/parking lot areas. Needs additional planting along north property line. The interpretive trail from the campground out into the Jennings Casino site restoration and to the trailhead off Kahle Drive should be included in the inventory.							
Photos							
Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
--	1-residential	12:30	N38d58.91 5';W119d57 .287'	view to new residential to north. 1983 photos this direction not available.	N60dW	behind, left	sunny
From this photo point, turning and looking up to the ridge shows the new gondola cut as very prominent. Camera error occurred, so no photo.							

Recreation Area Number	2								
Recreation Area Name	Zephyr Cove								
Day/Date	Tuesday, 11/7/2000								
Description of Changes (Contribute to or Detract from)									
On site	Paint concession buildings, remodel outside of Sunset Bar with new deck/landscaping, new beach fence, new tiki-style shade umbrellas. Maturation of veg associated with parking lot redesign continues to better screen parking. No change to power lines or arch quality of concession buildings (except bar).								
Off site	One rebuild to south in progress (too early to tell impact) and one other recent. No change to residences on ridgeline.								
Progress on Recommendations									
A and B	No apparent improvements, but new development appears to follow recommendations. Two rebuilds (one in progress) on beach to the south that are large and close to the lake.								
C.1	Completed in 1992.								
C.2	Improvement to Sunset Bar, but not continued to other structures. Paint job unifies the buildings, but poor color choice. Tiki huts and structures for photos and t-shirt sales increase clutter.								
C.4	Cyclone fencing replaced with wood posts/wire fence. The posts more massive and create a barrier feel to the edge of the beach. Worse situation.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
2-3	15 / 14	5	5	3	3	4	4	3	2
Note: New wooden fence at back of beach and larger buoy field creates problems with intactness from 2-1, 2-2, and 2-3, but the added close view of nearby residential rebuilds drops the score for 2-3 only.									
<i>Natural Features</i>									
No change									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
2-a	5 / 5.5	1	1	2	2	1	1	1	1.5
Notes: Consistent paint job of the concession buildings slightly improves coherence, but the poor color choice and lack of architectural upgrades do not improve coherence with the site itself. The rebuild of Sunset Bar with deck improves design quality.									
2001 Recommendations: Redesign and upgrade of concession buildings at the pier still need to be done. This should happen in the context of creating a consistent architectural theme for the entire resort, including the lodge and proposed campground accessory use structures. The campground and lodge should be included in the inventory.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
2-31	2-31-00	1:00 p	N39d00.34 8', W119d56.9 47'	from center of southern beach to north (view to south looking directly into sun, so I didn't take it)	N	behind	sunny
2-45	2-45-00	1:15	N39d00.42 4', W119d56.9 31	concession building	N40dE	behind, right	
2-46	2-46-00	1:15	N39d00.42 4', W119d56.9 31	concession building	E	right	sun
--	2-sunset bar	1;40	--	front of Sunset Bar			

Recreation Area Number	3								
Recreation Area Name	Cave Rock								
Day/Date	Thursday, 11/16/2000								
Description of Changes (Contribute to or Detract from)									
On site	New monitoring equipment on the restroom roof; large with shiny metal surfaces. Recent upgrades to boat ramp/breakwater not apparent.								
Off site									
Progress on Recommendations									
A and B	As viewed from the boat ramp and parking area, no new development along the ridgelines is obvious. Existing development that creates impacts remains with no obvious improvements.								
C	Some rebuilds and color changes for homes along the shoreline are visible and generally affect the degree of intactness in this area. Comparing the 1983 photos, however, doesn't show whether this is actually a degradation.								
D	Some landscaping exists around the parking lot, but it fails to reduce the preponderance of hardscape.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
3-a	15 / 14.5	3	2.5	5	5	3	3	4	4
Note: Reflective monitoring equipment reduces the coherence of the restroom building.									
2001 Recommendations: Monitoring equipment should be relocated to a less visible location.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
3-21	3-21-00	10 am	N39d02.65 1';W119d56 .925'	view of monitoring equipment, taken into sun	Due S	front	sunny

Recreation Area Number	4								
Recreation Area Name	Sand Harbor								
Day/Date	Tuesday, 11/28/2000								
Description of Changes (Contribute to or Detract from)									
On site	New perimeter fence, new festival area with amphitheater, new lifeguard tower, completion of the boardwalk around Sand Point.								
Off site	New vacation resort in Incline visible from the water near the boat ramp, but not from any of the mapped viewpoints. New development/redevelopment in the viewshed in Crystal Bay is not prominent from this distance, although some of it is visible. Compared to the 1983 slides, the increase in visibility is negligible.								
Progress on Recommendations									
A	From this distance, new development/redevelopment in Crystal Bay has avoided creating substantial new degradation. No apparent progress on revegetating roadway cutslopes.								
B.1-4	Design criteria appear to be met.								
B.5	Cutslope revegetation has to date not been successful.								
C	Ok								
D	The existing structures continue good maintenance practices. The new perimeter fence along the highway is the same design as that used at Memorial Point. This is a more attractive fence than the cyclone fence it replaces, yet is more massive in character and is more dominant when viewed by southbound travelers. Most of the "temporary" wood fencing protecting vegetation remains; some of this has been replaced with attractive permanent fencing in the performance area.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
4-2	17 / 16.5	5	4.5	4	4	5	5	3	3
Notes: The Intactness view has suffered since 1993, yet the score of 3 adequately defines its 2001 condition. Additional park development has cumulatively decreased the Unity score.									
<i>Natural Features</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
4-7	17 / 12.5	5	3.5	4	3	4	4	4	2
Notes: The 1993 rating for this resource was low; this evaluation amends the points for Vividness and Variety assigned then. Over time, the vegetation along the beach has receded due to trampling and the addition of the boardwalk, stage, drinking fountain retaining walls, and lifeguard tower have all combined to reduce the visual quality of the beach.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
4-i	15	--	4	--	4	--	3	--	4
4-i, festival area. The new amphitheater structures display high design values and establish a more organized and coherent festival use compared to the pre-project condition. The size of the new facility and its use of a stone type not compatible with the color and shape of on site rock are detriments, however. The 2000 November condition of the stage reflects several features that may be out of compliance with the TRPA permit, particularly the wall around the stage and the superstructure, both of which were to be removed after the performance season. The vegetation restoration on Sand Point that was part of the amphitheater approval is scheduled to begin in 2001. Completion of the mitigation measures may improve both the condition and compatibility scores for this area.									

2001 Recommendations: The concrete retaining walls around the drinking fountains should be faced with sand-colored stone. The lifeguard station should be replaced with a dark colored structure of site-appropriate design. State Parks should enforce terms of the lease agreement with amphitheater users relative to seasonal removal of stage structures. To reduce the color contrast between the sand and the stone used on the stage structure, additional vegetation capable of growth to 15' should be planted between the stage and the boardwalk. Where possible, additional vegetation should be planted downslope of the boardwalk to reduce the dominance of the shadow line.

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
4-2	4-2-00	11:30	N39d11.76 4':W119d55 .764'	View of beach and Sand Point from mid-beach. This view appears to match the 1983 slide, but is not located where the mapped viewpoint lies.	S70dW	left behind	sunny
--	4-beach		N39d11.81 0':W119d55 .830'	This viewpoint is close to that mapped, which perhaps should be slide 4-2.	S70dW		

Recreation Area Number	7								
Recreation Area Name	Incline Beach								
Day/Date	Tuesday, 11/28/2000								
Description of Changes (Contribute to or Detract from)									
On site	New entry feature and redesigned parking lot. New fence along Lakeshore Blvd.								
Off site	New piers with boathouses (compared to 1983) to the west and new/expanded piers to the east. All new boathouses predate 1993 update, but aren't noted in text. Some poor color choices on residences in Crystal Bay. New residences along SR 28 near Lakeshore Blvd.								
Progress on Recommendations									
A	Recommendation not followed as two new residences allowed in this area, one more visible than the other. Color choices good and not particularly obvious on a cloudy day, but window area is large with glare likely on sunny afternoons.								
B.1-3	Appears ok								
B.4, 6	Color recommendation not followed for a number of residences. New structures allowed in areas of sparse vegetative cover.								
B.5	Not successfully completed.								
C	To the east, new piers and at least three new boathouses are evident, compared to 1983 slides (see note below). To the west, a new large residence with no landscape screening sits close to the water. Views degraded in both directions.								
D.1-2	Completed.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
7-1	No change because the Intactness score is already a "2".								
7-2	11 / 10	2	2	3	3	3	3	3	2
Notes: The boathouse projects to the west predate the 1993 recreation area update, but are not identified in the text. Required additional lakeside landscaping for the new residence to the west is either not completed yet or is too small to be noticeable from this distance. Additional development to the east visible from the beach reduces the Intactness score.									
<i>Natural Features</i>									
No changes.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
7-a	13 / 15	3	4	4	4	3	3	3	4
7-b	13 / 14	3	3	4	4	3	3	3	4
Notes: New entry features and parking lot improvements increase the scores for these features.									
2001 Recommendations: Changes to Design Review Standards needed to increase lake set-back, improve color choices, and reduce bulkiness of new and remodeled residential projects.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
7-4	7-4-00	10:40	N30d14.37 6';W119d56 .979'	some residence w/bad color choices in Crystal Bay	S70dW	left	sunny
7-13	7-13-00		N39d14.32 7';W119d56 .896'	new house on SR 28, new piers and 3 boathouses	Due E	front right	same
--	7-shoreline		same	view to west showing new residence	D W		
7-20	7-20-00		N39d14.41 6';W119d56 .853'		S	--	--

Recreation Area Number	8								
Recreation Area Name	Burnt Cedar Beach								
Day/Date	Tuesday, 11/14/2000								
Description of Changes (Contribute to or Detract from)									
On site	Remove old concession building and replace with three structures that serve the swimming pool. Reconfigure parking lot. New perimeter fence and entry kiosk. New children's play area.								
Off site	New piers to the west and new/expanded piers to the east. Some poor color choices on residences in Crystal Bay visible from the peninsula.								
Progress on Recommendations									
A.1-2, 5	Additional development (and some structure color change) on the slopes in Crystal Bay is visible from Burnt Cedar and adds to the degradation noted in 1983.								
A.3	This has been followed.								
B	Actually, a new pier has been built in the center of the beach.								
C	Since upgrade in swimming pool area, inconsistent architecture between those structures and maintenance building near the children's play area.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
8-2	14 / 13	4	3	4	4	4	4	2	2
Notes: Off site development is more prominent from the peninsula and decreases both Intactness and Unity of view. The Intactness score will not be reduced as a 2 adequately describes the 2001 condition.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
8-b	15 / 14	4	3	5	5	2	2	4	4
Notes: The new structures demonstrate high design values and include good siting, roof pitch design, and window treatment. They are taller and more bulky than the previous structure, however, which is emphasized by the light colored stucco exterior and the extensive use of copper on the roof. The stucco is a particularly poor material/color choice for the wooded setting. The architectural style of these structures is now different from the maintenance structure and entry feature.									
2001 Recommendations: Changes to the Design Review Standards are needed to improve color choices and reduce bulkiness of new and remodeled residential projects. The stucco exterior of the new structures should be painted with a darker color. The reflective qualities of the roof should be reduced. Additional piers should be limited on the sandy beach to the west.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
8-10	8-10-00	10:30	N39d14.71 3';W119d58 .138'	piers to east	N50dW	behind	cloudy
8-16	8-16-00	10:30	same	piers to west	S70dE	front	same
--	8-pool	10:45	N39d14.71 7';W119d58 .137'	new pool structures from peninsula (couldn't get inside the fence to duplicate slide 8-21)	N30dW		
--	8-play	11 am	N39d14.73 6';W119d58 .114'	children's play area and maintenance structure from stone barbeque	N30dE	right	

Recreation Area Number	9								
Recreation Area Name	Kings Beach								
Day/Date	Thursday, 11/9/2000								
Description of Changes (Contribute to or Detract from)									
On site	Redeveloped pier; minimal profile, but with more extensive railing.								
Off site	CTC removal of commercial development to the east and creation of a park. Commercial structure upgrades across the highway.								
Progress on Recommendations									
A	The design related off site recommendations appear to be met for the most part. A few residences stand out in the Agate Bay neighborhood (due to glass and/or structure color), but it's hard to tell if these are recent changes.								
B	The design related off site recommendations appear to be met.								
C.1-5	These recommendations (related to on site upgrades and buffering property to the east) either completed or unnecessary after the CTC project.								
C.6	No noticeable landscaping near the conference center has occurred.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change.									
<i>Natural Features</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
9-3	11 / 12	3	4	3	3	3	3	2	2
Notes: The distractions of poorly maintained commercial buildings to the north have been removed by the CTC park project. Commercial development across the highway and the roadway itself has become visible in this area, however, precluding an increase in the Intactness score. As vegetation matures, Intactness will probably improve.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
9-e	16	--	3	--	5	--	4	--	4
9-e, pier. This pier replaces a bulky, double piling design that had become hazardous.									
2001 Recommendations: Inventory should be updated to include all the public access in this area.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
9-13	9-13-00side	12 noon	N39d14.164';W120d01.410'	side view of pier from beach	S85dE	right	
--	9-13-0length		N39d14.139';W120d01.425'	view of pier from end	Due S	front	

Recreation Area Number	11
Recreation Area Name	Tahoe Vista Recreation Area (Agatam Beach)
Day/Date	Thursday, 10/26/2000
Description of Changes (Contribute to or Detract from)	
On site	BMPs on the parking lot.
Off site	Removal of residence to east and restaurant to west. New pier to east with boatlift. Commercial structure upgrades across the highway.
Progress on Recommendations	
A.1-4	These appear to be met. The new pier to the east is not obtrusive without a boat on the lift. With a boat, this will block view.
A.5	I didn't notice this element, but do not believe this is accomplished.
B.1-5	These recommendations appear to be met.
C.1-3	These are no longer relevant as the property is now part of this recreation area.
C.4	Not completed.
D.1-4	These are not completed, but the entire property is currently under a master plan study for redesign. The parcel appears to be better maintained than noticed in 1983.
Scenic Quality Ratings Changes	
<i>Views from Recreation Area</i>	
No change. View 11-1 will remain the prominent view from the beach even after an expanded inventory includes the remainder of the publicly owned property.	
<i>Natural Features</i>	
No change.	
<i>Man-Made Features</i>	
No change.	
Notes: The property surrounding the 1993 Agatam Beach parcel has changed dramatically, although no on site improvements have been made.	
2001 Recommendations: Inventory should be updated to include all the public access in this area. New uses planned for this entire parcel should maximize the lake view available from the road, establish an upgraded entry, screen all parking from view from the beach and roadway, and limit the size and mass of future planned structures.	

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
Photos taken of existing condition, but no information noted.							

Recreation Area Number	12								
Recreation Area Name	Carnelian Bay West (Patton Beach)								
Day/Date	Tuesday; 11/7/2000								
Description of Changes (Contribute to or Detract from)									
On site	Completely redeveloped park; all new man-made features and new on site natural features. No change to the actual beach area. New man-made features: Cafe and parking, signage and fencing, retention basin and boardwalk. New natural features: diverse vegetation of the SEZ restoration and backshore barrier beach.								
Off site	Color change to the marina building, with a mural on the park side. Restoration of the SEZ across the highway with an attractive, arched stone-faced bridge visible. Large commercial structure under construction across highway (part of the miniature golf course property).								
Progress on Recommendations									
A	Design related recommendations for off site development appear to have been implemented. No noticeable degradations (or improvements) compared to 1983 photos.								
B	Warehouse painted with mural to substantially improve its appearance.								
C and D	Design related recommendations appear to have been met for adjacent and ridgeline surrounding development. Improvement in the cluttered appearance of the commercial area due to SEZ restoration.								
D	No noticeable improvement to the commercial area north of the beach has occurred. The large two-story commercial structure currently under construction is sited near the highway with no existing mature vegetation around it. The structure is very boxy, yet other facade details are not evident at this stage. On the other hand, just completed SEZ restoration directly across the highway adds to the landscape features visible from the park. Central to this view is a new bridge with an attractive curving stone-faced side view. No recreation access to this side, so no Rec area expansion needed here.								
E	Park completely redeveloped so recommendations no longer applicable.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
12-1	13 / 14	4	4	4	4	3	3	2	3
Note: Improvements at the Sierra Boat Company marina improve the view from the beach.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
12-a	6 / 19	1	5	2	5	2	4	1	5
12-b	-- / 19	--	5	--	5	--	4	--	5
12-c	-- / 20	--	5	--	5	--	5	--	5
Notes: New park features include: Entry treatment (12-a) consists of low stone wall with carved sign and perimeter fence; Cafe and parking (12-b) consists of redeveloped cafe sited to increase view to the lake and cluster development to marina side of the park; and retention basin and boardwalk (12-c). Mural on side of marina building provides an excellent compliment to the high quality of the on site improvements and considerably decreases the visual effects of a tall, flat surface along this edge of the park.									
2001 Recommendations: The commercial development across the highway from this park is now the biggest detriment to the recreation experience. Power line undergrounding and substantial frontage landscaping are necessary to reduce this impact.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
	12-cafe	11:30 am	N39d13.604'W120d04.789'	Cafe and kayak storage from pedestrian entry.	Due S		cloudy
	12-entry		N39d13.607'W120d04.770'	Entry signage and perimeter fencing	Due S		
12-7	12-7-00		N30d13.568'; W120d04.763'	View toward marina from beach showing color change.	S70W		
	12-mural	12 noon		View of mural from parking area			
	12-landscape		N39d13.609';W120d04.745'	View of retention basin and boardwalk	S30dW		

Recreation Area Number	14								
Recreation Area Name	Lake Forest Campground and Boat Ramp								
Day/Date	Tuesday; 11/7/2000								
Description of Changes (Contribute to or Detract from)									
On site	Remodeled restroom building in a landscaped area and screening landscaping along Lake Forest Road in the campground area.								
Off site	None noted.								
Progress on Recommendations									
A	The general recommendations related to design elements of surrounding development appear to be met.								
B.	No improvement at the Coast Guard facility has been made.								
C.1-2	No improvement in the boat trailer parking area or the disturbed area to the west has been made.								
C.3	Completed.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
14-a	10 / 12	3	3	2	3	3	3	2	3
Notes: TCPUD plans for redesign of the pier/breakwater on hold and possibly abandoned. UC Davis research facility is in planning stages and may be located where the campground is now.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
14-5	14-5-00	11:00a m	N39d10.95 7'W120d07. 165'	remodeled restroom and landscaping	N60dW	behind	cloudy

Recreation Area Number	15
Recreation Area Name	Tahoe State Recreation Area
Day/Date	Tuesday; 11/7/2000
Description of Changes (Contribute to or Detract from)	
On site	Parking lot on west side of the park to serve customers of a tour boat docked at the Lighthouse Center; this pavement existed in 1993, but apparently not in 1983. This parking lot sits at the upper edge of the meadow and is not screened from view from either the meadow or the lake; existing shrub vegetation partially screens it from view from the scenic highway during the summer season. New paved trail through the meadow and improved vegetation establishment in the meadow and at the water's edge.
Off site	Bank erosion visible from the park on the Lighthouse Center property has been eliminated through successful revegetation.
Progress on Recommendations	
A.1-6	All the general design requirements for surrounding property appear to be met.
B.1; C.1	Erosion problems addressed and barge removed, so completed.
B.2; C.2	Not completed.
B.3	Pier continually in use, so removal not feasible.
Scenic Quality Ratings Changes	
<i>Views from Recreation Area</i>	
No change.	
<i>Natural Features</i>	
Parking lot at upper edge and trail through the meadow may make a change, however, it was not possible to assess during snow conditions.	
<i>Man-Made Features</i>	
If the parking lot is to remain, it should be scored and added to the inventory.	
Notes: Current master planning efforts underway for this park. Alternatives under consideration include removing campground, building a boat museum, converting the parking lot noted above to general public parking. Several future projects likely that are visible from the pier: marina master plan underway for expansion of the Tahoe City marina, new very long pier at the base of Grove Street, and changes at Tahoe Commons.	
2001 Recommendations: If the parking lot near the Lighthouse Center is to remain, it should be screened from view from the meadow and lake. If it continues to be utilized by nearby recreational uses (tour boat), the signing and pedestrian entrance features should be upgraded and made comprehensible to the user.	

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
None taken as the parking area and trail through the meadow were under snow and not visible.							

Recreation Area Number	16								
Recreation Area Name	Commons Beach								
Day/Date	Tuesday; 11/7/2000								
Description of Changes (Contribute to or Detract from)									
On site	Improved landscape (and other) maintenance including that in parking lot; lawn area needs rehabilitation. Many small deciduous trees gone compared to 1983 photos. New and relocated children's play area and remodeled restroom building with improved architectural features. New boardwalk at the top of the slope with wooden stairs to beach. Most mature pines in the central part of the park have a bad mistletoe infestation, which endangers the park's future character.								
Off site	Large metal building to the north redeveloped with new roof, siding and the addition of windows, which results in the reduction in the sense of an industrial area. New two-story commercial structure at mid-town is visible from the beach; light color seen against the sky, but currently screened by mature pines and will be better screened eventually by growth of street trees.								
Progress on Recommendations									
A and B	All the general design requirements for surrounding property appear to be met.								
C	Existing development on this ridge is not improved, but no new development is obvious.								
D.1, 3	Not completed.								
D.2, 4	Essentially completed, with some maintenance lapses.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No changes in score. Remodeled metal warehouse building an obvious improvement, but not enough to alter the score for a panoramic view.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
16-a	15 / 16	3	4	4	4	4	4	4	4
16-c	13 / 14	3	4	4	3	3	4	3	3
Notes: The restrooms and children's play area have been upgraded since the 1983 photos were taken, yet both suffer somewhat by hard use. Current master plan efforts are underway to upgrade/redesign this park. No decision yet, but substantial grant funds available for park upgrade. The lakeside bike trail will run through this park, probably at the base of the slope and continue along the shoreline to the marina area. Future projects visible from this parking include marina expansion and the addition of a long pier at the bottom of Grove Street, both to the west, and a long public pier at the 64 Acres to the east.									
2001 Recommendations: Landscaping in the park needs restoration and should include understory establishment in areas near the beach and parking lot, and aggressive treatment of the mistletoe infestation. Bike trail development should not remove lakeside vegetation west of the park.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
--	16-warehouse	10 am	N39d10.24 2'; W112d08.4 57'	View of remodeled metal warehouse building. (out of focus)	N30dE	right	p. cloudy
16-21	16-21-00		N39d10.22 4';W120d08 .468'	Remodeled restroom building showing stairs to boardwalk behind	S60dW	left	
16-5	16-5-00		N39d10.17 4';W120d08 .495'	restrooms and relocated/upgraded children's play area	N10dW	behind	

Recreation Area Number	19								
Recreation Area Name	Kaspian Recreation Area								
Day/Date	Sunday, 11/19/2000								
Description of Changes (Contribute to or Deduct from)									
On site	New pier at north end of recreation area.								
Off site	One boat house removal/pier redevelopment to the north and fence replaced along the southern boundary (no improvement for fence). New Heavenly Valley gondola cut visible.								
Progress on Recommendations									
A1- 5	Off site design related recommendations appear to be met. With pier redevelopment (pier longer with boat lift), boat house removed. This opens the view to the north and makes the rock peninsula more prominent and interesting.								
B	What little development is visible to the south appears to meet the off site design criteria.								
C	No recognizable landscape planting is evident.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	00	93	00	93	00	93	00
19-1	11 / 12	3	3	3	3	3	3	2	3
19-1a	-- / 14		4		3		4		3
Notes: New pier offers important new view (19-1a). From the end of the pier, the view to the south is very natural with good vegetation diversity in the recreation area. Beyond the rec area, shoreline development is visible, but distant and not obtrusive. Ski slopes at Homewood and Rubicon Peak distinctive in the backdrop. New gondola cut at Heavenly distinct from this view. View to the north includes some vegetation diversity along the distant shoreline with residential development well integrated. Buoy field for Skyland with 45 buoys visible. View back to shore includes highway-side houses with no screening and prominent roadcut to Talmont.									
<i>Natural Features</i>									
No changes.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
19-c	-- / 17	--	3	--	4	--	5	--	5
Note: The new pier (19-c) is narrow and follows the minimum pier design guidelines, which produces good compatibility with the site. The access to the pier is not from the center of the beach and there is no room for nearby parking, so when parking occurs, it encroaches on the bike trail.									
2001 Recommendations: Frontage landscaping should be added to the residential property along the highway to help integrate those structures. The parking for the recreation area, including the large dirt lot across the street should be paved and formalized.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
--	19-2-00pan1 (-pan5)	11:35	N30d06.884';W120d09.451'	five pan shots (creating partial pan) of lake from end of pier	--	--	mostly cloudy
--	19-2pier	--	--	detail view of pier design	--	--	same

Recreation Area Number	20								
Recreation Area Name	Ski Homewood: Homewood Ski Area Portion								
Day/Date	Thursday, 11/30/2000								
Description of Changes (Contribute to or Detract from)									
On site	The main ski lodge has been painted and its roof repaired. New signage. No change to parking area or maintenance area. The lift towers are now black. A second structure has been added near the lodge; it is a modular building and shares no design detail except paint color with the lodge. This structure was approved as temporary and was to have been removed this summer.								
Off site	No changes.								
Progress on Recommendations									
A1-4	Off site design recommendations appear to be met.								
B.1-2, 4-5	None of these recommendations have been implemented.								
B3	Ski towers are now black.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No changes. (The modular building is very visible from 20-2, but this view is already scored very low.)									
<i>Natural Features</i>									
No changes.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
20-a	8 / 8	2	1	2	3	2	2	2	2
Notes: The addition of the modular building further deteriorates coherence; if this building is removed, this score should return to a "2". The addition of a structure here helps to break up the expanse of pavement in the parking lot and, if landscaping were incorporated, could improve the score for this feature and that of the parking lot itself. The condition of the main lodge structure has improved.									
2001 Recommendations: The modular building should either be removed or replaced with a structure compatible with the design features of the lodge. Landscaping should be incorporated around this structure and that of the main lodge.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
No photos taken.							

Recreation Area Number	21
Recreation Area Name	Ski Homewood: Tahoe Ski Bowl Portion
Day/Date	Sunday, November 19, 2000
Description of Changes (Contribute to or Deduct from)	
On site	All base buildings painted and consistent signage with the Homewood base facilities. No change to parking area or maintenance (more outdoor storage in parking lot; preparations for upcoming season?) Lift towers painted black.
Off site	No changes.
Progress on Recommendations	
A1-4	Off site design recommendations appear to be met.
B1-2	No landscaping improvements obvious.
B3	Ski towers have been painted black.
Scenic Quality Ratings Changes	
<i>Views from Recreation Area</i>	
No changes.	
<i>Natural Features</i>	
No changes.	
<i>Man-Made Features</i>	
No changes to the score.	
Notes: The coherence between all the structures at the base of the ski slope has been improved with consistent painting and signage. The new color blends well with the summer-time shrub vegetation on the slopes. However, the scores for these features are already sufficiently high to accurately indicate their 2001 condition.	
2001 Recommendations: No new recommendations needed.	

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
21-12	21-12-00	12 noon	N39d04.726';W120d09.597'	base facilities showing new colors and sign	Due S	--	cloudy
--	21-lodge		N39d04.721';W120d09.603'	as close as possible to view in 21-10 of lodge, considering snow in the way. standing on snow pile, so elevated +/- 2'.	N70dW		

Recreation Area Number	26								
Recreation Area Name	Vikingsholm/Emerald Bay								
Day/Date	Tuesday, November 28, 2000								
Description of Changes (Contribute to or Deduct from)									
On site	Redeveloped parking lot surrounded by CCC crew-built short stone walls reminiscent of the historic hand stone work found in other portions of Emerald Bay. A new foot trail along the highway links this parking lot with that for the Eagle Falls trailhead. Recent restoration work at the castle and its environs remedies most of the past visual problems associated with poor repair.								
Off site	Retaining walls and viaduct constructed by Caltrans mostly not visible from this area.								
Progress on Recommendations									
A.1,3	Appear to be met								
A.2	Some improvement in parking has occurred recently in Emerald Bay with the organization of parking at the overlook and on the roadway near Eagle Falls. The character remains chaotic during peak periods, however.								
B.1-3	These recommendations have been accomplished. The new rock work presents an added detail that enhances the visitor experience. The new foot trail helps to reduce the confusion along the roadway.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
26-d	11 / 16	2	4	4	4	2	4	3	4
Notes: The redesigned parking lot produces a comprehensible and efficient design small enough to avoid making users feel they are not engulfed in a broad expanse of asphalt. The perimeter granite rock wall is of high quality and evokes the historic rock guardrails found in other areas of Emerald Bay. The two remaining negative features are: the entrance sign, damaged by an avalanche several years ago and not yet replaced; and excessive congestion during peak periods.									
2001 Recommendations: None.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
--	26-parking	2:30	N38d57.23 9';W120d06 .626'	parking lot	Due N	behind	sunny

Recreation Area Number	27								
Recreation Area Name	Eagle Falls Picnic Area								
Day/Date	Tuesday, 11/28/2000								
Description of Changes (Contribute to or Detract from)									
On site	Permanent restrooms at the trailhead.								
Off site	None noted.								
Progress on Recommendations									
A	Ok								
B	Ok								
C	Permanent restrooms have replaced the port-a-potties.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
27-b	8 / 15	2	4	3	4	2	4	1	3
Note: The permanent restroom is an example of good US Forest Service facilities design. The siting, materials, and architectural quality all meet visitor expectations when embarking on a natural, outdoor experience.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
--	27-restrooms	2:20	N38d57.11 2';W120d06 .786'	restrooms from the parking lot	N60dW	left	sunny

Recreation Area Number	33								
Recreation Area Name	Camp Richardson								
Day/Date	Tuesday, November 28, 2000								
Description of Changes (Contribute to or Deduct from)									
On site	Overall upgrade to lodge/commercial buildings and cabins includes consistent paint colors and signage. Permanent signage and structure upgrades in this area produce important scenic improvements, but substantial clutter (temporary signs, strings of flagging, on road parking, etc.) and extreme congestion exists during peak season to overwhelm the improvements. New signs include "entry to historic resort" landscaped signs along the highway, structure identification signs for each use, and directional signage at the intersection with the main entrance drive. Rebuilt snack bar building on the beach results in larger structure but with good colors and better design features. New pier much larger using good design standards (low to the water, color, etc.) with improvements to marina buildings including better colors and removal of some of the overhead boat lift apparatus. Buoy field larger than in 1983; larger also than in 1993.								
Off site	Several rebuilds to the east in Jameson Beach not visible from the main beach area. Rebuild on east side of Eagle Point to the west discernable, but colors ok to reduce visibility. New gondola cut not visible from beach. Roof of Embassy Suites (Ski Run) visible. New Harrah's color an improvement.								
Progress on Recommendations									
A-B	Design oriented recommendations appear to be met.								
C.1, 3, 5	Overall structure upgrade and improved consistent signage increase coherence and sense of place for both commercial and tourist accommodation areas of the resort. The Beacon redesign produces the improvements noted in the recommendation. Although this structure is now larger, its form and colors avoid creating the sense of a substantial new building.								
C.2	Some color changes have occurred with this structure, improving the view from the lake but not from other areas of the resort. The large boat hoist mechanism has been removed as a mitigation measure to offset the effects of a larger pier.								
C.4	No noticeable improvements to the parking area have been made.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change. Removal of the boat hoist appears to be a good offsetting measure for a longer pier. At the time of evaluation, the larger buoy field was empty; it is possible that unity could be affected at peak season by this increase.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
33-a	5 / 15	1	3	2	4	1	4	1	4
33-b	5 / 14	1	3	2	4	1	4	1	3
Notes: Expanded inventory should include campground area, stables, and commercial development. Upgrade to some concession buildings occurred pre-1993 update, but not noted in text. Changes to scores for man-made features reflect a substantial upgrade, yet is based on the off-peak season condition. Peak season scores would be lower for the entry treatment, primarily because the seasonal signage and commercial clutter out competes the improvement in permanent signage and directional information.									
2001 Recommendations: Peak season uses along the highway, including temporary and seasonal activities and signage, has incrementally grown over the years and should be limited to reduce the congestion and visual clutter. The cluster of structures along the highway now used for commercial purposes threatens to exceed that which is appropriate to this historic area and should not grow any larger. No further development should be allowed in the viewshed of the highway, bike trail, or entry area. Peak season parking outside of developed parking lots should not be allowed within the viewshed of the highway and bike trail. The inventory should be expanded to include the campground, more detail concerning the commercial use area, and the stable.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
33-29	33-29-00	1:40 p	N38d56.23 2';W120d02 .430'	view of Beacon and parking lot (poor photo with extreme glare from the lake)	Due N	behind	sunny
33-35 and 36	33-35-00, 33-36-00	1:50	N38d56.33 0';W120d02 .430'	view of the beach and pier to the east; not exactly the same location as previously to illustrate the Beacon and the expanded pier.	N60dE and N30dE	behind right	sunny
33-2	33-2-00	1:50	N38d56.33 0';W120d02 .430'	view of upgraded cabins from the beach	S20dE	front	sunny

Recreation Area Number	36								
Recreation Area Name	El Dorado Beach and Campground								
Day/Date	Tuesday; 11/7/2000								
Description of Changes (Contribute to or Detract from)									
On site	Major redevelopment of picnic area, boat ramp, and backshore stabilization. Picnic area shrunk in size and lowered from surrounding elevation, which provides some psychological relief from roadway traffic. Designated entry feature provided with public art creates a distinct gathering area and focuses attention toward the lake. Use of lawn eliminates bare dirt undercover and, while not native, is appropriate to this more urban recreation area. Boat ramp widened to allow double launching. Some increase in dominance, but accompanied by some landscaping that will eventually reduce the dominance of the underpass when viewed from the beach edge. Vertical sheet piling walls and large rock riprap stabilizes the slope, the negative visual effects somewhat offset by maturing vegetation. Overall, a minor improvement over the badly eroding bank condition. Conifer trees on site maturing and screening motel to the west, will soon produce lake view blockage from the roadway and picnic area.								
Off site	Better motel color directly west and maturing vegetation reduce the dominance of this development; most other offsite improvements/degradations not very visible from this site. Embassy Suites and Heavenly gondola cut not visible from this area.								
Progress on Recommendations									
A.1; B.1	All the general design requirements for surrounding property appear to be met.								
C.1-2	Picnic area redesign sinks picnic sites 3' below lawn grade and provides psychological barrier. Vegetation growing well on the bluff to screen development to the west.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change.									
<i>Natural Features</i>									
	Unity	Vividness	Variety	Intactness					
#	Score	93	00	93	00	93	00	93	00
36-3	10 / 11	4	4	2	2	2	3	2	2
36-4	9 / 11	4	4	2	2	2	3	1	2
Notes: Erosion control and vegetation improvements along the bluff and between the beach and the motel to the west have increased the variety and intactness of the beach.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
36-c	12 / 16	3	4	4	4	3	4	2	4
Notes: Reconfiguring the picnic area and adding the lawn has improved the appearance and increased the variety of the stand of pine trees.									
2001 Recommendations: Landscaping improvements are needed in the parking lot along the highway.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
36-1	36-1-00	2:00 pm	N38d56.704', W119d58.504	formerly eroding bank	S40dW	behind	sunny
36-23	36-23-00	2:30p	N38d56.694', W119d58.524	picnic area to west with short wall and tile mural in center (public art)	N60dW	left	
--	36-entry	2:40	--	view of new entry, from the intersection			
36-22	36-22-00	2:45	N38d56.684', W119d58.524	picnic area to east	N40dE	behind	
36-17	36-17-00	2:45	N38d56.682', W119d58.594	boat ramp from bluff showing tree screening and enlarged boat ramp.	S40dE	left	

Recreation Area Number	37								
Recreation Area Name	Heavenly Valley Ski Area								
Day/Date	Tuesday; 12/5/2000								
Description of Changes (Contribute to or Detract from)									
On site	Refaced main lodge with cedar shakes and addition of accessory log structure. New gondola base and mid-mountain lodge not yet complete, but should be added to the inventory.								
Off site	No noticeable changes to neighborhood from main lodge area.								
Progress on Recommendations									
A, B	All the general design requirements for surrounding property appear to be met.								
C.1	Some revegetation on the ski slopes has been successful, although they do not yet appear "restored".								
C.2	The main lodge has been given a face lift, which has generally improved its appearance. This collection of structures, however, will be significantly outclassed by the new structures under construction in other areas of the resort. (It is important to note that after full implementation of the master plan, this area will no longer be the signature visitor entrance to the ski area.)								
C.3	Not completed.								
Scenic Quality Ratings Changes									
<i>Views from Recreation Area</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	00	93	00	93	00	93	00
37-a	9 / 10	2	2	3	4	2	2	2	2
Notes: The main lodge, although its appearance has improved, remains blocky with few details of architectural interest.									
2001 Recommendations: The inventory should be expanded to include what will be the primary visitor entry experience; i.e. getting on the gondola near Stateline and getting to the slopes at mid-mountain.									

Photos

Photo #	File Name	Time	GPS Point	Description	View Direction	Lighting	Weather
No photos.							

B. Bike Trails

The following notes provide the methodology for updating bike trail scenic resource scores.

1. Updated scenic resource scores for all bikeways that closely follow roadway scenic units were obtained from field notes taken by the Team during their field work in August, 2000. Roadway units that received increased scores in the 1996 evaluation were also considered.
2. For Bikeway Units 7 and 8, TRPA staff provided guidance on projects completed since 1993 and then nearby streets were driven to identify changes.
3. Using this methodology, the following bike trail units experienced no change to scenic resource scores:
 - 4 - Sunnyside to Timberland
 - 5 - Timberland to Tahoe Pines
 - 6 - Tahoe Pines to Tahoma (Although the 2000 roadway inventory noted improvements in Tahoma, these do not relate to man-made features noted in the bike trail inventory.)
 - 8 - Al Tahoe
 - 9 - Tahoe Valley Route
 - 10 - Tahoe Valley to City of South Lake Tahoe City Limits

Bikeway Unit Number	1								
Bikeway Unit Name	Tahoe City to River Ranch								
Description of Changes									
	New bicycle access bridge from the trailhead on the 64 Acres (replacing the old vehicle bridge to the trailer park). This occurred in 1990, but is not reflected in the 1993 text. Interpretive signage provided along the route. Repainting the Caltrans maintenance yard structures is a positive change.								
Scenic Quality Ratings Changes									
<i>Views of the Natural Landscape</i>									
No change.									
<i>Natural Features</i>									
No change. (The 1997 flood altered the south slope of the river corridor and damaged some of the bridges, yet the visual effects after restoration efforts are minor.)									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	01	93	01	93	01	93	01
1-b	12 / 13	3	3	2	4	3	3	4	3
Notes: The new bicycle bridge incorporates interest in the side rails and uses dark colored metal members, thus bringing some grace to a concrete bridge built to modern highway standards. The improvements along the highway noted in the roadway ratings are not impressive from the perspective of the bike trail.									
2001 Recommendations: The increased recreational use of the river corridor is the subject of a CRMP process. This process should consider the disruptive effects of roadside parking and placement of seasonal port-a-potties on the scenic quality of the bike trail.									

Bikeway Unit Number	2								
Bikeway Unit Name	Tahoe City to Dollar Point								
Description of Changes									
	New trail segment (very short) that removes the trail from the side of a private street between Tahoe City and Lake Forest. This creates a continuous Class I facility, but places it very close to the highway.								
Scenic Quality Ratings Changes									
<i>Views of the Natural Landscape</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
No change.									
Notes: None.									

Bikeway Unit Number	3								
Bikeway Unit Name	Tahoe Tavern								
Description of Changes									
	Utility undergrounding near the Y and continued restoration of the 64 Acres has improved man-made features. Creation of a trailhead and additional trails on the 64 Acres has pulled the trail off the highway edge in that area.								
Scenic Quality Ratings Changes									
<i>Views of the Natural Landscape</i>									
No change.									
<i>Views of the Lake</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	01	93	01	93	01	93	01
3-a	9 / 13	1	3	3	4	2	3	3	3
Notes: This trail has received recent overlay and is greatly improved in the 64 Acres section.									
2001 Recommendations: The new trail added on the 64 Acres should be added to the inventory.									

Bikeway Unit Number	7								
Bikeway Unit Name	City of South Lake Tahoe Recreation Area								
Description of Changes									
	Redevelopment of the picnic area at El Dorado Beach, including upgrade to the trail.								
Scenic Quality Ratings Changes									
<i>Views of the Natural Landscape</i>									
No change.									
<i>Views of the Lake</i>									
		Unity		Vividness		Variety		Intactness	
#	Score	93	01	93	01	93	01	93	01
7-3	12 / 13	3	4	3	3	3	3	3	3
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	01	93	01	93	01	93	01
7-a	8 / 10	2	3	2	2	2	2	2	3
Notes: The improvements at El Dorado Beach have not been continued throughout the rest of the public buildings in "El Dorado Park", so the scores here are lower than seen for the beach area alone.									
2001 Recommendations: The bike trail added to the lakeside part of this site should be included in the inventory.									

Bikeway Unit Number	11								
Bikeway Unit Name	City of South Lake Tahoe to Tallac Creek								
Description of Changes									
	Redevelopment and increased seasonal use at Camp Richardson.								
Scenic Quality Ratings Changes									
<i>Views of the Natural Landscape</i>									
No change.									
<i>Views of the Lake</i>									
No change.									
<i>Natural Features</i>									
No change.									
<i>Man-Made Features</i>									
		Coherence		Condition		Compatibility		Design Quality	
#	Score	93	01	93	01	93	01	93	01
11-d	12 / 13	3	2	3	4	3	3	3	4
Notes: Redevelopment at Camp Rich has improved the design quality of the structures near the bike trail. Unfortunately, growth in undesignated parking, seasonal and temporary uses, and increased clutter from signage all contribute to increased congestions and confusion as viewed from the bike trail.									
2001 Recommendations: Remove parking from the bike trail viewshed (at Camp Richardson and the entrance to Valhalla), reduce peak season accessory and temporary uses, and reduce temporary sign clutter.									

Appendix 4. NEW ROADWAY UNITS

Roadway Unit 20 - Tahoe Vista										
	Composite	Man-made Features	Roadway Distractions	Road Structure	Lake View	View of Landscape	Variety			
1996										
Unit 20	13	2.5	1	1.5	3	3	2			
2001								<i>% of total unit length</i>	<i>proportional score</i>	
Unit 20A	14	3	2	1.5	2.5	3	2	33%	4.62	
Unit 20B	12	2	1.5	1	3	2.5	2	36%	4.32	
Unit 20C	16	3	3	1.5	3	3	2.5	21%	3.36	
Unit 20D	13	2.5	2.5	3	1	1	3	10%	1.3	
2001 Unit 20 total									13.6	

Description of New Units and Boundaries:

Unit 20A - Tahoe Vista extends approximately 1.3 miles from the intersection at Estates Drive to Beach Street. This unit contains the low density tourist and commercial development in Tahoe Vista, as well as the newly restored stream zone area at Snow Creek. The landscape character is generally flatter terrain with filtered lake views through stands of mature conifers. Newly opened lake views at the Tahoe Vista beaches contribute.

Unit 20B - Kings Beach extends approximately 1.25 miles from the intersection at Beach Street to Beaver Street. This unit contains the area of dense and cluttered commercial development associated with Kings Beach. The landscape character is flat with good lake views limited to public access parcels at the base of SR 267 and in the commercial core. View of the golf course provides interest.

Unit 20C - Brockway extends approximately .7 miles from Beach Street to the Cal Neva Inn, approximately .15 miles west of the state line. This short unit contains residential development on both sides of the road. The landscape character is steep hillside with impressive lake views in most of its length.

Unit 20D - North Stateline Casino Core extends approximately .25 miles from the Cal Neva Inn to Reservoir Road and includes the high density tourist accommodation/gaming area surrounding the state line. The landscape character is gently sloping terrain with few native features remaining.

Appendix 4. NEW ROADWAY UNITS

Roadway Unit 30 - Zephyr Cove/Lincoln Park										
	Composite	Man-made Features	Roadway Distractions	Road Structure	Lake View	View of Landscape	Variety			
1996										
Unit 30	18	2	3	3	4	3	3			
2001									<i>% of total unit length</i>	<i>proportional score</i>
Unit 30A	16	2.5	2	3.5	4	2	2	2	35%	5.56
Unit 30B	16.5	3	3.5	2	2.5	3	2.5	2.5	17%	2.78
Unit 30C	15.5	2	3	3	3.5	2	2	2	27%	4.24
Unit 30D	18	3	3	3	3	3	3	3	21%	3.79
									2001 Unit 30 total	16.37

Description of New Units and Boundaries:

Unit 30A - Lincoln Park-Skyland extends approximately 1.65 miles from approximately 50' north of the intersection at Cave Rock Drive to the southern edge of the Skyland subdivision. This unit contains continuously moderate to heavy residential development. It offers an interesting road alignment and filtered lake views with occasional open lake views. A short area of undeveloped forest exists at the southern end.

Unit 30B - Tahoe School extends approximately .8 miles from the southern end of the Skyland subdivision to and including the stream zone approximately 100' north of the traffic signal at Zephyr Cove. This unit contains flat, open forest, stream zone vegetation, and filtered lake views, with minor amounts of public service and residential development.

Unit 30C - Zephyr Cove extends approximately 1.3 miles from the edge of the stream zone near Zephyr Cove to the southern end of the Pine Wild condominium development in Marla Bay. This unit contains moderate to heavy residential development on steeper slopes, some with large, exposed road cuts. It offers an interesting road alignment, some filtered lake views, with an open lake view near the Zephyr Cove Lodge.

Unit 30D - Round Hill extends approximately 1.0 miles from the southern end of the Pinewild condominium development to the intersection with Elks Point Road. This unit includes an interesting road alignment with view of the McFaul stream zone and its associated focused lake view. Development is light to moderate and includes limited view of residential development and view to the remodeled Round Hill mall property.

Appendix 4. NEW ROADWAY UNITS

Unit 30 - Airport Area										
	Composite	Man-made Features	Roadway Distractions	Road Structure	Lake View	View of Landscape	Variety			
1996										
Unit 36	14.5	2	2.5	3	1	3	3			
2001								<i>% of total unit length</i>	<i>proportional score</i>	
Unit 36A	10.5	1.5	2	2	1	2	2	35%	3.65	
Unit 36B	19	3	4	3	1	4	4	35%	6.60	
Unit 36C	14	2.5	2.5	2	1	3	3	19%	2.65	
								2001 Unit 20 total	12.90	

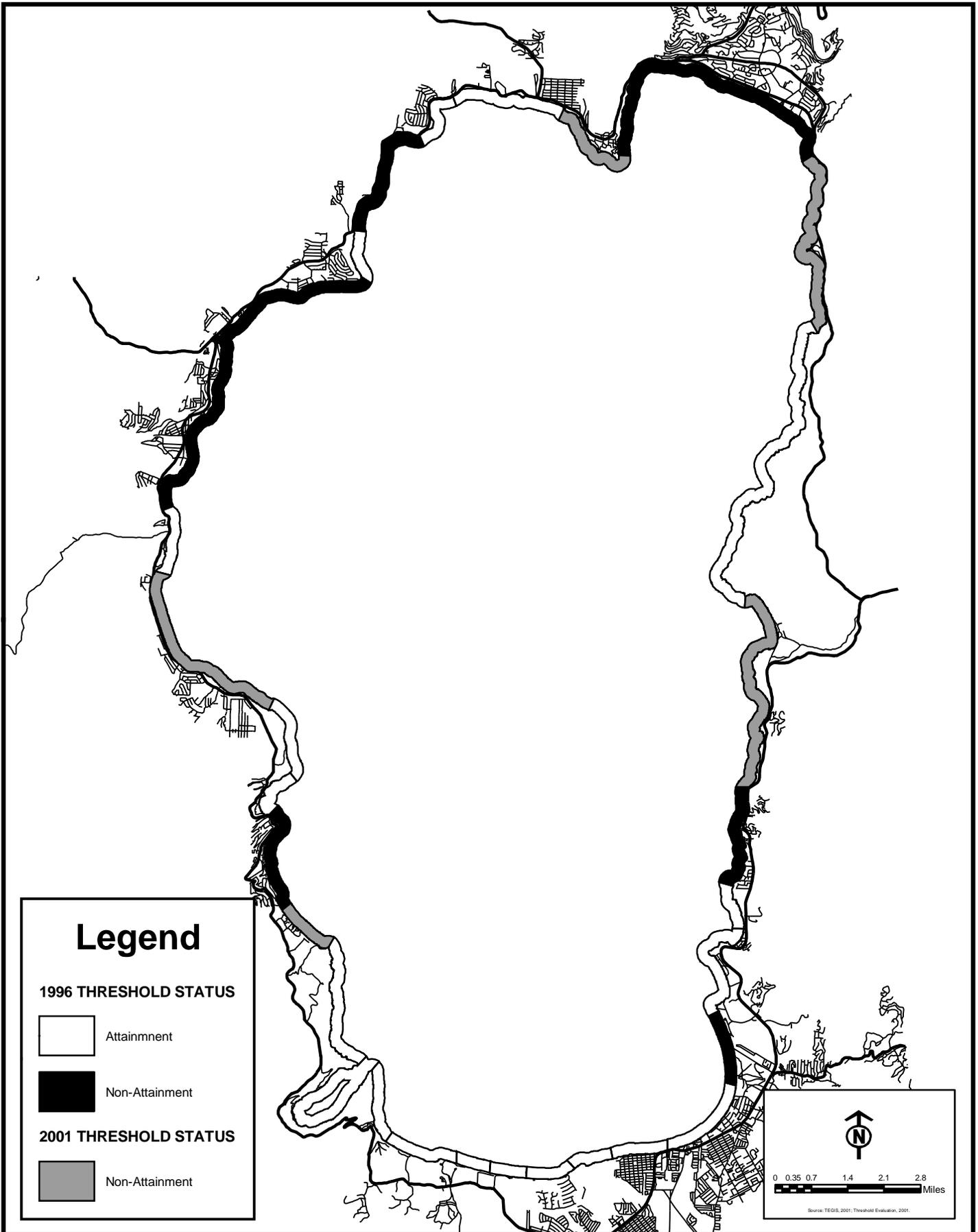
Description of New Units and Boundaries:

Unit 36A - Airport Area extends approximately 1.65 miles from the intersection at D Street to the southern end of the industrial development. This unit contains developed tourist accommodation properties at the north and areas of undeveloped forest land, although its principal character derives from the unattractive industrial uses located along much of its length. This include the airport, concrete plant, propane dealers, and other repair and storage uses. The landscape type is moderately rolling terrain with enclosed views of forested areas. Near the airport, short views to the ridgeline across the Upper Truckee River floodplain occur, as well as views to the more distant basin boundary ridges.

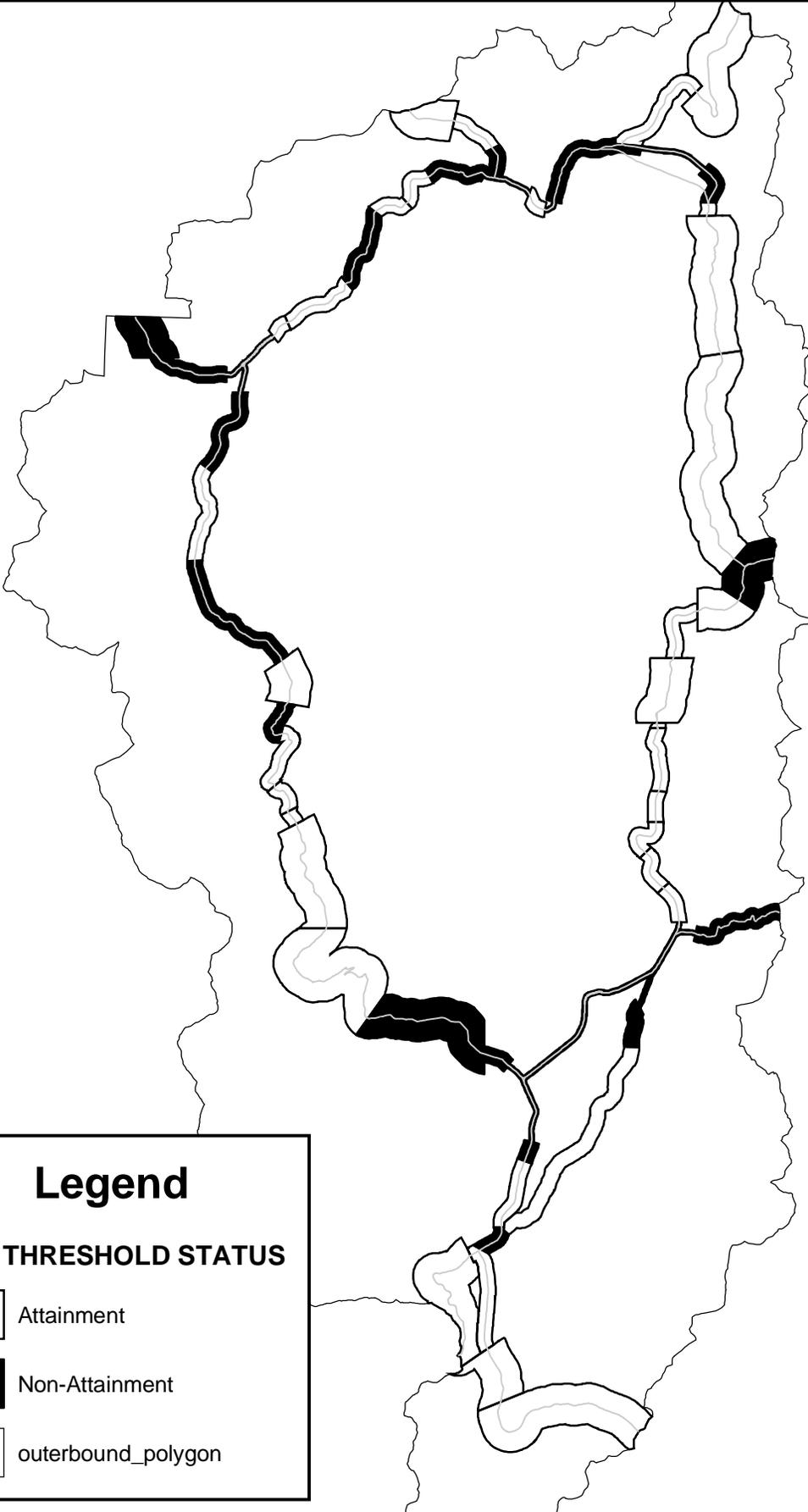
Unit 36B - Lake Valley extends approximately 1.65 miles from the southern end of the industrial development to the intersection at Pioneer Trail. This unit contains moderately rolling terrain with little development visible along its length. Distinctive views to the distant ridge and middle ground rock formations exist at the Lake Valley State Recreation Area. View of the Upper Truckee River and its associated stream zone offer interest and variety.

Unit 36C - Meyers extends approximately 0.9 miles from the intersection at Pioneer Trail to the intersection with SR 89. This unit contains the low density but continuous commercial development in Meyers. The landscape character is flat and open with dominant views to the mountain ridgeline around Echo Summit.

Appendix 5. Shoreline Travel Routes - 2001 Threshold Status



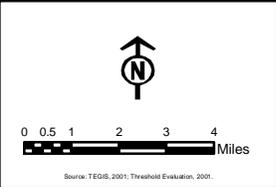
Appendix 5. Shoreline Travel Routes - 2001 Threshold Status



Legend

2001 THRESHOLD STATUS

-  Attainment
-  Non-Attainment
-  outerbound_polygon



Chapter 9

NOISE

I. INTRODUCTION

As required by the bi-state compact, TRPA has adopted noise standards for the Lake Tahoe Region. The environmental carrying capacities for noise, or “thresholds” as they are commonly referred to, are numerical Community Noise Equivalent Level (CNEL) values for various land use categories and transportation corridors; and single event (Lmax) standards for specific sources including motor vehicles, off-road vehicles, boats, snowmobiles and aircraft.

BACKGROUND

Noise is often defined simply as unwanted sound, and thus is a subjective reaction to characteristics of a physical phenomenon. Researchers have generally agreed that A-weighted sound pressure levels (sound levels) are very well correlated with community reaction to noise. The unit of sound level measurement is the decibel (dB), sometimes expressed as dBA. The decibel notation used for sound levels describes a logarithmic relationship of acoustical energy, so that sound levels cannot be added or subtracted in the conventional arithmetic manner. For example, a doubling of acoustical energy results in a change of 3 dB, which is usually considered to be barely perceptible. A 10-fold increase in acoustical energy yields a 10 dB change; subjectively, this is like a doubling of loudness. A-weighted sound pressure levels, measured in dBA, are most closely related to human response to noise; they are used to describe community noise unless otherwise indicated. Table 9-1 provides examples of noise levels associated with common noise sources.

Decibels	Description
130	Threshold of pain
120	Jet aircraft take-off at 100 feet
110	Riveting machine at operators position
100	Shotgun at 200 feet
90	Bulldozer at 50 feet
80	Diesel locomotive at 300 feet
70	Commercial jet aircraft interior during flight
60	Normal conversation speech at 5-10 feet
50	Open office background level
40	Background level within a residence
30	Soft whisper at 2 feet
20	Interior of recording studio

A relatively low noise level is an attribute of the Lake Tahoe Basin that is enjoyed by both visitors and residents. However, the study, *Report for the Establishment of Environmental Threshold Carrying Capacities* (TRPA, 1982) indicated that background noise in the Region was rising as a result of increased levels of human activity. TRPA's noise thresholds are based on achieving the following objectives as they relate to noise:

1. Reduce or eliminate those activities in the Basin that produce damaging or distressing noise levels; and
2. Provide for community and neighborhood tranquility.

The 1982 Threshold Study Report divided noise into four components. They are:

- The characteristics of sound and noise;
- The sources that produce noise;
- People's perception of noise; and
- Noise impacts on wildlife.

There are many sources of noise in the Region. Traffic on highways in the Region generates "noise corridors" along their paths. During the winter months, tire chains on vehicles generate more noise than non-chain equipped vehicles. Aircraft noise, though intermittent, is loud and widely broadcast. Other adverse noise sources include pets, machinery associated with refuse collection, stereo systems, construction and timber cutting, off-highway vehicles (OHV), motorboats, personal watercraft (PWC) and industrial operations.

Average noise levels describe the general acceptability of a noise environment, but it is usually a specific noise source that annoys people. A number of factors other than just the level of noise may also contribute to impacts perceived by visitors or residents. These include the duration of the noise, the presence of pure tone components, the presence of impulses, the time of day, the sensitivity of an activity to noise, prior attitudes of the recipient toward the noise generator, and the level of background noise in the area.

The level of noise at a specific site within a community is a random value that is continually changing as the activity, or level of activity, continually changes. The sound level is controlled by the activity that occurs at the site. The level of acceptability of a noise at a particular site is a function of the compatibility of the activity that generated the noise to the other activities in the area. In addition, acceptability of a specific level of noise may vary with time of day.

As a form of zoning, TRPA has divided the Lake Tahoe Region into more than 175 separate Plan Areas. Boundaries for each Plan Area have been established based upon similar land uses and the unique character of each geographic area. For each Plan Area, a "Statement" is made as to how that particular area should be regulated to achieve regional environmental and land use objectives. As part of each Statement, an outdoor CNEL standard is established based on the thresholds.

The CNEL standards are also established for major highways such as U.S. 50, S.R. 28, S. R. 207, S. R. 431, and S. R. 267, which bisect the Plan Areas. The roadway corridor CNEL standards generally override the Plan Area Standards at a distance of 300 feet from the roadway centerline.

INDICATORS

Pursuant to Chapter 32 of the Code, TRPA has adopted noise threshold indicators so that the noise threshold can be evaluated. These are as follows:

N-1 – Aircraft Noise

Aircraft noise measured in decibels monitored pursuant to the monitoring element of the Lake Tahoe Airport Master Plan.

N-2 – Single Noise Events

Any single event noise measurement made with a Type I sound level meter using the A-weighting and “slow” response pursuant to applicable manufacturer’s instructions, except that for sounds of a duration of two seconds or less, the “fast” response shall be used. See Chapter 23 of the Code of Ordinances.

N-3 – Community Noise Events

Community Noise Equivalent Levels (CNEL) calculated pursuant to the Code, Section 23.4. TRPA shall review proposed activities in the Region taking into account site-specific analyses, estimated impacts on affected land uses, consistency with other provisions of the Regional Plan, and reasonable tests of significance of change in noise levels.

II. THRESHOLD SUMMARY

A. THRESHOLD MATRIX

The threshold matrix serves as a summary of the trends, status, and recommendations for individual thresholds. It displays the trend toward attainment from 1987 to present, the current status of the threshold, progress on the 1996 recommendations, future threshold recommendations, interim targets and an attainment schedule to ensure the individual indicators and/or standards for the threshold are in attainment over time.

B. MEASUREMENT AND MONITORING ACTIVITIES

Aircraft noise is measured in decibels pursuant to the monitoring element of the adopted Lake Tahoe Airport Master Plan. Monitoring of single noise events, other than aircraft, is very limited. TRPA also utilizes noise reports from other agencies in the Basin to determine the status of noise thresholds. TRPA is currently working with noise consultants to establish monitoring for single events in the Basin. TRPA, with the assistance of Bollard and Brennan, Inc., sampled CNEL noise levels during June-July, 2000. Forty-three representative plan areas were chosen for monitoring. TRPA is also working with noise experts to establish a thorough monitoring for CNEL noise levels. See Section III for more details.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

For aircraft, both categories are in non-attainment. Tests conducted in the fall of 2000 indicated an exceedance of the transport aircraft standard. For all other aircraft, 17 exceedances occurred. Four were waived pending those aircraft not return to the airport. Of the remaining 13 exceedances, 85% were due to military aircraft for which the airport has no enforcement authority. For single events other than aircraft, data indicate that the snowmobile single event standards were exceeded in the winter of 2000-2001. Research into watercraft noise levels indicates that boats may also be exceeding their assigned standard. See Section III for more details.

N-1: AIRCRAFT NOISE; SINGLE EVENT

Threshold Standards	N-1 Indicator	1996 Interim Targets	Threshold Attainment Status		
<p><u>Departures (all aircraft):</u> 80 dBA at 6,500 meters from start to takeoff roll. 77.1 dBA at 6,500 meters from start to takeoff roll between 8 p.m. and 8 a.m.</p> <p><u>Arrivals:</u> 84 dBA at 2,000 meters from the runway threshold approach (general aviation and commuter aircraft). 86 dBA at 2,000 meters from the runway threshold approach (transport category aircraft). 77.1 dBA (all aircraft) 2,000 meters from the runway threshold approach between 8 p.m. and 8 a.m.</p> <p>Note: Within ten years after adoption of the airport master plan, the single - event noise standard for all arrivals shall be 80 dBA.</p>	<p>Aircraft noise measured in decibels monitored pursuant to the monitoring element of the adopted Lake Tahoe Airport Master Plan.</p>	<p>By December 31, 1996, review the phasing schedule for implementation of the 80-dBA standard.</p>	1991 Attain Status	1996 Attain Status	2001 Attain Status
			<p>Transport and Commuter Aircraft</p>	<p>Unknown</p>	<p>Attainment</p>
<p>General Aviation Aircraft</p>	<p>Unknown</p>	<p>Non-Attainment</p>	<p>Non-Attainment</p>		
<p>N-1 2001 Monitoring Status</p>					
<p>Monitoring has been conducted pursuant to the monitoring element of the adopted Lake Tahoe Airport Master Plan.</p> <p><u>Transport Aircraft:</u> The results of the noise monitoring during the third quarter of 2000 of Allegiant Air revealed that the averages for 53 flights were 85.6 dBA and 81.4 dBA for arrivals and departures, respectively. At the airport manager's discretion, 8 flights were removed from the average due to atmospheric conditions during those flights and their effects on noise measurements. The averages for arrivals and departures were 85.2 dBA and 80.4 dBA, respectively. Both averages, with wind effects removed, fall within 1 dBA of the airport settlement agreement standards.</p> <p><u>Other Aircraft:</u> For all other aircraft that are evaluated on a single event basis, airport documents in 2000 show 11 noise complaints where exceedances had occurred. Also, the airport issued noise violation letters to six other aircraft operators. After 4 exceedances were waived, military operations, for which the airport has no enforcement authority, accounted for 85% of the remaining exceedances.</p>					
<p>N-1 2001 Recommendations</p>					
<ol style="list-style-type: none"> 1. TRPA should re-evaluate the threshold and consider adding an exemption for military aircraft, or seek cooperation from the military to reduce flights (August 2002). 2. TRPA will work with the South Lake Tahoe Airport to implement the reduced arrival noise levels (August 2002). 3. TRPA should clarify the threshold to establish when noise measurements apply to threshold attainment (August 2002). 					
<p>N-1 2006 Attainment Schedule</p>					
<p>By August 26, 2002, implement a single – event noise standard of 80 dBA for all aircraft arrivals and establish procedures that allow exceedances in special weather conditions.</p>					

N-2: SINGLE EVENT NOISE - OTHER

Threshold Standards	N-2 Indicator	1996 Interim Targets	Threshold Attainment Status		
			1991 Attain Status	1996 Attain Status	2001 Attain Status
<p>Single-Event Noise (dBa)</p> <p><u>Boats:</u> Overall: 82; Distance: 50 ft. @ 3,000 rpm</p> <p><u>Motor Vehicles:</u> > 6,000 GVW <35 mph: 76, >35 mph: 82, Distance: 50 ft.</p> <p><u>Motorcycles:</u> > 35 mph: 77, < 35 mph: 86, Distance: 50 ft.</p> <p><u>Off-Road Vehicles:</u> < 35 mph: 72, > 35 mph: 86, Distance: 50 ft.</p> <p><u>Snowmobiles:</u> <35 mph: 82, Distance: 50 ft.</p>	<p>Any single-event noise measurement made with a Type I sound level meter using the A-weighting and "slow" response pursuant to applicable manufacturer's instructions, except that for sounds of a duration of two seconds or less, the "fast" response shall be used. See Chapter 23 of the Code of Ordinances.</p>	<p>No interim targets developed in 1996 since threshold was deemed in attainment.</p>	<p>Single-Event Noise (dBa)</p> <p>Attainment</p>	<p>Attainment</p>	<p>Non-Attainment</p>
<p>N-2 2001 Monitoring Status</p>					
<p>N-2 2001 Recommendations</p>			<ol style="list-style-type: none"> 1. TRPA, with the input of the Noise Working Group and other consultants, shall create and implement a consistent noise monitoring program for single and community noise events. (See Recommendation D in Section III of the 2001 Threshold Noise Evaluation) [March 2004]. 3. TRPA shall adopt measurement protocols that allow for boat noise enforcement (see Section III for details). (November 2002). 4. TRPA should develop and implement a program to study the effects of noise on wildlife. (December 2002) 5. Utilizing data from the above wildlife study, TRPA shall adopt standards in cooperation with the U.S. Forest Service for wilderness and non-Urban areas (December 2004). 		
<p>N-2 2006 Attainment Schedule</p>			<p>By 12/03, no more than 5 single event noise occurrences per year.</p>		

N-3: COMMUNITY NOISE EQUIVALENT LEVEL (CNEL)

Threshold Standards	N-3 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
High Density Residential Area's; 55 dBA Low Density Residential Area's; 50 dBA Hotel/Motel Areas; 60 dBA Commercial Areas; 60 dBA Industrial Areas; 65 dBA Urban Outdoor Recreation Area's; 55dBA Rural Outdoor Recreation Area's; 50 dBA Wilderness and Roadless Area's; 45 dBA Critical Wildlife Habitat; 45 dBA Roadways; Highway 50 (65 dBA) Highways 89, 207, 28, 267, and 431 (55 dBA) South Lake Tahoe Airport (60 dBA)	Community noise equivalent levels (CNELs) calculated pursuant to the Code, Section 23.4. TRPA acknowledges that development permitted by the Regional Plan may, in some locations, cause community noise levels to exceed 1982 levels.	By 2006, complete a noise study of watercraft, including personal watercraft, and adopt appropriate noise regulations by April 1, 1997. By June 30, 1998 adopt an interagency noise enforcement MOU. By June 30, 2000, study and reconsider the threshold that "background noise levels shall not exceed existing levels or the following levels whichever is less."	Community Noise Equivalent Level	Non-Attainment	Non-Attainment	Non-Attainment
N-3 2001 Monitoring Status						
A noise monitoring survey was conducted in 2000 as part of the evaluation. Sound level measurements were gathered at 43 sites for 24 hours at each site. For details, see the 2001 Evaluation. The 2000 monitoring program found community noise levels to be generally consistent with the thresholds, however, 8 of the 43 sites monitored exceeded the CNEL criterion for the plan area. For interim targets, research into jet ski noise led to the adoption of the 600 foot no-wake zone. An interagency noise enforcement MOU has not been adopted. The threshold was revised to state, "background levels shall not exceed the following levels."						
N-3 2001 Recommendations						
1. TRPA, with the input of the Noise Working Group and other consultants, shall develop a more thorough CNEL monitoring program. Noise measurements need to be performed more often, perhaps on an annual basis, in order to determine if standards are being met. (See Recommendation D in Section V of the 2001 Threshold Noise Evaluation) [March 2004]. 2. TRPA, with the input of the Noise Working Group and other consultants, should re-evaluate the thresholds for the traffic corridors. Any threshold changes should include corrections to the numeric values based upon roadway grades, pavement conditions, etc. (March 2004). 3. To help attain the roadway standards, TRPA recommends that a test be performed to evaluate different pavement types and their potential for noise reduction. (March 2003).						
N-3 2006 Attainment Schedule						
By June 30, 2003, adopt an interagency noise enforcement MOU. Complete a 2004 Noise Work program by December 2004 June 30, 2002 . Conduct roadway pavement testing by March, 2003.						

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

A. N-1: AIRCRAFT NOISE

The Lake Tahoe Airport is located adjacent to Highway 50, 2 miles from the intersection of S.R. 89 and Highway 50. The California Department of Transportation, Aeronautics Program functionally classifies the airport as “Regional-Business/Corporate.” The Federal Aviation Administration (FAA) categorizes the airport as “Non-Hub Small.” Basic services available at the airport include: auto rental, aviation fuel sales, aircraft rental/sales, and repair service.

The Lake Tahoe Airport is located in an environmentally sensitive region. Stage 3 aircraft meeting local single event noise standards may operate at the airport from 8:00 a.m. to 8:00 p.m. (local time). Only aircraft able to operate under 77.1 dBA Lmax may operate during the nighttime curfew hours of 8:00 p.m. to 8:00 a.m.

1. Evaluation Criteria

TRPA thresholds for aircraft noise are given in Table 9-2.

Table 9-2. TRPA Threshold: Single-Event Noise¹		
NUMERICAL STANDARDS: The following maximum noise levels are allowed (All values are in decibels).		
Source	Threshold - dBA	
	Overall	Monitoring Distances
Aircraft	80 ²	6,500 m – start of takeoff roll
		2,000 m – runway threshold approach
	77.1 ³	6,500 m – start of takeoff roll
		2,000 m – runway threshold approach

¹For transport aircraft, noise events for each monitor are averaged over each quarter. For all other aircraft, noise events are measured as single events.

²The single event noise standard of 80 dBA Lmax for aircraft departures at Lake Tahoe Airport shall be effective immediately. The single event noise standard of 80 dBA for aircraft arrivals at Lake Tahoe Airport is not to be effective until ten years after the adoption of an airport master plan by TRPA. The schedule for phasing in the 80 dBA arrival standard shall be based on a review and consideration of the relevant factors, including best available technology and environmental concerns, and shall maximize the reduction in noise impacts caused by aircraft arrivals while allowing for the continuation of general aviation and commercial service. The beginning arrival standard shall not exceed 84 dBA for general aviation and commuter aircraft, and 86 dBA for transport category aircraft.

³Between the hours of 8 p.m. and 8 a.m.

2. Measurement and Monitoring

Monitoring has been conducted pursuant to the monitoring element of the adopted Lake Tahoe Airport Master Plan. Data from the Lake Tahoe Airport show that in 2000 there were:

- a. 17,705 Annual Aircraft Operations
- b. 2,432 Passenger Enplanements

In a review of transport aircraft operations in 1999, TRPA staff discovered the noise monitoring equipment was not functioning properly, and had not operated correctly since December 1997. By June of 2000, the City of South Lake Tahoe, with the contract assistance of Jim Buntin (Brown-Buntin Associates, Inc.) had corrected the problems.

In July of 2000, the airport contracted Brown-Buntin Associates to perform noise measurements of aircraft from Allegiant Air, a commercial air service that was resuming service in the Tahoe Basin.

3. Results of Measurement and Monitoring Efforts

Noise Complaint Logs and Aircraft Carrier Tests were collected for the years 1996-2000. Results indicate that exceedances of the noise standards occurred. However, most exceedances were due to military aircraft, which are exempt from the airport's noise requirements.

For air transport aircraft (scheduled airlines) the noise events are averaged on a quarterly basis. Allegiant Air only operated during the third quarter of 2000. The results of noise monitoring of Allegiant Air revealed that there were 53 flights and the averages were 85.6 dBA and 81.4 dBA for arrivals and departures, respectively. The threshold and the airport settlement agreement set the standards of 86.0 dBA for arrivals and 80.0 dBA for departures.

The Airport Manager, who is responsible for administration of the noise monitoring program believed that the settlement agreement did not include consideration for atmospheric conditions and their effects on aircraft. During the third quarter, winds in the vicinity of the airport are typically fairly strong from the south. This results in frequent wind shear on approach to runway 18, requiring high power settings and downwind departures on runway 36, resulting in longer takeoff rolls. Both of these situations result in higher noise levels at the monitoring stations. To compensate for these weather conditions, the airport manager removed eight flights from the average due to atmospheric conditions during those flights and their effects on noise measurements. The averages for arrivals and departures were 85.2 dBA and 80.4 dBA, respectively. The average arrivals, with wind effects removed, still exceed the airport settlement agreement standard 80.0 dBA for departures.

As a result, TRPA and other parties to the settlement disagreed with the Airport Manager's determination. TRPA, the City of South Lake Tahoe, and California Attorney General contracted Brown-Buntin Associates, Inc., to assemble and evaluate the noise protocols for Allegiant Aircraft to address the certification and measurement procedures. In the meantime, the operations that violated the standards have ceased and there are no other transport operations occurring at this time.

For all other aircraft that are evaluated on a single event basis, airport documents in 2000 show 11 noise complaints where exceedances had occurred. The airport also issued noise violation letters to six other aircraft operators. Of these 17

exceedances, four penalties were waived contingent on those aircraft not returning to the airport. Of the remaining 13 exceedances, military operations, for which the airport has no enforcement authority, accounted for 85% of the exceedances. However, since data are incomplete and monitoring equipment was not functioning properly from January 1998 through June 2000, more exceedances may have occurred during those years.

4. Trends

In general, it appears that noise levels at the South Lake Tahoe airport have not significantly changed in the last five years. Several exceedances continue to occur. Transport aircraft exceeded noise standards, and actions were taken to address those exceedances.

5. Threshold Attainment Status

Data indicate that the airport single event noise standards have not been met. Once monitoring equipment became functional, data indicated one quarter with exceedances by commercial aircraft operations. This operation has ceased and procedures are being developed to avoid this problem in future operations.

6. Effectiveness of Measures in Place

Compliance measures in place are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development to reduce avoid, or remedy an environmental impact of activities within the Tahoe Region or to promote attainment or maintenance of any threshold or standard (Table 9-9). To meet noise thresholds, these measures would be aimed at reducing and maintaining current noise levels generated by a variety of sources, prohibiting activities that generate excess noise, and regulating the South Lake Tahoe Airport for noise. Supplemental measures are programs, regulations or other measures that are not currently enacted, but would assist threshold maintenance and attainment.

The measures in place appear to be effective since far less than 1% of all flights exceeded standards, with a majority being due to military aircraft for which the airport has no enforcement authority. For more details on compliance measures, see Table 9-9.

Category: noise

Parameter: single-event (aircraft)

~~noise violation by general aviation aircraft not under a testing regimen.~~

1. STANDARD

TRPA threshold - departures (all aircraft): 80 dBA at 6,500 meters from start to takeoff roll. 77.1 dBA at 6,500 meters from start to takeoff roll between 8 p.m. and 8 a.m.

TRPA threshold - arrivals: 84 dBA at 2,000 meters from the runway threshold approach (general aviation and commuter aircraft). 86 dBA at 2,000 meters from the runway threshold approach (transport category aircraft). 77.1 dBA (all aircraft) 2,000 meters from the runway threshold approach between 8 p.m. and 8 a.m.

Note: Within ten years after adoption of the airport master plan, the single - event noise standard for all arrivals shall be 80 dBA

2. INDICATOR (UNITS): Aircraft noise measured in decibels monitored pursuant to the monitoring element of the adopted Lake Tahoe Airport Master Plan.

3. MONITORING SUMMARY: Monitoring has been conducted pursuant to the monitoring element of the adopted Lake Tahoe Airport Master Plan. Data from the Lake Tahoe Airport show that in 2000 there were:

- a. 17,705 Annual Aircraft Operations
- b. 2,432 Passenger Enplanements

In a review of transport aircraft operations in 1999, TRPA staff discovered the noise monitoring equipment was not functioning properly, and had not operated correctly since December 1997. By June of 2000, the City of South Lake Tahoe, with the contract assistance of Jim Buntin (Brown-Buntin Associates, Inc.) had corrected the problems.

In July of 2000, the airport contracted Brown-Buntin Associates to perform noise measurements of aircraft from Allegiant Air, a commercial air service that was resuming service in the Tahoe Basin.

~~Data submitted from the City of South Lake Tahoe for 1995 show:~~

- ~~2,530 Carrier operations~~
- ~~8 Charter operations~~
- ~~19,019 General Aviation operations~~

~~Noise monitoring data show no violations of the single-event noise standards for carrier or charter aircraft. There was one single-event~~

4. ATTAINMENT STATUS: Non-Attainment for transport and commuter aircraft. Non-attainment general aviation aircraft. In the third quarter of 2000, transport aircraft quarterly averages exceeded the noise standards. For all other aircraft that are evaluated on a single event basis, airport documents in 2000 show 11 noise complaints where exceedances had occurred. The airport also issued noise violation letters to six other aircraft operators. Of these 17 exceedances, four penalties were waived contingent on those aircraft not returning to the airport. Of the remaining 13 exceedances, military operations, for which the airport has no enforcement authority, accounted for 85% of the exceedances. However, since data are incomplete and monitoring equipment was not functioning properly from January 1998 through June 2000, more exceedances may have occurred during those years.

5. TARGET DATE: 2006

6. EVALUATION INTERVAL: Five years

7. INTERIM TARGETS: By August 26, 2002, implement a attain the single-event noise standard of 80 dBA for all aircraft arrivals and establish procedures which allow exceedances in special weather conditions. By December 31, 1996, review the phasing schedule for implementation of the 80 dBA standard.

8. COMPLIANCE MEASURES:

- a. MEASURES IN PLACE: ~~NOISE-01 Mitigation Measures through Airport Master Plan 174, 179, 182, 185, 187~~
- b. EFFECTIVENESS OF MEASURES IN PLACE: ~~The 1996 Evaluation makes no recommendation regarding the effectiveness of the airport noise enforcement program (01), however, the program appears to be highly effective and should remain in place. The~~ measures in place appear to be effective since far less than 1% of all flights exceeded standards, with a majority being due to military aircraft for which the airport has no enforcement authority.

- c. SUPPLEMENTAL MEASURES: None.
- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Not applicable.

9. ADEQUACY OF COMPLIANCE MEASURES: The compliance measures are adequate to attain and maintain the threshold.

B. N-2: SINGLE NOISE EVENTS

Two ways of perceiving noise pollution exist. Single events are the way to consider sounds that occur in a non-regular or non-repetitive manner. Examples of single event noise pollution would be snowmobiles, motorcycles and boats, etc., which create noises that exceed tolerable levels.

1. Evaluation Criteria

The TRPA thresholds for single noise events are shown in Table 9-3. They include maximum allowed noise levels for aircraft, boats, motor vehicles, motorcycles, off-road vehicles, and snowmobiles. Chapter 23 of the TRPA Code specifies that TRPA shall use the maximum level recorded on a noise meter, Lmax, for measuring single event noise events.

TRPA did not adopt interim performance targets for single-event noise pursuant to Chapter 32 of the Code because this threshold was found to be in attainment in 1996.

Table 9-3. TRPA Threshold: Single-Event Noise				
NUMERICAL STANDARDS: The following maximum noise levels are allowed (All values are in decibels).				
Source	Threshold - dBA			
	Overall	Less than 35 mph	Greater than 35 mpg	Monitoring Distances
Boats	82	-	-	50 ft. – engine at 3,000 RPM
Motor Vehicles less than 6,000 GVW	-	76	82	50 ft.
Motor Vehicles greater than 6,000 GVW	-	82	86	50 ft.
Motorcycles	-	77	86	50 ft.
Off-road Vehicles	-	72	86	50 ft.
Snowmobiles	-	82	-	50 ft.

2. Measurement and Monitoring

Except for monitoring conducted at the Lake Tahoe Airport in South Lake Tahoe, monitoring of single-event noise has been very limited. Project files and related environmental analyses contain individual noise level measurements, including emergency generators and snowmaking equipment.

Snowmobiles:

On March 23-24, 1999, Bollard & Brennan, Inc., as consultants for the U.S. Forest Service, Lake Tahoe Basin Management Unit (LTBMU), conducted continuous 24-hour background noise level measurements at two snowmobile staging areas within the Lake Tahoe Basin, which include Tahoe City and Brockway Summit. The noise level measurements were conducted to determine existing single event snowmobile passby noise levels and the corresponding CNEL values.

Boats:

Shorezone No-Wake Zone: In November 1996, the TRPA contracted with Brown-Buntin Associates, Inc. (BBA) to provide a discussion to the TRPA Shorezone Committee on the dynamics of the existing Regional Plan noise level criteria for watercraft. In addition, BBA was requested to provide examples of other noise level criteria that may provide correlation to annoyance and may be applicable to the evaluation of PWC use on Lake Tahoe. This included examples of the Preferred Speech Interference Level (PSIL) criteria. The PSIL criteria are based upon the voice effort required to carry on a conversation at varying distances, based upon the background noise level. The PSIL background noise level is determined by the arithmetic average of the background sound pressure levels in the 500, 1000, and 2000 Hz octave band center frequencies (the frequency range of speech).

The PSIL was originally developed for rating steady state noise sources according to its ability to interfere with conversation between two people. It is well founded on the science of speech communication. BBA has used the PSIL concept for the design of outdoor activity areas adjacent to busy roadways. It can be considered for use in any location where a noise source can interfere with communication between two people. Using the PSIL for determining potential speech interference due to watercraft use is probably most applicable for areas of Lake Tahoe, which are subject to repeated watercraft operations.

BBA conducted noise level measurements of various watercraft types on May 21, 1997 to determine maximum noise levels associated with watercraft at various distances. Overall A-weighted maximum noise levels were measured, and the PSIL values were calculated from octave band data. Where possible, noise level measurements were conducted with watercraft operating at 3000 rpm, to determine the relationship with the TRPA threshold and Regional Plan Criteria.

The measurements from this study were used to calculate the setback distance for watercraft from the shoreline (i.e. how far from the shorezone the “no-wake” zone should be assigned). A no-wake zone of 600 feet from the shoreline was chosen based on this study.

Boat Noise Standards:

Although there were no documented watercraft violations, TRPA received a petition with 65 public signatures objecting to watercraft noise.

On January 17, 2001, the Division of Wildlife of the State of Nevada, Department of Conservation and Natural Resources conducted motorboat noise testing on five vessels at the North Tahoe Marina to address concerns by business, property and boat owners relative to the proposed boating regulation for noise restrictions statewide.

3. Results of Measurement and Monitoring Efforts

Snowmobiles:

Data for single event snowmobile passby noise levels are shown in Table 9-4. No measurements in the test exceeded the TRPA single event maximum (Lmax) noise level criterion of 82 dBA at a distance of 50 feet. However, data from the U.S. Forest Service indicates that five citations were issued in the winter of 2000-2001 for snowmobiles exceeding noise level standards.

Table 9-4. Measured Single Event Snowmobile Passby Noise Levels. Projected to a Distance of 50 feet			
Snowmobile Model	Speed	Sound Level, dB	
		Lmax	SEL
Snowmobiling Unlimited (Brockway Summit)			
Skidoo 380	Medium	66.6	69.7
	Fast	70.6	73.9
Skidoo 440	Slow	67.7	72.1
	Slow	65.8	70.0
	Medium	69.3	73.1
	Medium	66.6	69.9
	Fast	73.0	76.2
Polaris 440	Fast	67.7	70.7
	Slow	67.8	73.0
	Slow	68.9	74.7
	Medium	72.0	76.0
	Medium	70.6	74.8
	Fast	74.0	78.2
Snow Cat	Fast	72.2	75.8
	Typical	70.8	80.1
	Typical	71.2	80.3
TC Sno Mo's (Tahoe City)			
Polaris 440	Slow	66.5	71.5
	Slow	66.1	71.6
	Medium	72.5	77.8
	Medium	70.1	75.8
	Fast	74.5	78.7
	Fast	74.0	77.9
Average		69.9	75.8

Bollard and Brennan, Inc. 1999

Boats:

Based on watercraft studies, a 600-foot no-wake zone was adopted in 1997 to reduce noise levels on the shoreline to below applicable standards. Table 9-5 shows the setbacks required to achieve the PSIL criteria for the watercraft tested.

Table 9-5. Watercraft Setbacks required to achieve PSIL Criteria							
Voice Effort	Distance between Talker & Listener	Watercraft Setback (feet)					
		Inboard 4-stroke	PWC 2-stroke	Outboard 4-stroke	I-O 4-stroke	Large I/O 4-stroke	Average
Normal	1 foot	64	57	87	46	80	67
	2 feet	161	142	218	115	202	168
	4 feet	403	357	548	288	508	421
	6 feet	745	659	1013	532	938	777
Raised	1 foot	25	23	35	18	32	27
	2 feet	64	57	87	46	80	67
	4 feet	161	142	218	115	202	167
	6 feet	297	262	403	212	374	310
Very Loud	1 foot	10	9	14	7	13	11
	2 feet	25	23	35	18	32	26
	4 feet	64	57	87	46	80	67
	6 feet	118	104	161	84	149	123

(Brown-Buntin Associates, 1997)

The TRPA noise standard for boats is 82 dBA with the vessel running at 3,000 rpm at 50 feet. The tests were not conducted at this distance, however previous studies have shown that noise levels due to a single watercraft passby will attenuate by approximately 4.5 dBA per doubling of distance. Also, watercraft at ½ throttle is generally running at 3,000 rpm. Therefore, by extrapolating from the distances in these tests, data can be compared to the TRPA threshold. Measurements are given in Table 9-6.

It appears that most boats commonly seen on Lake Tahoe meet the threshold noise standard of 82 dBA. However, older boats and new high performance boats used on the lake may exceed the standard. A violation of the standard occurred by a 35' Fountain high performance boat. However, since the tests were not conducted at a 50-foot distance with the boats at 3,000 rpm, direct comparison of the noise generated by most of the watercraft in this test to TRPA's thresholds is not possible. Therefore, it can only be speculated which boats meet the standard.

Table 9-6. Results of Noise Measurements on Common Watercraft

Boat	Wind Speed	Background Noise	Throttle	dBA	Distance (feet)	Approx. dBA at 50 feet
29' Fountain, single engine, 500 hp, EFI, mufflers through transom in water	6 mph	61 dBA	J2005	87		
			J1970, ¼	76	100	80.5
			½	74	138	81
			Full	76	126 (wave slap)	82
			Full	79	126	85
			Full	63	600	79
			Full	61	600	77
20' Crowline, single engine, 200 hp, EFI, muffled through prop exhaust	4 mph	61 dBA	J2005	73		
			J1970 ¼	71	78	74.5
			½	65	204	74
			Full	67	204	75
28' Formula, twin 350 engine, 300 hp, EFI, muffled through prop in water	6 mph	59 dBA	J2005	73		
			J1970 ¼		105	
			½	66	210	75
			Full	67	270	76
35' Fountain, twin engine, 500 hp, EFI, exhaust through the transom with silent choice (captain's call) option through the water. When the "option" is closed, exhaust is through the water. There is no muffler system.	6 mph, 8-10 mph	60 dBA	J2005 Closed Option	93 with single engine		
				95 with both engines		
			Open Option	100 with both engines		
			J1970 Open Idle	74	114	78.5
			Open ¼	78	114	82.5
			Open ½	84	138	91
			Open Full	85	297	96.5
21' 1973 Century (Classic), 350 FLV, mufflers through transom	4 mph	59 dBA	J2005	86		
			J1970 Idle	60	270	71.5
			¼	64	342	77
			½	63	450	76.5
			Full	69	480	83
			J1970 Idle	61	168	70
			¼	67	228	76
			½	69	216	78
Full	77	192	86			

Division of Wildlife of the State of Nevada, 2001

4. Trends

It appears that single event noise levels in the Basin have not significantly changed in the last five years. However, data is extremely limited, and thus it is very difficult to draw sound conclusions.

5. Threshold Attainment Status

The single event noise level standards are not being met. Data from the U.S. Forest Service indicates that five citations were issued for exceedances of the snowmobile noise standards in the winter of 2000-2001. Tests conducted on boats commonly seen on Lake Tahoe reveal that standards are likely not being met by some of the watercraft.

6. Effectiveness of Measures in Place

The measures in place are not effective. The measures require enforcement accompanied by a more thorough monitoring program. For more details on compliance measures, see Table 9-9.

Category: noise

Parameter: single-event (other than aircraft)

1. STANDARD: The following maximum noise levels are allowed: (All values are in decibels):

Source	Overall	Threshold - dBA		Monitoring Distances
		Less Than 35 MPH	Greater Than 35 MPH	
Boats	82	--	--	50 ft.-engine at 3,000 rpm
Motor Vehicles less than 6,000 GVW	--	76	82	50 feet
greater than 6,000 GVW	--	82	86	50 feet
Motorcycles	--	77	86	50 feet
Off Road Vehicles	--	72	86	50 feet
Snowmobiles	--	82	--	50 feet

2. INDICATOR (UNITS): Any single-event noise measurement made with a Type I sound level meter using the A-weighting and "slow" response pursuant to applicable manufacturer's instructions, except that for sounds of a duration of two seconds or less, the "fast" response shall be used. See Chapter 23 of the Code of Ordinances.

3. MONITORING SUMMARY: Meter calibration, location of microphone, and measurement intervals must comply with the provisions of Section 23.4 of the Code. TRPA has not conducted a comprehensive program of single-event noise monitoring; monitoring is conducted on a case-by-case basis.

4. ATTAINMENT STATUS: Non-Attainment

5. TARGET DATE: ~~Not applicable~~ 2006

6. EVALUATION INTERVAL: Five years

7. INTERIM TARGETS: ~~Not applicable~~ No more than 5 monitored single-event noise occurrences per year by 12/03.

8. COMPLIANCE MEASURES: (See Section II for inventory)

- a. MEASURES IN PLACE: ~~NOISE-02, 03, 04, 05, 06, 07, 08, 11, 12, and 14~~ 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189.

- b. EFFECTIVENESS OF MEASURES IN PLACE: The measures in place are ~~effective and should remain~~ not effective. Measures require enforcement accompanied by a more thorough monitoring program.

- c. SUPPLEMENTAL MEASURES: None
~~Noise-02 and 03~~

- d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: The supplemental measures in place ~~are effective and should remain~~ from 1996 have been completed.

9. ADEQUACY OF COMPLIANCE MEASURES: The compliance measures, with proper enforcement, are adequate to attain and maintain the interim target adopted in 2001.

C. N-3: COMMUNITY NOISE EQUIVALENT LEVEL

The Community Noise Equivalent Level (CNEL), which is the metric used by TRPA for determining land use compatibility, is the annual average community noise level represented by the repeated number of operations, or measured noise levels throughout a 24-hour period. The contour graphically illustrates the area impacted by noise from repetitive operations and reflects consideration for duration and the time of day of each single event. The CNEL is based upon the weighted average of all noise over a 24-hour period. However, the CNEL applies a +4.77 dB penalty to noise levels during the evening period (7:00pm to 10:00pm) and a +10 dB penalty to noise levels during the nighttime period (10 pm to 7 am). Its intent is to account for peoples' reaction to noise exposure during those time periods.

1. Evaluation Criteria

The TRPA thresholds for noise include the following Community noise event standards:

NUMERICAL STANDARD: Background Noise Levels shall not exceed the following levels:

<u>Land Use Category</u>	<u>Average Noise Level or CNEL Range (dBA)</u>
High Density Residential Areas	55
Low Density Residential Areas	50
Hotel Areas	60
Commercial Areas	60
Industrial Areas	65
Urban Outdoor Recreation Areas	55
Rural Outdoor Recreation Areas	50
Wilderness and Roadless Areas	45
Critical Wildlife Habitat Areas	45

POLICY STATEMENT: It shall be the policy of the TRPA Governing Body in the development of the Regional Plan to define, locate, and establish CNEL levels for transportation corridors.

In the noise subelement of the Regional Plan Goals and Policies (TRPA 1986), TRPA established the following average noise level standards for transportation corridors:

- Highway 50 (65 dBA)
- Highways 89, 207, 28, 267, and 431 (55 dBA)
- South Lake Tahoe Airport (60 dBA)

The highway CNEL values override the land-use based CNEL thresholds and are limited to an area within 300 feet from the edge of the road. The airport CNEL value applies to areas impacted by the approved flight paths.

Pursuant to Chapter 23 of the TRPA Code, TRPA established CNEL levels in the Plan Area Statements (PAS), which shall not be exceeded by any one activity or combination of activities. The CNEL levels established in the PAS are based on land use classification, the presence of transportation corridors, and the applicable threshold.

Because there is not a one-to-one correlation between the land use categories in the thresholds and the land use categories in the PAS, TRPA set appropriate CNEL standards for the plan areas based upon site-specific characteristics and current activity levels. For example, most mixed-use tourist plan areas have CNEL standards of 60 dBA, but a few have CNEL standards of 55 dBA.

2. Measurement and Monitoring

Plan Areas: Bollard & Brennan, Inc performed a noise monitoring survey for TRPA in 2000. The purpose of the survey was to evaluate the existing background noise environment throughout the Tahoe Region, in comparison with adopted standards and with previously measured 1991 and 1996 levels.

Bollard & Brennan conducted continuous 24-hour noise level measurements at 43 locations. Short-term noise measurements were conducted in five locations on Lake Tahoe at three separate times during the day and evening. In addition, traffic noise calibrations were conducted for the major State Highways within the Lake Tahoe Basin in seven locations. The noise monitoring results are intended to provide an indication of potential noise levels within the Basin, and a comparison of the recently measured noise levels to the criteria contained within the Plan Area Statements. Results are given in Table 9-7 in Section VII. When the measured noise level data exceeds the Plan Area Statement criterion, the measured noise level is highlighted.

The continuous noise measurement sites were, to the extent possible, the same noise measurement sites selected in 1991 and 1996 for previous threshold evaluations. Therefore, the measured noise levels collected by Bollard & Brennan can also be compared to the noise levels from those previous years.

Traffic Corridors: As a means of determining traffic noise levels along the major highway corridors within the Lake Tahoe Basin, Bollard & Brennan, Inc. employed the Federal Highway Administration (FHWA) Highway Traffic Noise Prediction Model (FHWARD-77-108). The FHWA model is the analytical method currently favored for traffic noise prediction by most state and local agencies, including the California Department of Transportation (Caltrans). The model is based upon the CALVENO noise emission factors for automobiles, medium trucks and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site.

The FHWA model predicts hourly average (L_{eq}) noise levels due to traffic. To predict CNEL values, it is necessary to determine the day/evening/night distribution of traffic and adjust the traffic volume input data to yield an equivalent hourly traffic volume. This adjustment is made to the FHWA model for determining the 24-hour CNEL traffic noise levels.

Bollard & Brennan, Inc. also conducted noise level measurements and concurrent counts of traffic at sites adjacent to major transportation corridors. The purpose of the short-term traffic noise level measurements and traffic counts is to determine the accuracy of the FHWA model in describing the existing traffic noise at each of the sites, while accounting for shielding from local topography, actual traffic speeds, roadway grade, and pavement type and conditions. Noise measurement results were compared to the FHWA model results by entering the observed traffic volume, speed and distance as inputs to the FHWA model. Since the FHWA predicted values fell within 2 dBA to the measured values, no offsets were applied to the FHWA model to predict the traffic noise levels at locations along the considered highways.

Continuous 24-hour noise level measurements were also conducted at or near the short-term noise measurement calibration sites. The measured CNEL values at each of the sites were used for comparison to the predicted noise levels, and for determining effective day/evening/nighttime traffic split, for direct input to the FHWA model.

To predict traffic noise levels, traffic data contained in the most recent traffic count books for the states of Nevada and California were used as direct inputs to the FHWA model. Table 9-8 (in Section VII) shows the locations and the predicted traffic noise levels at 100 feet and 300 feet from the roadway centerlines.

In 1996, the existing 1991 sound level measurements of major traffic corridors, in conjunction with data regarding traffic volume increases, were used to generate a mathematical model to evaluate increases in traffic noise impacts. Because sound measurements are defined as logarithmic numbers, the values can not be directly added or subtracted. Generally, it takes a doubling of noise energy to increase the measured noise level by 3 dB. In other words, given a similar vehicle fleet mix (heavy trucks vs. automobiles), the traffic volumes would have to double to increase the noise measurements by 3 dB.

In 1991, traffic noise contours for the major transportation corridors in the Tahoe Region were predicted using the Federal Highway Administration's STAMINA computer simulation program. Traffic volume and traffic mix information was obtained from traffic counts performed by Caltrans and NDOT. Average vehicle speeds were obtained from observations. Although the CNEL threshold for the transportation corridors is either 55 or 65 dBA, where a corridor passes through a commercial/public service or tourist area, the higher threshold applies.

3. Results of Measurement and Monitoring Efforts

A list of Plan Area sites monitored in 2000 and the resulting measurements is found in Table 9-7. Exceedances of the applicable CNEL standards are shaded.

High Density Residential Areas. The CNEL threshold for these areas is 55 dBA. In 2000, two of the thirteen high density residential areas exceeded the CNEL standards. These exceedances were primarily due to local traffic and construction-related activities

Low Density Residential Areas. The CNEL threshold for low density residential areas is 50 dBA. This standard was exceeded in 3 of the 8 areas measured.

Exceedance of the CNEL standard was likely due to local traffic, including automobiles and construction-related vehicles.

In any residential area, the primary noise source is automobile traffic. Although noise levels measured adjacent to main traffic corridors are expected to be higher than along side streets, traffic noise permeates the entire neighborhood and controls the calculated CNEL values.

Commercial/Industrial Areas. The CNEL thresholds for commercial and industrial sites are 60 and 65 dBA, respectively. No measurements exceeded the applicable standards.

Tourist Areas. The CNEL standard for tourist areas is 55 dBA. Four tourist areas were measured in 2000. No sites exceeded the standard.

Urban Outdoor Recreation Areas. The CNEL standard for urban outdoor recreation sites is 55 dBA. Two of the four sites monitored in 2000 exceeded the CNEL standard. The CNEL levels at these two sites were generally controlled by construction activities and background traffic (North Tahoe Fish Hatchery) and highway traffic noise and local resort activities (Zephyr Cove).

Rural Outdoor Recreation Areas. The CNEL criterion for these areas is 50 dBA. Of the single site TRPA monitored in 2000, Emerald Bay exceeded the standard. The Emerald Bay CNEL value is controlled by traffic noise.

Wilderness and Roadless Areas. Due to limited resources, no noise measurements in these areas were conducted in the Basin during the last five years. No complaints leading to citations were issued in the last five years.

Near Shore Measurements: Measurements were conducted at five locations near to the shore of Lake Tahoe. One measurement exceeded the applicable Plan Area Standard (Sand Harbor). This is a very popular beach, and thus human activity, including traffic, voices, and children playing, is the likely cause of this exceedance.

Traffic Corridors: In 2000, no exceedances occurred for the Highway 50 noise level standard of 65 dBA and for the Lake Tahoe Airport (Highway 50) standard of 60 dBA. Using the predicted values from the FHWA model output, the following exceedances occurred (see Table 9-8 in Section VII for specific locations-exceedances of the applicable standards are shaded):

- On State Route 89, the 55 dBA CNEL criterion was exceeded at four sites.
- On State Route 28, the 55 dBA CNEL criterion was exceeded at seven sites.
- On State Route 267, the 55 dBA CNEL criterion was exceeded at the two sites that were measured.

4. Trends

Based upon the results of the noise measurement program, it is apparent that in most cases noise levels increased. Using a 3 dBA increase in CNEL as the test of significance, locations where significant increases in measured noise levels occurred, when compared to the 1996 results, were in the following plan areas:

006	Fish Hatchery
009A	Lake Forest Commercial
021	Tahoe Estates
024A	North Tahoe Recreation Area
043	Chateau/Country Club
051	Tyrolian Village
054	Incline Village Industrial
066	Zephyr Cove
076	Kingsbury Community Plan
092	Pioneer/Ski Run
102	Tahoe Keys
113	Industrial Tract
125	Meyers Community Plan
149	Rubicon

A significant decrease in noise levels occurred in the following plan areas:

073	Lake Village
146	Emerald Bay

In 2000, CNEL levels were exceeded in eight plan areas. In 1996 and 1991, noise standards were exceeded in six and five plan areas, respectively. Noise levels decreased in only 11 plan areas from 1996.

It appears that overall noise in the Basin has been increasing. However, noise data for the last 15 years is extremely limited. Also, CNEL values for 2000 are based on one 24-hour measurement, whereas the definition of CNEL is an annual average Community Noise Level Equivalent. Increased noise levels or levels exceeding the standard appeared to be due to traffic in most areas. Since traffic in the basin has increased over the last 15 years, it is expected that noise will also increase.

5. Threshold Attainment Status

CNEL standards were exceeded in several plan areas. It appears that traffic and construction were responsible for high noise levels in most plan areas. Construction activities are temporary and, therefore, considered exempt from the noise standards. In plan areas where traffic was the main noise source, further monitoring is necessary to determine if mitigation is required.

For transportation corridors, noise levels generally complied with the TRPA threshold noise level criteria. In some instances, noise levels are anticipated to exceed the criteria.

6. Effectiveness of Measures in Place

The compliance measures in place are moderately effective in attaining and maintaining the applicable thresholds. Revisions are needed to attain and maintain the thresholds. For more details on compliance measures, see Table 9-9.

Category: noise
Parameter: community noise levels

1. STANDARD: Background noise levels shall not exceed existing levels or the following levels, whichever is less:

Land Use Category	Average Noise Level or CNEL Range (dBA)
High density residential areas	55
Low density residential areas	50
Hotel Areas	60
Commercial Areas	60
Industrial Areas	65
Urban outdoor recreation areas	55
Rural outdoor recreation areas	50
Wilderness and roadless areas	45
Critical wildlife habitat areas	45

POLICY STATEMENT: It shall be a policy of the TRPA Governing Body in the development of the Regional Plan to define, locate, and establish CNEL levels for transportation corridors. In the Noise Subelement of the Goals and Policies (TRPA, 1986), TRPA established the following average noise level standards for transportation corridors:

Highway 50	65
Highways 89, 107, 28, 267, and 431	55
South Lake Tahoe Airport	60

The highway CNEL values override the land use-based CNEL thresholds, and are limited to an area within 300 feet from the edge of the road. The airport CNEL value applies to areas impacted by the approved flight paths. Pursuant to Chapter 23 of the TRPA Code, TRPA established CNELs in the plan area statements which shall not be exceeded by any one activity or combination of activities. The CNELs established in the plan area statements are based on land use classification, the presence of transportation corridors, and the applicable threshold. Because there is not a direct correlation between the land use categories in the thresholds and the land use categories used in the plan area statements, TRPA set appropriate CNEL criteria in each plan area based on the predominant land use.

2. INDICATOR (UNITS): Community noise equivalent levels (CNELs) calculated pursuant to the Code, Section 23.4. ~~TRPA acknowledges that development permitted by the Regional Plan may, in some locations, cause cumulative noise levels to exceed 1982 levels. Pending possible revisions to the thresholds or the Code,~~

~~TRPA shall review proposed activities in the Tahoe Region taking into account site-specific noise analyses, estimated impacts on affected land uses, consistency with other provisions of the Regional Plan, and reasonable tests of significance of changes in noise levels.~~

- MONITORING SUMMARY: Meter setting, meter calibration, location of microphone, and measurement intervals shall be in accordance with Section 23.4 of the Code. A noise monitoring survey was conducted in ~~1996~~ 2000 as part of the evaluation. Sound level measurements were gathered at ~~40~~ 43 sites for 24 hours at each site. For details, see the ~~1996~~ 2001 Evaluation.
- ATTAINMENT STATUS: Non-Attainment. The ~~1996~~ 2000 monitoring program found community noise levels to be generally consistent with the thresholds, however, ~~seven of the 40~~ 8 of the 43 sites monitored exceeded the CNEL criterion for the plan area. For transportation corridors, noise levels generally complied with the TRPA threshold noise level criteria. In some instances, noise levels appeared to exceed the criteria based on comparing actual data to modeled conditions. In addition, the monitoring program showed: the CNEL noise criterion for commercial/public service land uses was higher than the noise level that currently exists at the monitored sites; and the CNEL criterion for wilderness and roadless areas is an unrealistic value. For details, see 1996 Evaluation.
- TARGET DATE: ~~2006~~2010
- EVALUATION INTERVAL: Five years
- INTERIM TARGETS: ~~Complete a noise study of watercraft, including personal watercraft, and adopt appropriate noise regulations by April 1, 1997-1998. Unless modified by the reports below, the interim target is no more than 6 sites exceeding the CNEL standard. By June 30, 1998-2003, adopt an interagency noise enforcement MOU. Complete a 2004 Noise Work program by June 30, 2001. Conduct roadway pavement testing by March, 2003. By June 30, 2000, study and reconsider the threshold that "background noise levels shall not exceed existing levels or the following levels whichever is less."~~

8. COMPLIANCE MEASURES: (See Section II for inventory)
- a. MEASURES IN PLACE: NOISE ~~01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, and 14~~ 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: The compliance measures in place are moderately effective in attaining and maintaining the applicable thresholds. Revisions are needed to attain and maintain the thresholds.
 - c. SUPPLEMENTAL MEASURES: NOISE- ~~None. 01, 02, and 03~~ 229, 230, 231
 - d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: ~~The 1996 Evaluation recommends implementation of these three supplemental measures to attain and maintain the thresholds. Not~~ Applicable If supplemental measures were put in place, TRPA would have the ability to enforce current compliance measures and thus reduce noise levels. Also, if construction noise were limited and/or accounted for in the Plan Area measurements, CNEL standards may be attainable.
9. ADEQUACY OF COMPLIANCE MEASURES: The compliance measures, with recommended additions from the list of supplemental measures, are not adequate to attain and maintain the thresholds. Since some of the thresholds may be unrealistic to attain, re-evaluation of the thresholds is necessary. In some cases, TRPA has no enforcement authority over compliance measures. This is covered in supplemental measures based on monitoring conducted to date.

Table 9-9. Effectiveness of Measures in Place for the Noise Threshold

Compliance Measure	Effectiveness	Thresholds	Explanation	Recommendation
(174) Airport noise enforcement program: The City of South Lake Tahoe enforces noise standards at the airport. By 2002 the single event noise standard for all aircraft arrivals at the airport will be 80 dBA. TRPA enforces the noise standards at heliports.	Yes	1,2,3		
(175) Boat noise enforcement program: Marinas and boat launching facilities open to the public shall post conspicuous notices of single-event noise standards. Rental and excursion operators shall not operate or offer for use of rent marine craft not in compliance with single-event noise standards.	Marginal	2,3	This measure lacks a stringent monitoring program.	See (In recommendation section V): E
(176) Motor vehicle/motorcycle noise enforcement program: Upon receipt of a noise complaint or detection of a possible violation, TRPA may conduct a monitoring study in accordance with Chapter 23 of the Code. TRPA shall implement corrective measures pursuant to Chapters 8 (Compliance) or 9 (Remedial Action Plans).	Marginal	2,3	This measure lacks a stringent monitoring program.	See (In recommendation section V): D, G, H, I
(177) ORV restrictions: Public agencies responsible for the administration of public lands and recreation areas shall post notices of the single-event noise standards in conspicuous locations at access points to use areas. Rental and excursion operators shall not operate or offer for rent or use any off-road vehicle not in compliance with single-event noise standards.	Marginal	2,3	This measure lacks a stringent monitoring program.	See (In recommendation section V): D, E, F, G
(178) Snowmobile Restrictions: Public agencies responsible for the administration of public lands and recreation areas shall post notices of the single-event noise standards in conspicuous locations at access points to use areas. Rental and excursion operators shall not operate or offer for rent or use any over-snow vehicle not in compliance with single-event noise standards.	Marginal	2,3	This measure lacks a stringent monitoring program.	See (In recommendation section V): D, E, F, G

Table 9-9. Status of Control Measures in Place for the Noise Threshold (continued)

Control Measure	Effectiveness	Thresholds	Explanation	Recommendation
(179) Land use planning and controls: TRPA established CNEL criteria for all plan area statements according to land use classification, presence of transportation corridors, and applicable thresholds.	Yes	1,2,3		
(180) Vehicle trip reduction programs: Mass transportation and transportation demand management (TDM) measures of the Regional Transportation Plan as amended.	Yes	2,3		
(181) Transportation corridor design criteria: TRPA shall provide design guidelines to reduce transmission of noise from transportation corridors.	Marginal	2,3	This measure lacks a stringent monitoring program.	See (In recommendation section V): D, G, H, I
(182) Airport master plan: The City of South Lake Tahoe Airport shall operate and perform noise enforcement and monitoring pursuant to the adopted airport master plan.	Yes	1,2,3		
(183) Loudspeaker restrictions: No person shall use loud speakers or similar devices for amplifying sound outdoors for the purpose of advertising products or services to attract patrons	Yes	2,3		
(184) Project Review-TRPA shall not approve a project that causes a CNEL standard to be exceeded: Based upon completion of an initial environmental checklist (IEC), TRPA may require a noise impact report prior to approving a project.	Yes	2,3		
(185) Complaint system: Upon receipt of a noise complaint or upon detection of a possible violation of a noise standard, TRPA may conduct a monitoring study in accordance with Chapter 23 of the Code of Ordinances. Based on the results of the monitoring study, TRPA shall implement appropriate corrective measures under the provisions of Chapters 8 and 9 of the Code. TRPA may delegate all or part of these activities to another public entity through a memorandum of understanding.	Yes	1,2,3		

Table 9-9. Status of Control Measures in Place for the Noise Threshold (continued)

Control Measure	Effectiveness	Noise Thresholds	Explanation	Recommendation
(186) Transportation corridor compliance program: If TRPA determines that noise standards are not being met in transportation corridors, TRPA, in cooperation with other local entities, shall develop a compliance program to ensure attainment and maintenance of the noise thresholds.	Marginal	2,3	This measure lacks a stringent monitoring program.	See (In recommendation section V): D, G, H, I
(187) Exemptions to noise limitations: Single-event and community noise standards shall not apply to safety signals, warning devices, emergency pressure relief valves, other similar devices, emergency work to protect life or property, and fireworks used in accordance with a state or local permit.	Yes	1,2,3		
(188) TRPA's Environmental improvement program (EIP) includes improvement projects that were created to specifically reduce the transmission of noise from transportation corridors.	Marginal	2,3	Projects have not yet been implemented.	Implement projects.
(189) Personal watercraft noise controls: In 1997, TRPA adopted a 600-foot no wake zone to reduce noise impacts to on-shore users and wildlife.	Yes	2,3		
Supplemental Measure (229). Hire noise compliance officer for the Lake Tahoe Basin. Officer will conduct noise monitoring around the Basin to determine compliance with all noise thresholds.	N/A	2,3	N/A	
Supplemental Measure (230). Develop and implement strategies to reduce traffic-generated noise on roadways that do not comply with noise threshold standards. Such strategies may include time-of-day restrictions on certain vehicular types, reduced speed limits, etc	N/A	2,3	N/A	
Supplemental Measure (231). Revise the TRPA exemption for construction noise. Revisions may include modified time-of-day restrictions, the elimination of the exemption, mitigation measures, etc.	N/A	3	N/A	

IV. STATUS OF 1996 RECOMMENDATIONS

Below is a list of recommendations made in the 1996 Threshold Evaluation. Following, in italics, is a summary of the status of that recommendation.

N-1: Aircraft Noise

1. Implement the noise mitigation measures listed in the South Lake Tahoe Airport Master Plan. *Although the noise monitoring system was put in place prior to the 1996 Evaluation, the monitoring equipment fell into disrepair. By January 2000, the program was fully operational. Some work is needed in establishing monitoring and testing procedures.*

N-2: Single Event Noise Level

1. TRPA should undertake a long-term single-event noise monitoring program for the noise generators listed in the threshold. TRPA should consider adding personal watercraft to the list of single-event noise generators in the threshold. *TRPA is currently discussing a more intensive monitoring program. In May, 1997, TRPA adopted a 600 foot no-wake zone to maintain noise levels on shore that allow normal voice effort conversation.*
2. TRPA should continue to implement the noise control measures in place, and should add three supplemental measures to the Regional Plan: a noise mitigation program within the integrated environmental improvement program; research into jet ski noise; and an inter-agency noise enforcement Memorandum Of Understanding (MOU). *The EIP includes projects developed to reduce noise levels and impacts in the Basin. Research into jet ski noise led to the adoption of the 600 foot no-wake zone. An interagency noise enforcement MOU has not been adopted.*

N-3: Community Noise Event Level

1. The CNEL threshold for commercial/public service land uses should be lowered from the existing 65 dBA standard to 60 dBA to better represent existing noise levels. *The CNEL for commercial areas was lowered to 60 dBA.*
2. For tourist areas not located within a transportation corridor, a CNEL threshold of 60 dBA is appropriate. *All tourist areas, except for the Incline Village Tourist Area (55 dBA), have a CNEL value of 60 dBA. No standards were exceeded.*
3. The CNEL threshold for urban and rural outdoor recreation areas is appropriate for those locations outside a major transportation corridor. *This threshold remains appropriate.*
4. The CNEL threshold for wilderness and roadless areas and critical wildlife habitat areas is an unrealistic value. The penalties computed into the CNEL calculations for evening and nighttime hours would require sound pressure levels in the range of 15 to 20 dBA to obtain a CNEL value of 25 dBA. Even in the absence of people, background noise levels in isolated wilderness areas are higher than this level. A CNEL threshold in the range of 40 to 45 dBA would be appropriate for isolated wilderness areas. *A CNEL threshold of 45 dBA was adopted for wilderness areas.*

5. The CNEL threshold, which states that "background noise levels shall not exceed existing levels, or the following levels, whichever is less," presents several problems of application. First, some areas where monitoring has been performed exceed the stated CNEL threshold, and mitigation has not been identified to bring the areas into compliance. Second, some areas which have received, or are likely to receive, higher levels of build-out under the Regional Plan will naturally experience higher community noise levels, exceeding existing levels, but may still remain well within the threshold for their land use category. Third, the threshold does not give TRPA the ability to change the land use classification of a given area or parcel of land to a classification that would create higher CNELs. *The community noise event threshold was reworded to state that "background noise levels shall not exceed the following levels:"*
6. TRPA should elaborate upon the language of the community noise level thresholds to acknowledge that development permitted by the Regional Plan may, in some locations, cause community noise levels to exceed 1982 levels. TRPA should, however, maintain strong anti-degradation policies for the Region in general. TRPA should develop a noise mitigation program for those areas that exceed the threshold in the plan area statements to reduce noise impacts on those areas to the extent feasible, and include that program in the Environmental Improvement Program (EIP). *TRPA has not developed mitigation measures for Plan Areas exceeding CNELs due to a very limited data set. TRPA is currently pursuing a more thorough noise monitoring plan.*
7. TRPA should conduct research into jet ski noise impacts, and develop an inter-agency noise enforcement MOU. TRPA should continue to monitor community noise levels periodically in preparation for subsequent threshold evaluations. *TRPA has adopted a 600 foot no-wake zone for watercraft. The TRPA Noise Working Group is discussing the future noise work program and monitoring plan.*
8. TRPA should create a CNEL category for Industrial Areas with a CNEL threshold of 65 dBA. *A CNEL threshold of 65 dBA was adopted for Industrial areas.*

V. 2001 RECOMMENDATIONS

The following recommendations are made to compliment the existing compliance measures and supplementary measures recommended to be in place. Recommendations may not be given for all thresholds if they are in attainment and trends indicate that levels will remain in attainment.

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~A. Airport noise standards phase in for August 2002~~

~~Eighty-five percent of airport noise violations in 2000 were due to military aircraft. Since the airport has no enforcement authority over military aircraft, the current threshold as written will be difficult to attain. Also, exceedances of the noise standards sometimes occurred on noise testing regimes, which are conducted to determine if an aircraft will meet standards, or on the first flight of a particular aircraft into the Basin. Since the current thresholds consider one violation non-attainment, this threshold, as written, may continue to be out of attainment.~~

~~Responsible Entity: TRPA/South Lake Tahoe Airport
Funding/Cost: TRPA Staff Time: 170 hours
Completion Date: August 2002
Threshold Indicator: N-1~~

~~**Recommendation:** In August, 2002, the noise standards for airport arrivals will be lowered to 80 dBA. This will require a significant reduction in noise for several aircraft. Implementation of the lower noise level limit should be preceded by adequate research, environmental documentation, and by consideration of the national and international factors that affect the potential for achieving lower aircraft noise levels over time.~~

~~**Product:** Agreement with the South Lake Tahoe Airport to implement the reduced noise levels.~~

~~B. Address military aircraft and noise effects~~

~~Responsible Entity: TRPA
Funding/Cost: TRPA Staff Time: 85 hours
Completion Date: August 2002
Threshold Indicator: N-1~~

~~**Recommendation:** Based upon review of the airport records supporting the number of military flights and the types of aircraft involved, TRPA should re-evaluate the threshold and consider adding an exemption for military aircraft, or seek cooperation from the military to reduce flights.~~

~~**Product:** TRPA will develop procedures for evaluating military flights as they apply to threshold attainment.~~

~~C. Evaluating noise levels for all aircraft~~

~~Responsible Entity: TRPA
Funding/Cost: \$5,000
Completion Date: August 2002~~

~~Threshold Indicator: N-1~~

~~**Recommendation:** TRPA should clarify the threshold to establish when noise measurements apply to threshold attainment. This may include exclusions for military and emergency aircraft, aircraft affected by weather conditions, and aircraft noise testing periods.~~

~~**Product:** TRPA, with the assistance of Brown Buntin Associates, Inc., the South Lake Tahoe Airport, the Noise Working Group and other local and state agencies, will develop guidelines for the airport to determine the applicability of certain flights to threshold attainment.~~

~~**D. Single event noise monitoring**~~

~~Currently, there exists no on-going noise monitoring program for single noise events. Although several local agencies intermittently perform noise analyses, data are too limited to allow strong conclusions.~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: \$100,000 (includes CNEL monitoring also); TRPA Staff Time: 170 hours~~

~~Completion Date: March 2004~~

~~Threshold Indicator: N-2, N-3~~

~~**Recommendation:** TRPA, with the input of the Noise Working Group and other consultants, shall create and implement consistent noise monitoring program for single and community noise events. This may include annual monitoring of snowmobiles, highway traffic, OHV's and watercraft. This program would benefit the single and community event noise thresholds. The schedule and associated costs are as follows:~~

- ~~a) Hire noise consultant to develop 2004 Work Program. \$5,000 (December 2001)~~
- ~~b) Develop and implement monitoring program. \$25,000 (March 2002)~~
- ~~c) Use a noise model or analysis to estimate appropriate noise standards. \$50,000 (March 2003)~~
- ~~d) Develop regulations, EIP projects and compliance measures to attain and maintain standards. \$20,000 (March 2004).~~

~~**Product:** Appropriate noise thresholds and control programs to be included in the 2007 Regional Plan.~~

~~**E. Boat noise**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: TRPA Staff Time: 170 hours~~

~~Completion Date: November 2002~~

~~Threshold Indicator: N-2~~

~~Currently, the methods used to measure boat noise make enforcement of the noise standards extremely difficult. First, measuring boat noise at a 50 foot distance while screening out noise from the monitoring boat is very difficult to do, if not impossible. Second, the standard is set for when a boat is at 3,000 rpm. This is not possible to determine from a monitoring boat.~~

~~**Recommendation:** TRPA shall adopt the noise measurement protocols listed in the Nevada Administrative Code (NAC) 488.460 (see below). The Code includes protocols that make enforcement of boat noise standards possible. The enforcement tests include SAE J2005 and SAE 1970. Both of these tests are endorsed by various law enforcement agencies, the NMMA, and Personnel in the Watercraft Industry Association.~~

~~The SAE J2005 is a stationary test. It is done while the vessel engine(s) is at idle and is measured at 1.5 meters from the exhaust. Because it only measures the engine at idle, it only gives an indirect indication of the noise level a boat will produce (it will only get louder). Recommended limit level 90 dBA.~~

~~The SAE 1970 is a shoreline test. This test measures the noise received on shore from the operation of any vessel. It involves making measurements at the shoreline. Recommended limit 75 dBA. This test allows TRPA to take direct action against an individual boat that is exceeding the limit. It also complies with the 600 foot no-wake zone.~~

~~**Product:** An ordinance for watercraft that will provide for the measurement and maintenance of TRPA's boat noise standards.~~

~~**F. Study the effects of noise on wildlife**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: (Included in Recommendation D)~~

~~Completion Date: December 2003~~

~~Threshold Indicator: N-2, N-3~~

~~**Recommendation:** TRPA shall develop a program to study the effects of noise on wildlife. The program needs to include the following: 1) the determination of noise levels associated with detrimental effects on wildlife, including level, frequency and duration of noise; 2) the sources of the noise; and 3) methods to minimize noise impacts. Based on the findings of this program, TRPA shall make recommendations for new standards and indicators or improvements to the existing noise standards and indicators. The threshold standards shall be measurable, scientifically defensible, and attainable.~~

~~**Product:** Recommended noise thresholds and indicators to address elements listed above.~~

~~**G. Standards for wilderness areas to protect wildlife**~~

~~Responsible Entity: TRPA/USFS~~

~~Funding/Cost: TRPA Staff Time: 170 Hours~~

~~Completion Date: June 2004~~

~~Threshold Indicator: N-2, N-3~~

~~**Recommendation:** Utilizing data from the above recommendation for a wildlife study, TRPA shall adopt standards in cooperation with the U.S. Forest Service for wilderness and non-urban areas.~~

~~**Product:** Adopted noise standards for wilderness and non-urban areas.~~

H. CNEL monitoring program

~~While it appears that noise levels in the Basin are increasing, data are extremely limited. Measurements for CNEL noise standards have only been performed once every five years since the adoption of the thresholds. Such measurements only encompass one point in time. It is extremely difficult to determine if threshold standards are being met with the current data set. (See Recommendation D for Single Event Noise Levels). Also, the thresholds for some transportation corridors may not be realistic based upon the traffic volumes along the roadways.~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: (Costs covered under Single Events- Recommendation D); TRPA
Staff Time: 170 Hours~~

~~Completion Date: March 2004~~

~~Threshold Indicator: N-3~~

~~**Recommendation:** TRPA, with the input of the Noise Working Group and other consultants, shall develop a more thorough CNEL monitoring program. Noise measurements need to be performed more often, perhaps on an annual basis, in order to determine if standards are being met.~~

~~**Product:** Appropriate noise thresholds and control programs to be included in the 2007 Regional Plan.~~

I. Traffic corridors

~~Responsible Entity: TRPA~~

~~Funding/Cost: TRPA Staff Time: 340 Hours~~

~~Completion Date: March 2004~~

~~Threshold Indicators: N-2, N-3~~

~~**Recommendation:** TRPA, with the input of the Noise Working Group and other consultants, should re-evaluate the thresholds for the traffic corridors. Any threshold changes should include corrections to the numeric values based upon roadway grades, pavement conditions, etc.~~

~~**Product:** Noise thresholds and indicators for transportation corridors that are appropriate and realistic to highway conditions. New standards and associated compliance measures will be included in the 2007 Regional Plan.~~

J. Pavement testing

~~Responsible Entity: TRPA~~

~~Funding/Cost: TRPA Staff Time: 170 Hours~~

~~Completion Date: March 2003~~

~~Threshold Indicator: N-3~~

~~**Recommendation:** To help attain the roadway standards, TRPA recommends that an evaluation be conducted to review different pavement types and their potential for noise reduction.~~

~~**Product:** Recommended pavement types for the Lake Tahoe Basin and identification of proposed test project.~~

VI. EIP INTEGRATION

Completed EIP Projects And Contribution To Thresholds

TRPA's records indicate that three projects for the noise program have been completed, totaling \$ 18,500. They are:

- Amendment of CNEL threshold (N #547). The Community noise event threshold was amended as follows: the CNEL standard for hotel/motel facilities (now considered hotel areas) changed from 55 dBA to 60 dBA, the CNEL standard for commercial areas was adjusted from 60 to 65 dBA, and a CNEL standard for industrial areas was added (65 dBA). The wording was also amended to state that "background noise levels shall not exceed the following levels."
- Study on Personal Watercraft Noise (N #548). In 1997, TRPA hired Bollard and Brennan, Inc. to perform a Lake Tahoe Watercraft Noise Measurement Survey. This study analyzed noise from personal watercraft at various distances. In May 1997 TRPA, utilizing this data, adopted a 600 foot no-wake zone for watercraft.
- Amend background noise level (N #550). The previous CNEL standard for wilderness/roadless areas was 25 dBA. However, data revealed that the actual noise in background areas was 40-45 dBA. Therefore, the CNEL standard was adjusted to account for natural background noise to 45 dBA.

Most Critical EIP Projects

Noise Programs

Generally noise programs relate to the enforcement of noise standards. The Lake Tahoe Airport Master Plan continues to be the lead programming document for the enforcement of noise standards relating to aircraft. TRPA shorezone enforcement program is the primary program for the enforcement of standards relating to watercraft. The Noise Element of the EIP is another program that assists in implementing the objectives.

Two program areas directly related to research studies and implementation of control programs include Shorezone Ordinance amendments and Motorized Watercraft Ordinances. The direction and outcome of these programs are dependent upon the conclusions of research studies, which continue today.

Noise Projects

Physical projects are required to attain the noise standards. At this time, there are only a few noise abatement projects. Key studies are ongoing or proposed that will assist to more effectively design, implement, and construct noise mitigation projects. These studies relate to project effectiveness and prioritization. The key objective of the majority of noise mitigation projects in the EIP is to eliminate or reduce the sources of noise contamination that have negative impacts, principally from urbanization and roadway networks.

As noted in the recommendations above, there are several EIP projects that are critical to the attainment of current thresholds and establishment of new thresholds. It is important to note that the funds assigned to specific agencies are only preliminary

estimates, and therefore are not yet available and changes may be made. Below is a list of projects and their threshold unit of benefit:

Single Event and Community Event Noise Levels

- EIP project numbers: 549, 551 and 10157. These projects include developing an interagency noise enforcement MOU (cost of \$5000 funded by TRPA), the implementation of a master plan program by Heavenly Valley that will reduce existing noise levels to begin to attain the CNEL standards, principally focusing on snowmaking equipment as required by the final EIR/EIS (cost of \$75,000 funded privately), and the development of an integrated adaptive noise computer model that can determine a “noise scoring function” to quantify noise ratings for a specific site of interest (cost of \$200,000 with funding as follows):

Local	\$25,000
Federal	\$50,000
CA State	\$50,000
TRPA	\$75,000.

Recommendations For EIP Update

1. Noise data in the Region are extremely limited. Current EIP projects include projects that will increase the enforcement of noise standards and reduce CNEL noise levels in the Heavenly Valley area. Project 10157 includes the development of a noise computer model. Since data are very limited, this project should include or correspond with increased monitoring efforts for both single and community noise events. A more thorough data set will make the computer model a more useful and feasible investment.
2. The Noise Working Group has suggested that the current noise standards for Plan Areas may not be feasible. Therefore, it may prove worthwhile to re-evaluate the standards assigned to the current Plan Areas. However, such a study will require a more thorough data set than currently exists. This project may be useful to apply once increased monitoring of Plan Areas in the Basin has begun.

VII. SUPPLEMENTAL INFORMATION

Table 9-7. Comparison of Measured Noise Levels to Plan Area Statement Criteria

Table 9-8. Predicted Traffic Noise Levels

Table 9-7. Comparison of Measured Noise Levels to Plan Area Statement Criteria

Monitoring Site	Plan Area	Plan Area Description	PAS CNEL Criterion, dB	Measured CNEL, dB		
				1991	1996	2000
1S	006	Fish Hatchery	55	54.0	49.6	56.8
2S	009A	Lake Forest Commercial	65	55.0	49.8	54.3
3S	010	Dollar Point	50	47.0	47.6	48.7
4S	012	North Tahoe High School	55	44.0	49.2	49.4
5S	016B	Carnelian Bay Residential	55	49.0	48.0	47.7
6S	017	Carnelian Bay Tourist	60	56.0	51.1	53.7
7S	021	Tahoe Estates	55	47.0	42.7	44.7
8S	022	Tahoe Vista Commercial	60	59.0	51.7	52.4
9W	024A	North Tahoe Recreation	55	49.0	44.2	54.2
11S	028	Kings Beach Residential	55	51.0	51.4	50.5
13W	032	North Stateline Tourist	60	60.0	49.7	47.5
14W	035	Crystal Bay Condos	55	55.0	58.7	61.4
15S	037	Lakeview	55	54.0	54.0	53.8
16W	043	Chateau/Country Club	50	47.0	57.2	60.3
17S	046	Incline Village Residential	55	54.0	53.3	52.7
18W	048	Incline Village Tourist	55	55.0	51.6	54.4
19S	051	Tyrolian Village	50	46.0	44.5	44*
20S	054	Incline Village Industrial	65	54.0	49.7	54.6
22S	063	Lincoln	55	49.0	46.1	47.5
23S	066	Zephyr Cove	55	50.0	51.0	56.7
24W	073	Lake Village	50	53.0	51.5	46.5
25S	076	Kingsbury Commercial	65	59.0	55.1	59.2
26S	088	Tahoe Village	55	48.0	47.3	44.6
27S	092	Pioneer/Ski Run	55	56.0	49.7	57.3
28	098	Bijou/ Al Tahoe	60	52.0	57.6	56.6
29	102	Tahoe Keys	55	49.0	48.4	51.5
30S	105	Sierra Tract	55	55.0	50.3	51.6
31	107	Black Bart	50	53.0	54.5	51.7
32W	113	Industrial Tract	65	53.0	53.6	59.4
33S	124	Meyers Residential	50	51.0	51.6	53.1
34S	125	Meyers Commercial	65	58.0	56.5	61.2
39S	146	Emerald Bay	50	53.0	54.1	51.0
40	149	Rubicon	50	45.0	41.2	47.0
41	160	Homewood Residential	55	n/a	n/a	50.2
42	170	Tahoe Park Pineland	55	n/a	n/a	50.8
43	173	Granlibakken	55	n/a	n/a	53.0
44	00	<i>Near Shore Lake Tahoe Camp Richardson</i>	55	n/a	n/a	51.1
45	00	<i>Near Shore Lake Tahoe Meeks Bay</i>	55	n/a	n/a	52.0
46	00	<i>Near Shore Lake Tahoe Dollar Point</i>	55	n/a	n/a	53.5
47	00	<i>Near Shore Lake Tahoe Sand Harbor</i>	55	n/a	n/a	57.4
48	00	<i>Near Shore Lake Tahoe Skunk Harbor</i>	55	n/a	n/a	48.6

* Corrected CNEL. See detailed discussions on each noise measurement site.

Bollard and Brennan, Inc. 2001

Table 9-8. Predicted Traffic Noise Levels

Location	Existing ADT	Predicted CNEL(dBA)		Distance to Contours (feet)		
		@100 ft	@300 ft	55 dB CNEL	60 dB CNEL	65 dB CNEL
S.R. 89 CNEL Criterion is 55 dBA						
Luther Pass	5,900	61.2	54.0	258	120	56
South Lake Tahoe, Jct. Rte. 50	28,000	61.2	54.0	257	119	55
South Lake Tahoe, 10 th Street	22,600	60.2	53.1	223	103	48
West Way	7,900	55.7	48.5	111	51	24
Fallen Leaf Lake Road	6,300	60.3	53.2	227	105	49
Spring Tract Road	5,000	59.3	52.2	194	90	42
Bliss Memorial State Park Road	4,500	58.9	51.7	181	84	39
Rubicon Glenn Drive	7,700	61.2	54.0	259	120	56
El Dorado County/Placer County Line	12,100	63.2	56.0	350	163	75
McKinney Creek Road	13,200	63.5	56.4	371	172	80
Ward Creek Bridge	15,100	64.1	57.0	406	188	87
Fir Avenue	25,500	63.9	56.7	390	181	84
Fanny Bridge	24,300	60.5	53.4	234	109	50
Tahoe City, Jct. Rte. 28 East	20,400	61.4	54.3	268	124	58
State Highway Station; Tahoe City, West	21,100	61.6	54.4	274	127	59
U.S. 50. CNEL Criterion is 65 dBA						
Upper Truckee River Road	16,200	65.9	58.8	537	249	116
Meyers, Jct. Rte. 89 South	19,600	64.3	57.1	417	194	90
Meyers, Pioneer Trail Road	18,000	63.9	56.8	394	183	85
Sawmill Road	17,200	66.2	59.1	559	259	120
South Lake Tahoe, H Street	30,000	66.2	59.0	554	257	119
South Lake Tahoe, Jct. Rte. 89 North	43,500	67.8	60.6	710	330	153
South Lake Tahoe, Upper Truckee River Bridge	42,000	67.4	60.3	672	312	145
South Lake Tahoe, Lakeview Avenue	42,000	67.4	60.3	672	312	145
South Lake Tahoe, Rufus Allen Blvd.	44,000	67.6	60.5	693	322	149
South Lake Tahoe, Ski Run Blvd.	44,000	67.6	60.5	693	322	149
South Lake Tahoe, Pioneer Trail Rd.	50,000	68.2	61.0	755	351	163
South Lake Tahoe, Park Avenue	55,000	68.6	61.4	805	374	173
South Lake Tahoe, NV/CA State Line	26,700	62.5	55.3	315	146	68
Jct. Rte. 207 (Kingsbury Grade)	21,800	64.6	57.4	434	202	94
Nevada Beach & Elk Point	19,600	65.4	58.2	493	229	106
Jct. Road to Glenbrook	11,700	62.5	55.3	315	146	68

Table 9-8. Predicted Traffic Noise Levels

Location	Existing ADT	Predicted CNEL(dBA)		Distance to Contours (feet)		
		@100 ft	@300 ft	55 dB CNEL	60 dB CNEL	65 dB CNEL
S.R. 28 CNEL Criterion is 55 dBA						
Jct. Rte 50	11,700	61.1	54.0	257	119	55
Tahoe City, Jct. Rte. 89	23,400	60.7	53.6	240	112	52
Grove Street	22,600	60.6	53.4	235	109	51
Tahoe State Park Entrance	20,200	63.3	56.1	355	165	76
Lake Forest Drive	15,500	62.1	54.9	297	138	64
Lardin Way	13,900	64.2	57.1	412	191	89
Carnelian Bay Road	17,000	65.1	57.9	472	219	102
Granite Road	18,400	65.4	58.3	497	231	107
National Avenue	24,400	66.7	59.5	600	278	129
Kings Beach, Jct. Rte. 267 North	24,700	63.6	56.4	374	174	81
Coon Street	32,000	63.7	56.6	383	178	83
Cal-Nevada Drive	19,500	61.6	54.4	275	128	59
West of Rte. 431	12,100	61.0	53.9	252	117	54
East of Rte. 431	12,200	61.1	53.9	254	118	55
West of Village Blvd.	11,000	60.6	53.5	237	110	51
East of Village Blvd.	11,900	61.0	53.8	249	116	54
West of Lakeshore Blvd.	6,200	58.1	51.0	161	75	35
East of Lakeshore Blvd.	7,300	58.8	51.7	180	84	39
North Shore Road	6,300	60.8	53.6	243	113	52
S.R. 267 CNEL Criterion is 55 dBA						
Martis Peak Road	10,800	66.8	59.6	609	283	131
Kings Beach, Rusty Road / North Avenue	11,900	63.0	55.8	339	158	73
S.R. 207 (Kingsbury Grade) CNEL Criterion is 55 dBA						
Jct. Rte. 50	15,100	61.8	54.7	284	132	61
East of Jct. Rte. 50	11,300	62.0	54.8	291	135	63
S.R. 431 CNEL Criterion is 55 dBA						
Barbara Street	5,450	60.2	53.0	221	103	48

Source: FHWA-RD-77-108 with inputs from Caltrans & Bollard & Brennan, 2001.

Chapter 10

RECREATION

I. INTRODUCTION

Recreation activities in Tahoe are dominated by seasonality and variation in visitor groups. Participation rates are further influenced seasonally by the state of the economy and daily by local weather. Visitor groups, likewise separated by day visitors and destination visitors, each contribute in different ways to the Tahoe Region's economic well-being.

In order to preserve the scenic and outdoor recreational opportunities of the region, there is a need to ensure equilibrium between the region's natural endowment and its manmade environment. (Tahoe Regional Planning Compact, P.L. 96-551-DEC. 19, 1980.)

The Recreation threshold is different from most of the other environmental carrying capacity thresholds, although all thresholds are inextricably connected. While the other thresholds are aimed at curbing the effects of urban development, the recreation threshold promotes the development of recreation facilities that can support a multitude of opportunities for the general public. Additionally, the recreation threshold goes further by requiring TRPA to reserve a fair share of the Basin's resource capacities to facilitate the development of recreation facilities.

The Recreation Threshold is subjective in nature and does not easily lend itself to quantification, which further complicates evaluative efforts and identifying deliverable research goals. Nonetheless, access to recreational opportunities and the development of diverse recreation facilities will become an ever increasing concern as visitation levels rise with the boom in population of Northern California and Nevada. This increase corresponds to increased demand for access to the shorezone of Lake Tahoe and other public lands for recreation activities. Additionally, the increase in the resident population of the Tahoe Basin contributes to a greater demand for urban recreation facilities, such as swimming pools and ball-fields.

BACKGROUND

The Regional Plan recognizes three types of recreational pursuits based upon the level of facility improvement: dispersed, developed and urban recreation. Dispersed recreation activities include hiking, jogging, primitive camping, nature study, fishing, cross country skiing, rafting/kayaking and swimming. Dispersed recreation activities typically do not require the use of improved facilities. Developed recreation involves activities enhanced by the use of man-made facilities, such as campgrounds, marinas, and ski resorts. Indoor and outdoor urban recreation facilities are primarily designed for use by the residents of the region, such as athletic fields and neighborhood parks.

The TRPA Goals and Policies, addressing these differing types of recreation facilities and their appurtenant activities, states they “*are expected to achieve the intent of the recreation thresholds over the life of the plan by ensuring that recreational opportunities keep pace with public demand, that recreation facilities remain high on the development priority list, and that the quality of the outdoor recreational experience will be maintained.*” (Goals and Policies, Chapter V, Recreation Element, page V-1.)

It is important to recognize that TRPA defines recreation opportunities based upon the level of facility development, but does not try to actually define what recreation is. This is, in part, why the Recreation Threshold is difficult to evaluate and implement; recreation is defined by the participant(s) where the quality of the experience is location-dependent and activity-specific. Therefore, within the context of the Regional Plan, all of the region’s resource agencies manage recreation as a resource that affords relaxation and enjoyment.

Many common threads can be woven among recreation participants, but the emotional and spiritual revelation gained by participating in recreational pursuits cannot be easily identified. Whether the facility being constructed, open space purchased, or policy implemented is for the Tahoe visitor or resident, recreation is a resource affording relaxation and enjoyment. Additionally, recreation isn’t merely ‘play-time’, but a societal pursuit that directly translates into the backbone of the Tahoe Region’s primary economy: tourism. Refer to Chapter 11, Economics for supporting documentation.

It is important to recognize that many external forces, beyond the purview of the recreation threshold, influence the performance of the threshold, both positively and negatively. Some of those forces include traffic congestion and mass transit operations, urban redevelopment and commercial development, in addition to the state of the economy at the local, state and federal levels.

Like most public services, funding and staffing are critical issues for recreation providers, and there is a clear disparity in the ability to address these issues between private and public recreation facility owners/operators. Typically, public recreation providers, such as the USFS and State Parks, do not operate their facilities to generate a profit, as do private recreation providers such as Heavenly Ski Resort. Therefore, a revenue stream to deal with operations, maintenance and reinvestment in a facility is increasingly difficult for public recreation providers. Additionally, quickly addressing the changing trends of recreation activities and user groups is more difficult for the public sector to address. Private providers possess the fiscal flexibility to address unforeseen needs immediately, whereas many public land managers are tied to budget cycles that are established months in advance of any given recreation season. This is especially true for the State of Nevada, which has a two-year budget cycle (i.e., state agency budgets are established for two year periods).

One approach that the USFS has recently taken to address the issue of inadequate staffing has been to contract the operation of facilities to outside concessionaires. However, the concessionaires operate these facilities with the mind-set of generating revenue that is not necessarily reinvested into the facility.

THRESHOLD STATUS SUMMARY

The following bulleted items list an overview of the status of the Recreation thresholds. While not all of the points made in this report are summarized here, the main points of interest are represented. This list is intended to give the reader a quick reference to the issues facing recreation in Tahoe today.

- Expectations of visitors and residents are generally being met.
- Many public agencies have successful land acquisition programs.
- Few projects requiring PAOT (i.e., Persons At One Time) allocations are being constructed; however, many projects that do not require PAOT allocations are being constructed.
- The demographic mix of visitors to the Tahoe Region may change in the future, reflecting the shifts seen in California, Tahoe's main visitor market.
- Lack of operation and maintenance funds is precluding capital investments.
- TRPA's role in the recreation community is undefined and limited resources have prevented the agency from assuming a leadership role.
- The health of the local economy is inextricably tied to the success of recreation providers.
- It is anticipated that the EIP will spur recreation facility development and rehabilitation.
- Facility maintenance has continued to be an issue affecting the quality of the recreation experience.
- Habitat restoration goals continue to conflict with recreation access.
- Recreation advocacy groups continue to be formed.
- The desired future condition of recreation at Tahoe needs to be defined.
- The quality of recreational experiences is wholly subjective and is influenced by a variety of factors.

INDICATORS

R1 – Quality Experience and Additional Access

The first recreation threshold indicator is a two-part policy statement which reads: *"It shall be the policy of the TRPA Governing Body in development of the Regional Plan to preserve and enhance the high-quality recreational experience including preservation of high-quality undeveloped shorezone and other natural areas. In developing the Regional Plan, the staff and Governing Body shall consider provisions for additional access, where lawful and feasible, to the shorezone and high-quality undeveloped areas for low density recreational uses."*

R1 is a unitless indicator, i.e., there is no numerical standard that can be employed to determine the attainment status of the threshold. However, various numerical expressions such as linear feet of shoreline or miles of bike trail can be used to gain insight into the attainment status. In and of themselves, these quantifiable features do not express the quality of the recreation experience at Tahoe, nor are they a true expression of access to the shorezone or other undeveloped lands but collectively they provide insight on threshold status.

The mere presence or availability of a facility doesn't necessarily mean it would provide high quality recreational experiences. Indeed it is difficult to singularly measure the R1 indicator, as it depends upon a multiplicity of factors that can and do influence attainment status. Stated more plainly, a facility may get constructed but be in the 'wrong place,' too crowded, too expensive, etc. Therefore, while numeric factors can be collected and tracked, they do not always reveal the expectations of recreationists, and whether those expectations are being met.

The features and activities that contribute to a high-quality experience are different for everyone. That is, in part, why to effectively manage the Basin's resources for recreation, providers often key on elements that they can address, which detract from the quality of the experience. Unfortunately many external forces and circumstances influence the recreation experience and are beyond the control of many providers.

R2 – Fair Share of Resource Capacity

The second recreation indicator (R2) addresses the Basin's resource capacity for development and attempts to ensure that recreation development keeps pace with other urban development pressures. It reads: *"It shall be the policy of the TRPA Governing Body in development of the Regional Plan to establish and ensure a fair share of the total Basin capacity for outdoor recreation is available to the general public."*

This is a difficult threshold to implement due to the high level of uncertainty associated with resource needs and facility development. While well intended, the main limitations on outdoor recreation facility development appear to be available funding for capital expenditures, operation, maintenance and staffing, in addition to land acquisition, rather than deficient resource capacity (water and sewerage treatment). Previous research was unable to definitively determine resource requirements for outdoor recreation facility development. (Recreation Resource Allocation and Capacity Study, 1996, RRC Associates/Vasey Engineering).

It is believed that an appropriate level of outdoor recreation facility development that is controlled by a people-at-one-time (PAOT) capacity system, has been planned. PAOT capacity limits are a planning tool developed in the 1970's as a means to determine the appropriate size of a facility and the suitable number of patrons the site should accommodate. However, there are inherent flaws in this system, as well as how it has been implemented. PAOT limitations are useful for designing a 'closed system' facility such as a ski resort; however, PAOTs have been asked to perform other functions for which they are inherently oversimplified. For example, facilities which charge parking fees are much more reliable in terms of reporting true visitation; however, even in those situations walkers and bicyclists are not captured by parking receipts.

The limitations of PAOTs can be expressed with this real-life example. Eagle Falls day-use/trailhead area (with only 36 parking spaces) receives in excess of 50,000 visitors a season, yet its design capacity is 75 PAOTs. For a 150-day summer recreation season, around 5,000 visitors a day would recreate at Eagle Falls. Obviously, the 75 PAOT design capacity does not capture this level of visitation.

Numerous polices exist within the Regional Plan for locating various types of recreation facilities in appropriate areas, given compatible surrounding land uses, site specific environmental constraints, and available infrastructure. Other operational considerations such as hours and seasons of operation, and coordination with mass-transit improvements are also key considerations for recreation facility development. While the recreation threshold promotes the physical development and, in some cases, the topographical manipulation of the landscape, it is recognized that this type of development cannot move forward, nor remain viable, if certain environmental issues are not addressed.

II. THRESHOLD SUMMARY

A. THRESHOLD MATRIX

The Threshold Matrix is intended as a summary of the major points highlighted throughout this chapter. For additional information on the summary presented herein, please refer to the appropriate section of this Chapter.

B. MEASUREMENT AND MONITORING ACTIVITIES

The Recreation Thresholds are expressed as policy standards, intended to evoke general support by the TRPA Governing Board and all Tahoe land management agencies, to manage resources for a desired recreation condition. For this reason, the Recreation Thresholds do not have quantifiable standards or numeric indicators of attainment. Therefore, the majority of the measurement and monitoring activities for the Recreation Thresholds focuses on the experience of both visitors and residents.

The following tools were employed to evaluate the Recreation Thresholds:

- Recreation Advisory Group – This group met for over a year and established a work program that directed their efforts to effectively evaluate the conditions of the Threshold standards.
- 1999 and 2000 Summer Recreation User Preference Survey – These surveys were aimed at identifying recreationist expectations and experience at Tahoe, in addition to developing standard demographic information, budgetary expenditures, and positive and negative trends.
- 2000 Focus Group Study – a study of select respondents were designed to provide qualitative insight into a range of recreation planning issues.
- 2000 Recreation Facility Inventory – TRPA was able to update the inventory of recreation facilities and their level of development.

C. RESULTS OF MEASUREMENT AND MONITORING ACTIVITIES

The results of the evaluation effort illuminated two primary findings. First, the Recreation Thresholds are difficult for TRPA to directly influence. TRPA relies on private and public recreation providers to offer a variety of opportunities while simultaneously managing the many other basin resources, such as vegetation and wildlife habitat. The results of surveys and other research found that the basin meets and/or exceeds many of the facility and condition attributes of those facilities associated with recreation areas. While limited in number, the total acreage of public land purchases has significantly contributed to the overall acres of land available for recreation opportunities, especially along the shoreline of Lake Tahoe.

Secondly, the Agency's existing capacity system for recreation development (PAOTs) attempts to both promote and control recreation facility development. The past 15 years of recreation management shows that this is a marginally effective program for directing, ensuring and appropriately locating the development of recreation facilities that meet visitors' and residents' needs. While well intended and in specific cases successful, the PAOT capacity system needs to be seriously reevaluated and a new or modified system, aimed at the same goals, must be developed for the next Regional Plan.

R-1: High-Quality Experience; Additional Access

Threshold Standards	R-1 Indicator	1996 Interim Targets	Threshold Attainment Status			
			1991 Attain Status	1996 Attain Status	2001 Attain Status	
<p>It shall be the policy of the TRPA Governing Body in development of the Regional Plan to preserve and enhance the high quality recreational experience, including preservation of high quality undeveloped shorezone and other natural areas. In developing the Regional Plan, the staff and Governing Body shall consider provisions for additional access, where lawful and feasible to the shorezone and high quality undeveloped areas for low density recreational use.</p>	<p>Experience of recreation users regarding quality of recreation experience by comparing the importance of identified recreation attributes (facilities and conditions) with the perceived Lake Tahoe recreation experience. (unitless). Additional access to the Lake and other natural features by the general public (including urban areas and edges) via land acquisition programs, additional trailheads and supporting amenities, additional trails, and additional bicycle trail segments. See interim targets for quantities.</p>	<p>a. Annual user surveys conducted by TRPA in cooperation with the recreation providers listed below which include questions regarding user satisfaction levels and perceptions of the quality of the outdoor recreation experience. Annual surveys, which address user satisfaction, should be administered by at least two of the following providers on a rotating basis: Forest Service, California State Parks, Nevada Division of State Parks, TCPUD, NTPUD, IVGID, Douglas County, and the City of South Lake Tahoe. TRPA should fund and compile the portions of the surveys that provide threshold-related data. b. Additional miles of bicycle and hiking trails developed including the following: <u>Miles of Hiking Trails</u> <u>Miles of Bicycle Trails</u> By June 30, 2002 21.5 as follows: 64 as follows: 12 (TRT) 55 (Phase 1 Bikeway 2000) 6 (NSP) 6 (IVGID) 3.5 (CSP) 2.5 (USFS) 0.5 (CSLT) By June 30, 2007 20 (TRT) 34 as follows: 19 (Phase 2 Bikeway 2000) 10 (IVGID) 5 (USFS) c. Develop the Regional Recreation Plan at the following schedule: By June 30, 1997 1998, prepare draft work program. By June 30, 1998 1999, secure funding and staff commitments. By December 31, 1998 1999, prepare administrative draft plan. By June 30, 1999 2000, prepare administrative draft environmental document. By December 31, 1999 2000, release draft plan and environmental document for public review and comment.</p>	<p>R-1: High-quality Recreation Experience; Additional Access</p>	<p>Unknown</p>	<p>Unknown</p>	<p>Non-attainment</p>

R-1: High-Quality Experience; Additional Access (continued)

		d. By December 31, 1997, TRPA should amend the Goals and Policies and the Code to ensure preservation of existing legal public rights-of-way and easements that provide public access to public recreation areas, including Lake Tahoe.				
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R-1 Monitoring Status

In the past fifteen years, limited consistent surveys of recreation users have been conducted by Tahoe recreation providers to monitor user perception of recreation quality, relative satisfaction levels with facilities and programs, and recreation activities, on a Regional basis. Additional land acquisition for low density recreational use, developed and urban recreation facility improvements, and development of dispersed recreation amenities has been monitored by TRPA in cooperation with appropriate agencies.

R-1 2001 Recommendations

Complete the Shorezone Ordinance Amendments EIS and present to TRPA Governing Board. EIP # 17. April 2004.
Ski areas should encourage increased ridership of ski shuttle buses through an incentive program, and shall be required to employ these measures concurrent with Master Plan implementation. Winter 2003/04
Add appropriate Code language and/or a new section to address subdivision and other development actions that may result in the loss of legal public access. June 2002
Conduct surveys to gain an understanding of recreation users' experiences in Tahoe, and track any negative or positive trends. December 2007
Develop a Regional Recreation Plan. EIP # 511. April 2004.
Conduct necessary research of historical resources that may lend themselves to recreation opportunities. August 2003.
Promote the tourist accommodation bonus unit incentive program as an alternative means for gaining additional public access to the shoreline of Lake Tahoe. December 2007.
TRPA should work with Marinas and Tour boat operators to expand operations, where financially feasible and environmentally sound, to increase access directly to Lake Tahoe. May 2003
Research and develop a program to secure funding annually for facility improvement, maintenance and operation. December 2007.

R-1 2006 Attainment Schedule

- A. Annual user surveys conducted by TRPA in cooperation with the recreation providers, which include questions regarding user satisfaction levels and perceptions of the quality of the outdoor recreation experience. Surveying efforts should occur during the winter and summer recreation seasons.
- B. Additional miles of bicycle and multi-use trails developed between 2001 and 2007 including the following:
 - Paved Bike Trails:
 - Class 1: 38.5 miles
 - Class 2: 32 miles
 - Class 3: 13 miles
 - Multi-use Trails: 25 miles
- C. Develop the Regional Recreation Plan by April 2004.
- D. By June 2002, TRPA should amend the Regional Plan, and evaluate appropriate permit application requirements to ensure preservation of existing legal public rights-of-way and easements, which provide public access to public lands, including Lake Tahoe.
- E. In 2001, 46% of Lake Tahoe's shorezone was in public ownership. Tahoe land management agencies shall attempt to increase this inventory to 50% of the shorezone by 2007.

R-2: Fair Share of Resource Capacity Available to the General Public

Threshold Standards	R-2 Indicator	1996 Interim Targets	Threshold Attainment Status																														
It shall be the policy of the TRPA Governing Body in development of the Regional Plan to establish and insure a fair share of the total Basin capacity for outdoor recreation is available to the general public.	Cumulative accounts of PAOT disposition, when applicable (units). Facility development of non-PAOT projects. Land acquisition for recreation use purposes (acres).	<p>A study of recreational resource allocation and reservation of a fair share of the Region's capacity for additional development for recreation has been completed. Additional capacity presently exists in certain resources for additional development, including outdoor recreation projects. TRPA, in cooperation with public service providers, should establish fair-share estimates of water and sewer resource capacity, by local jurisdiction or public utility district, necessary to implement the recreation projects that are included in the EIP.</p> <p>The following PAOT development targets are recommended to achieve the additional recreation capacity targets:</p> <table border="1"> <thead> <tr> <th></th> <th>Summer Day Use</th> <th>Winter Day Use</th> <th>Overnight</th> </tr> </thead> <tbody> <tr> <td>Estimated Existing Alloc.</td> <td>100</td> <td>900</td> <td>150</td> </tr> <tr> <td>July 1, 2002</td> <td>1,000</td> <td>2,000</td> <td>1,000</td> </tr> <tr> <td>July 1, 2007</td> <td>1,500</td> <td>2,500</td> <td>1,000</td> </tr> <tr> <td>July 1, 2012</td> <td>2,000</td> <td>3,000</td> <td>1,864</td> </tr> <tr> <td>July 1, 2017</td> <td>2,161</td> <td>4,000</td> <td>2,000</td> </tr> <tr> <td>Totals</td> <td>6,761</td> <td>12,400</td> <td>6,114</td> </tr> </tbody> </table>		Summer Day Use	Winter Day Use	Overnight	Estimated Existing Alloc.	100	900	150	July 1, 2002	1,000	2,000	1,000	July 1, 2007	1,500	2,500	1,000	July 1, 2012	2,000	3,000	1,864	July 1, 2017	2,161	4,000	2,000	Totals	6,761	12,400	6,114	1991 Attain Status	1996 Attain Status	2001 Attain Status
				Summer Day Use	Winter Day Use	Overnight																											
Estimated Existing Alloc.	100	900	150																														
July 1, 2002	1,000	2,000	1,000																														
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July 1, 2017	2,161	4,000	2,000																														
Totals	6,761	12,400	6,114																														
R-2 2001 Monitoring Status			Attainment	Attainment	Attainment																												
TRPA is to monitor status of resource capacities through maintenance of cumulative accounts pursuant to Chapter 32. In the past 15 years, additional recreation opportunities have been developed in the region. Most additional opportunities have not been allocated PAOTs due, in large part, to the limited definition of PAOT allocations and lack of resources in the recreation program.																																	
R-2 2001 Recommendations			Attainment	Attainment	Attainment																												
Complete the Shorezone Ordinance Amendments EIS and present to TRPA Governing Board. EIP # 17. April 2004.																																	
Ski areas should encourage increased ridership of ski shuttle buses through an incentive program, and shall be required to employ these measures concurrent with Master Plan implementation. Winter 2003/04																																	
Consider amending Chapter 6 to include an additional finding that ensures resource capacities remain available to meet the recreation goals and policies of the Regional Plan. March 2004																																	
Develop the Regional Recreation Plan by April 2004.																																	
Conduct necessary research of historical resources that may lend themselves to recreation opportunities. August 2003			Attainment	Attainment	Attainment																												
Promote the tourist accommodation bonus unit incentive program as an alternative means for gaining additional public access to the shoreline of Lake Tahoe. December 2007.			Attainment	Attainment	Attainment																												
TRPA should work with Marinas and Tour boat operators to expand operations, where financially feasible and environmentally sound, to increase access directly to Lake Tahoe. May 2003			Attainment	Attainment	Attainment																												
Research and develop a program to secure funding annually for facility improvement, maintenance and operation. December 2007.			Attainment	Attainment	Attainment																												
R-2 2006 Attainment Schedule			Attainment	Attainment	Attainment																												
Additional capacity presently exists in certain resources for additional development, including outdoor recreation projects.			Attainment	Attainment	Attainment																												

III. THRESHOLD STATUS AND EFFECTIVENESS OF MEASURES IN PLACE

A. R-1: QUALITY EXPERIENCE AND ADDITIONAL ACCESS

The R1 indicator is comprised of two non-numeric standards, which are also an indicator of attainment and maintenance. The first standard is to ensure a high-quality recreation experience and the second seeks provisions for additional access to the shorezone of Tahoe Region lakes and other undeveloped areas for low-density (dispersed) recreation. These standards have unitless indicators for threshold status reporting; however, provisions for additional access can be assessed by the additional numeric factors of:

- Linear feet of shoreline
- Miles of paved multi-use trails
- Miles of unpaved multi-use trails
- Acres of public land with dispersed recreation opportunities purchased
- Miles of OHV roads
- Expansion/intensification of the number of existing uses (parking spaces, moorings, picnic tables)
- The number of Interpretation facilities (signage, kiosk, interpretation center) constructed
- Increased mass transit ridership, especially the seasonal trolley service to recreation sites

1. Evaluation Criteria

Threshold-specific evaluative criteria have not been adopted for the Recreation program. The attainment status of the threshold is determined by the performance of various recreation providers in meeting patron expectations, and the success of land acquisition programs as outlined by the indicators in the 1996 Compliance Forms. Additionally, the progress made in realizing the performance standards established by the interim targets in 1996 is also used to discern threshold status.

Interim Targets

The 1996 Threshold Evaluation and this Evaluation (from 1996 to 2001) established five interim targets (accomplishments). The five targets were intended to address: 1) annual surveys; 2) bicycle and hiking trails; 3) development of the Regional Recreation Plan; 4) annual maintenance of facilities; and 5) Regional Plan amendments to address actions resulting in the loss of legal public access. To varying degrees, each target was acted upon; however, completion of these targets has been marginal at best. While completion of the individual tasks may not necessarily equate to threshold attainment, their completion certainly would provide information and/or products that may cumulatively lead to threshold attainment.

2. Measurement and Monitoring

Due to the inherent qualitative nature of the recreation thresholds, coupled with non-numeric indicators and the absence of quantifiable standards, the recreation threshold lends itself to very limited measurement to gauge its status.

Recreation Advisory Group

In an effort to gain the recreation providers perspective, TRPA staff initiated the formation of the Recreation Advisory Group (RAG) to assist in the 2001 Threshold Evaluation process. Public and private recreation providers were represented in addition to other supporting entities, such as consulting firms and the California Tahoe Conservancy (see Section VII for a list of RAG members). The Group began monthly meetings in October 1999, and developed a work program directing efforts to effectively evaluate the conditions of the Recreation Threshold. Guest speakers attended meetings, various elements of the Regional Plan were critiqued, members submitted recreation related information, as well as general participation in numerous group discussions.

The RAG work program had seven components. First and foremost, the three Recreation types were reviewed, discussed and fully debated as to how to best evaluate the standards, in addition to the best means of implementing programs and/or projects for threshold attainment. Given that the Recreation standards do not possess numeric indicators of attainment, other indicators, i.e., 'additional factors' were developed in an effort to evaluate the thresholds. Progress on the 1996 recommendations was reported, and a conceptual outline of the Regional Recreation Master Plan was developed. With RAG's guidance, an Americorp EIP Implementation Technician completed the 2001 Recreation Facility Inventory updating the efforts of 1996. The last element of the RAG work program, which was not fully crafted, is the development of an effective strategy to gain greater recognition of the Recreation Threshold within the region 's land management agencies, as well as the public. This evaluation is a first step in that direction.

Recreation User Survey

TRPA has monitored the quality of the recreation experience via recreation user perception surveys during the summer seasons of 1999 and 2000. While this is useful information, surveying needs to occur annually, including the winter recreation season, so as to identify positive and negative trends over time, instead of five-year intervals.

The surveying efforts produced a profile of recreation use in the Lake Tahoe Region including, but not limited to, activity patterns, frequencies, perceptions of and preferences for recreation in the region .

Focus Group Study

A Focus Group study of select respondents was designed to provide qualitative insight into a range of recreation planning issues including, but not limited to, resource and habitat restoration, and related impacts on user perceptions.

Focus Group sessions were conducted among a sample of Regional residents with one session conducted in the south shore community of South Lake Tahoe and

one session conducted in the north shore community of Kings Beach. Focus Group participants were recruited by *Opinions Research of Sacramento*, with a screening questionnaire targeting a range of recreation activities among selected respondents. A written guide was utilized to conduct the session, ensuring a spontaneous yet directed discussion of the issues.

Recreation Facility Inventory

TRPA partially tracked additional recreation access via an extensive inventory of recreation facilities, coupled with additional research that has produced various statistical data regarding trail construction, recreation site visitation numbers, etc.

The intent of the inventory effort was twofold. One, the updated inventory enabled TRPA to determine facility expansion and development of the past five years. Second, the facility attributes will, in the future, be entered into TRPA's GIS, beginning the long-term effort of gaining geographic data for future recreation studies.

While many types of activities (uses) are available at the identified recreation sites, this inventory focuses on the improved attributes of the sites. An exhaustive list of potential recreation activities and opportunities may be accomplished in the future; however, the USFS Recreation Opportunity Spectrum can provide much of this information when the levels of facility improvements are identified.

For management and conceptual convenience, possible mixes or combinations of activities, settings, and probable experience opportunities have been arranged along a continuum, or the Recreation Opportunity Spectrum, which is divided into six classes. The six classes and the accompanying class names have been selected and conventionalized because of their descriptiveness and utility in Land and Resource Management Planning and other management applications. Each class is defined in terms of its combination of activity, setting, and experience opportunities.

3. Results of Measurement and Monitoring Efforts

Recreation Rating Comparison

This section compares the importance of identified recreation attributes with the perceived Lake Tahoe recreation experience. The analysis provides a view of any "gaps" between attribute importance and the reported experience. In other words, how does Lake Tahoe perform with respect to recreation user expectations? The value of this data for policy makers is a relative priority ranking among the listed attributes.

In Figures 10-1 and 10-2, importance ratings are presented as mean scores and then compared to mean scores for the respondent's experience at Lake Tahoe. Means are used in the section because they include all responses, both positive and negative. For purposes of the graphs, an inverse average of responses on the questionnaire 1 to 5 scale is used, so the higher the mean the more positive the score. In addition, the middle point of the rating scale (3) is shown – "neutral" for importance, "average" for experience ratings – against which mean ratings can be referenced.

Finally, note that the rating system provides relative rules of thumb by which gaps can be viewed:

- Attributes with an experience mean 1.0 or more below importance are the region's most problematic
- A negative gap of .5 to 1.0 signals emerging problems
- Gaps from .25 to .5 are of moderate concern
- Gaps of .25 or less show that attributes nearly met user expectations
- No gap or a positive difference between scores indicates exceeded expectations

All gaps should be viewed in the context of the average – how does the region perform on important versus unimportant recreation attributes.

Recreation Conditions – Lake Tahoe

The most highly rated recreation experiences at Lake Tahoe are the quality of the region's beaches, wherein 74 percent of the respondents rated beach quality as a "4" or "5", on a five point scale; the attitude of staff at parks and recreation area (73%); and security (71%). A second cluster of attributes with majority ratings included the quality of day use areas and campgrounds (61% and 60%) and the cost or value of recreation (59%). Of special note, only a minority of respondents rated crowding (25%) and traffic (18%) as positive.

Overall, expectations for the listed condition attributes are very high, with seven out of nine attributes receiving higher than a neutral/average importance scores. Policy makers should keep this finding in mind when assessing recreation quality issues. Whether due to the increasing level of quality at competing recreation destinations or a rise in recreation user expectations in general, those who recreate in the region expect an exemplary experience with regard to conditions.

As indicated in Figure 10-1, Lake Tahoe scores are most problematic for some of the most important recreation issues. Of particular concern are levels of crowding and traffic congestion, not necessarily news for the region but certainly emphatically presented here. These attributes necessarily require a combined effort in the region as a whole, and may not be dramatically influenced by any individual resource management agency.

Though expectations are especially high, the quality of the beaches at Tahoe scores well. When addressing beach quality, policy makers may also refer to the associated ratings of recreation site maintenance. The operations and maintenance issue clearly needs attention. The perceived maintenance levels at recreation sites were below average and markedly below expectations for recreation destinations overall.

Security is regarded as about average at Lake Tahoe but falls below expectations. This gap may, in part, be due to concerns carried to the destination by an urban visitor or by a relatively low profile presence by local law enforcement and security personnel. Likewise, experiences with the attitude of staff at recreation sites is rated as about average though somewhat below respondents' rating of importance.

The cost of the region 's recreation experience is rated below average and somewhat below expectations. Of course, these perceptions should be considered in light of respondents' place of residency – in other words, those from high cost of living areas (such as the San Francisco Bay area) may have different and, perhaps, lower expectations than those from moderate cost of living areas.

Camping quality and, to a lesser extent, day use quality, rated somewhat below the average in terms of experience, but are nonetheless attributes for which the Lake Tahoe Region generally meets expectations. Note that if crowding or maintenance issues improve we might expect that perceived quality of day use and camping areas would exceed both an average experience rating and respondents' expectations.

Recreation Facilities – Lake Tahoe

Access to forest areas is the most positive element of the Lake Tahoe recreation experience, with 83 percent of the survey's respondents giving forest access a "4" or "5" rating, (see Figure 10-2.) Respondents' experiences with the region's trails system were also highly rated (unpaved 74% and paved 74%). A second tier of experiences also received a majority of responses including beach access (67%), town pedestrian areas (66%), nature and wildlife viewing areas (61%) and the availability of day use areas (58%). Somewhat fewer than half rated the region as positive for cultural offerings (attractions and events, each 49%). However, experience of campground availability, signage, disabled access, and education and interpretive programs did not receive majority responses for having high levels of quality.

As shown in Figure 10-2, respondents showed a higher level of satisfaction with their experience at the region 's recreation facilities. First, in contrast with conditions, only three facility attributes receive higher than average importance scores. Secondly, gaps in performance are obvious for only a minority of the 16 identified facility attributes. Unfortunately, the gaps in performance do occur among the more important attributes.

Lake Tahoe facility scores are most problematic for access issues. Both beach and forest access are the most important recreation factors and additionally show gaps with regards to the recreation experience. This is particularly so for beach access where the region performs below expectations (see Figure 10-2). Forest access, was less problematic showing a slight gap and an above average experience. These findings, especially for beaches, may reflect the often-mentioned conditions of traffic and crowding.

Figure 10-1. Recreation Conditions – Importance vs. Experience

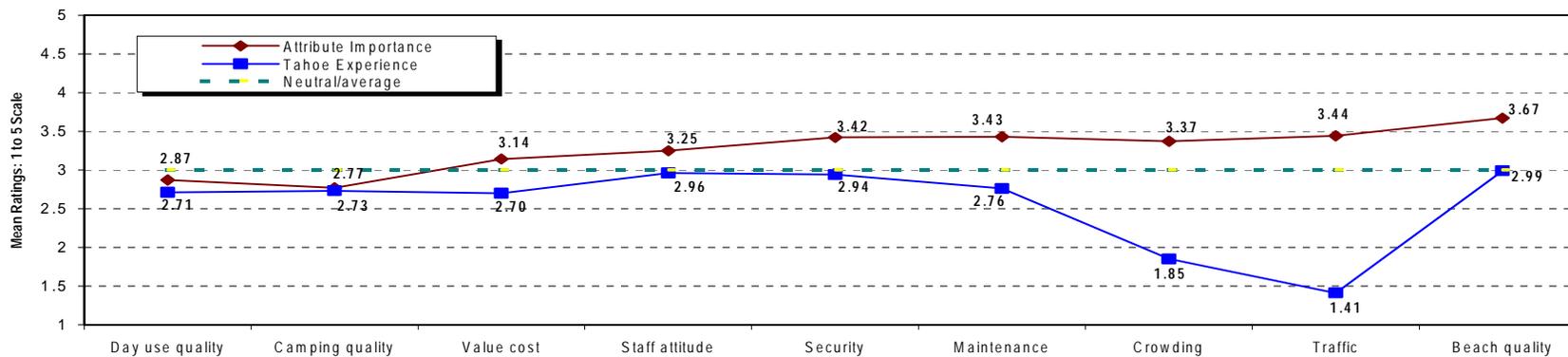
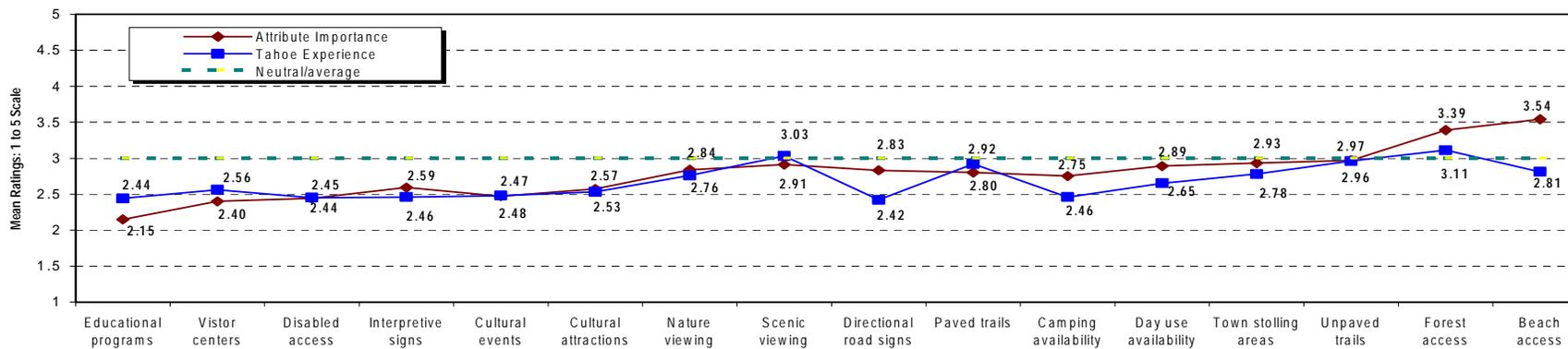


Figure 10-2. Recreation Facilities – Importance vs. Experience



Another category of concern was the availability of day use and camping areas, which is also probably linked to crowding. Interestingly, directional signage was a problem area that may contribute to real or perceived traffic issues, since lost drivers certainly slow the flow of movement. The TRPA adopted the Lake Tahoe Recreation Sign Guidelines in January 2001, which is a positive step toward improving this issue.

Unpaved trails show virtually no gap in performance and, combined with paved trail scores, the overall experience on the region's trail systems was well regarded. Planned expansion of the Lakeside trail system may additionally improve user perceptions. In addition, the pedestrian environment in the region's town sites was very close to meeting expectations. Though no comparative data is available for recreation experiences in town settings prior to the recent and continuing improvements in Tahoe City, the City of South Lake Tahoe and other locations, it is expected that this would be an improving issue. In addition, the region met or exceeded expectations for scenic and nature viewing opportunities.

The remaining facilities attributes show a very close relationship between expectations and performance, though some slight gaps in either positive or negative directions exist. These are somewhat lower priority areas and include cultural attractions and events, interpretive signage and education programs, visitor centers, and access for disabled persons.

Recreation Visitation

While not all recreation areas are owned and operated by the USFS and the two State Park departments, their visitation levels are indicative of the overall visitation to the Tahoe Region. As shown in Table 10-1, visitation at USFS facilities has hovered around 3,000,000 visitor days a year for the past five years, while Nevada and California state parks have seen slightly more fluctuation between roughly 700,000 and 1,000,000 visitors annually. It is important to note that each recreation provider tracks these numbers differently. The USFS visitation numbers are expressed in terms of recreation visitor days (RVD), which are quantifications of 12 hours per activity, e.g., one person may participate in the same activity for 12 hours, or 12 people may participate in the same activity for one hour. The Nevada State Parks department tracks visitation numbers by counting cars parked at various facilities and adding a multiplier for people per car depending upon the facility (different facilities see different automotive occupancy); California State Parks have a similar process to track visitation.

Table 10-1. Recreation Visitation at Lake Tahoe			
Year	USFS ⁽¹⁾	California State Parks ⁽²⁾	Nevada State Parks ⁽²⁾
1995	2,882,200	671,277	960,157
1996	2,998,500	903,034	885,902
1997	2,947,350	802,397	892,805
1998	3,151,450	713,037	752,693
1999	3,002,500	908,958	918,300
2000	3,005,100	885,147	1,072,858
⁽¹⁾ Numbers represent Recreation Visitor Days (RVD) ⁽²⁾ Numbers represent the number of vehicles parked at a facility with a multiplier of people per vehicle added to the total, depending upon the type of facility (i.e., different types of facilities use different multipliers).			

Recreation Facility Inventory

The 2000 Lake Tahoe Region Recreation Facility Inventory included 160 of the Basin's recreation facilities. This inventory attempted to capture all of the recreation facilities within the region. All of the facilities that were inventoried are public recreation facilities, with the exception of Glenbrook Golf Course, which is a private course. Approximately 31 percent of the facilities included in the inventory are operated by state or federal agencies, local governments operate 44 percent, and 25 percent of the facilities are privately operated. Keep in mind that these percentages represent the breakdown of the number of facilities, but are not indicative of facility size, individually or cumulatively. A large majority of the land in the Tahoe Region is owned by the USFS and undeveloped (i.e., there are no recreation facilities on the land), affording numerous dispersed recreation opportunities.

One out of the 160 facilities inventoried has been constructed since the 1996 inventory. However, 30 of the facilities have attributes that are new or altered since the last evaluation. Over the past few years the USFS has concentrated on upgrading/modernizing and rehabilitating their facilities rather than constructing new facilities. There are also 27 locations with plans for future facility or capacity expansion. Figure 10-3 shows nine general recreation categories and the number of facilities that fall into each category. There are approximately 20 recreation facilities such as trailheads, resorts, snow play areas and visitor centers, which did not fit into any of these categories and are not represented. The 22 campground facilities found in the Basin account for roughly 2,332 improved camping sites in the Tahoe Region (improved sites refers to sites with tables, fire-pits, parking areas, BBQs, etc.). As presented in Figure 10-3, there are more public beach facilities than any other type of recreation facility in the region. In relation to the threshold's direction for additional access to the shorezone and undeveloped areas for low-density recreational uses, only three of the public beach areas included in this inventory (owned by California State Parks) are completely undeveloped with no trailhead, signage, parking, etc.

Each of the facilities in this inventory offers different recreational opportunities. Figure 10-4 shows the number of facilities included in the inventory that offer access to recreational opportunities such as trails, shoreline, public transit, day use areas, camping areas, and vistas. The recreational opportunities available at each facility are dependant on the time of year that the facility is open. 58 of the facilities inventoried are open during the summer only, 100 of the facilities are open year round, and two of them are winter-only facilities.

The results of the Recreation Facility Inventory alone do not provide a lot of information regarding the status of the Recreation Threshold. One can conclude, from the results of the inventory that in the last five years there has been no major growth in the overall number of recreational facilities in the Tahoe Region. However, many facilities have expanded their available recreational opportunities with facility upgrades and programs (interpretive and educational).

Figure 10-3. Recreation Facility Types

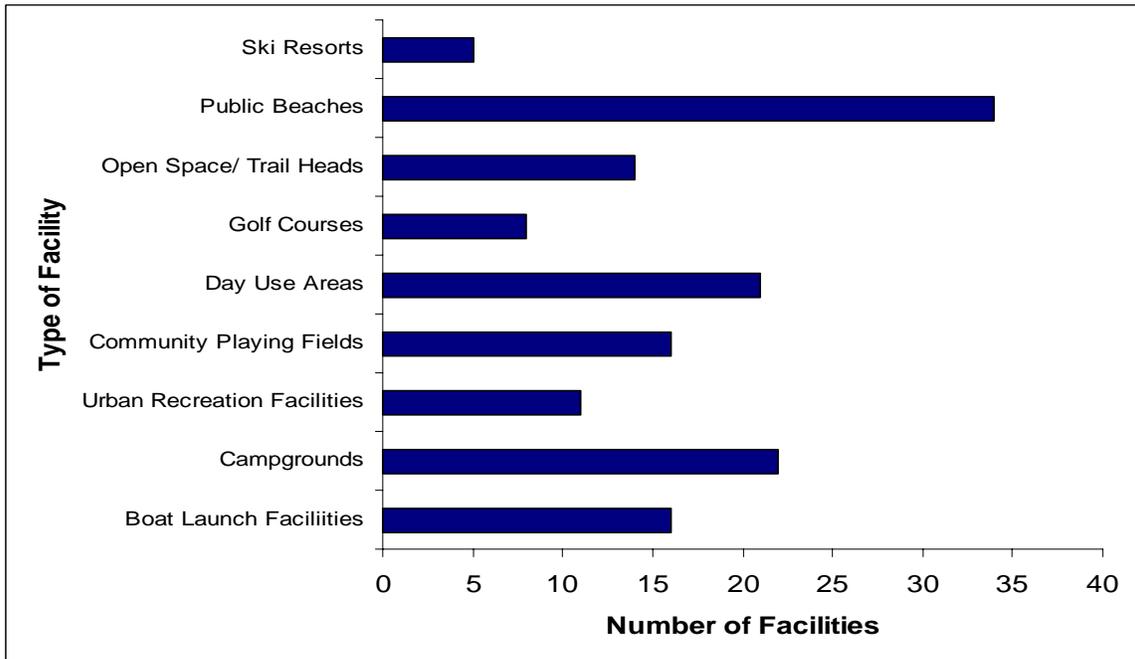
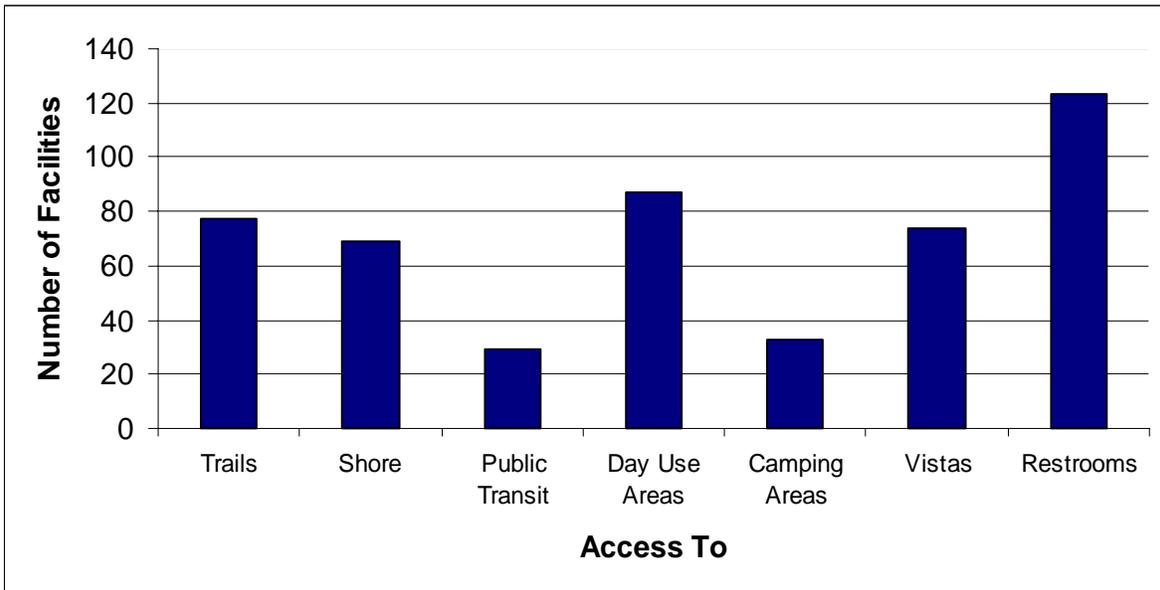


Figure 10-4. Recreation Facilities Providing Access



Bike Trails

In addition to providing numerous air quality and transportation benefits, the paved bicycle trail network of the Basin also provides numerous recreation benefits as well. Not only is riding on the trail itself a recreation activity, but is also a means to gain access to other recreation sites such as beaches, scenic vistas, visitor centers and other urban amenities. Bike paths are classified by three categories. Class 1 trails are paved trails that are separate from any road, typically between eight and twelve feet in width. Class 2 trails are trails that are immediately adjacent to roads, and are separated by the fog-stripe and signs that designate the lane for bicycles; they are typically four feet in width. Class 3 trails are usually found on small residential collector roads, wherein there is no stripe for a dedicated lane; instead bicyclists share the road with automobiles. These bike trails are indicated by signage, primarily for directional purposes, but also to make motorists aware of potential cyclists on the roadway. Table 10-2 gives the status of existing and proposed trails in the region, broken down by class.

Class	Miles	Status
1	33.5	Existing
1	51	Proposed
2	30	Existing
2	41	Proposed
3	12	Existing
3	13	Proposed

Hiking/Biking/Equestrian Trails

In addition to the bike trail network, there is an extensive hiking trail network in the region (multi-use, unpaved trails). Issues facing these unpaved trails, which need to be addressed, are minimizing user conflicts and controlling 'way-trail' creation. These are not mutually exclusive issues; some way-trails have been created due to user conflicts, although residents seeking the quickest route to another trail or recreation destination have also created the large majority. Currently, there are approximately 425 miles of officially recognized unpaved trails supported by trailheads. There are far more way-trails which are not actively managed and are created seasonally.

The U.S. Forest Service-Lake Tahoe Basin Management Unit (LTBMU) is currently completing its third year of inventorying their official trail and road network in addition to the user created way-trails. The Forest Service is moving toward producing a trail access management plan for the Basin's National Forest Lands. Public participation in this process will be very important for its success.

The Tahoe Rim Trail (TRT) has seen a dramatic increase in mountain bike use over the past five years. About 90 percent of TRT's use is by hikers and bikers (45% hikers, 45% bikers), while only 10 percent are equestrian users. The majority of day-use on the trails occurs within two or three miles of trailheads; the TRT is also beginning to see an increase in backpackers and the associated overnight use.

User conflicts were initially a major concern on the Tahoe Rim Trail. However, through public education, user group workshops and trail signs, in addition to an even/odd day user rotation cycle (all users on even days of the month, hikers and equestrians only on odd days of the month), conflicts have decreased on the TRT.

As has been discussed before, maintenance and operation funds are the main limiting resource for TRT construction, as capital funds are more readily available for trail construction, signage and trailhead development.

Historical Resources

Visitation to historical sites and museums has been growing steadily over the past ten years in Tahoe as well as the entire nation. Tahoe is not typically considered as a place for these types of passive activities; however, as more baby-boomers move into their retirement years, these locations will be sought out even more. Additionally, and corollary to visitors desire for 'urban strolling/shopping' areas, Tahoe is losing some of the older, more traditionally resort-oriented developed areas around the Lake that were constructed during the 1940's and 50's as the post-World War II recreation movement was at its peak.

Historical structures, resorts and sites, coupled with interpretive programs and tours, will become more important in the future as these types of recreation resources are sought after. They also add to the already diverse array of recreation opportunities at Tahoe.

4. Trends

TRPA has been unable to sufficiently track information to definitively report significant trends relative to the recreation threshold, either positive or negative. However, there are certain trends that have been empirically recorded and reported to the TRPA via the Recreation Advisory Group as well as numerous conversations with other recreation providers. These include:

- Demographics of Basin visitors has been shifting toward more minority populations
- Day-trip visitation continues to dominate visitation duration
 - When visitors do stay overnight, nearly 48 percent stay 3 to 6 nights
- Rising in popularity along with the aging demographics of the nation, recreational vehicle camping instead of classic tent camping, is becoming the preferred 'camping' experience
 - The aging recreationist is also seeking more passive activities, such as cultural/historical exhibits and museums
- Nationwide, destination resorts are offering the full gamut of recreation opportunities, while still providing urban amenities
 - Seasonal resorts (ski resorts) are shifting to four season activities instead of one season of operation/activity

5. Threshold Attainment Status

Given the results of the recreation user perception surveys, the first part of the R1 indicator (high-quality recreation experience) generally appears to be in attainment for the majority of attributes that contribute to a high-quality recreation experience. Other attributes, mostly beyond the purview of recreation providers, are detracting from the quality of the recreation experience.

The results of the Recreation Facility Inventory, in addition to other research, indicates that public access to the shorezone and other undeveloped areas for dispersed recreation also appears to be in attainment.

However, due to the inability of TRPA to successfully acquire the appropriate resources to conduct the required research and planning, as outlined in the interim targets of the 1996 Compliance Forms, the R-1 threshold attainment status is non-attainment.

6. Effectiveness of Measures in Place

Compliance measures are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region or to promote attainment or maintenance of any threshold or standard. In the case of recreation, these measures would be aimed at ensuring a quality recreation experience, and taking advantage of the opportunities for additional access to quality undeveloped lands for low density recreation activities.

Supplemental measures are compliance measures that are not being implemented at a given time, but that TRPA may employ to attain or maintain a threshold or standard at a later date.

Refer to Table 10-4 for a complete evaluation of the effectiveness of each compliance measure.

Category: recreation
Parameter: high quality recreational experience; additional access to undeveloped lands.

1. STANDARD: It shall be the policy of the TRPA Governing Body in development of the Regional Plan to preserve and enhance the high quality recreational experience, including preservation of high quality undeveloped shorezone and other natural areas. In developing the Regional Plan, the staff and Governing Body shall consider provisions for additional access, where lawful and feasible to the shorezone and high quality undeveloped areas for low density recreational use.
2. INDICATOR (UNITS): ~~Perceptions~~ Experience of recreation users regarding the quality of recreation experiences as recorded in ~~opinion~~ surveys of TRPA and recreation providers by comparing the importance of identified recreation attributes (facilities and conditions) with the perceived Lake Tahoe Experience (unitless).
 Additional access to the Lake and other natural features by the general public (including urban areas and edges), via land acquisition programs, additional trailheads and supporting amenities, additional trails, and additional bicycle trail segments. ~~The provision of recreation facilities which are maintained in a state of good repair or are rehabilitated to improve their condition. Assessments of damage caused by overuse of recreation resources prepared by recreation providers. See interim targets for quantities.~~
3. MONITORING SUMMARY: In the past ~~five~~ fifteen years, limited consistent surveys of recreation users have been conducted by Tahoe recreation providers to monitor user perception of recreation quality, relative satisfaction levels with facilities and programs, and recreation activities, on a Regional basis. Additional land acquisition and preservation of undeveloped land for low density recreational use, developed and urban recreation facility improvements, and development of dispersed recreation amenities has been ~~will be~~ monitored by TRPA in cooperation with appropriate agencies ~~and other land conservancies.~~

4. ATTAINMENT STATUS: ~~Not known.~~ Non-attainment. At this time, the Region is believed to attain both portions of the threshold, however, ~~based on the limited data presently available, its status is not certain.~~ given that the interim targets from 1996 for the R1 threshold were not completely realized within the past five years, the status is non-attainment.

5. TARGET DATE: 2006

6. EVALUATION INTERVAL: Five years

7. INTERIM TARGETS:

- a. Annual user surveys conducted by TRPA in cooperation with the recreation providers ~~listed below~~ which include questions regarding user satisfaction levels and perceptions of the quality of the outdoor recreation experience. Surveying efforts should occur during the winter and summer recreation seasons. Annual surveys, which address user satisfaction, should be administered by at least two of the following providers on a rotating basis: Forest Service, California State Parks, Nevada Division of State Parks, TCPUD, NTPUD, IVGID, Douglas County, and the City of South Lake Tahoe. TRPA should fund and compile the portions of the surveys which provide threshold-related data.
- b. Additional miles of bicycle and hiking multi-use trails developed between 2001 and 2007 including the following:

Miles of Hiking Trails	Miles of Bicycle Trails
-----------------------------------	------------------------------------

By June 30, 2002	21.5 as follows:	64 as follows:
	12 (TRT)	55 (Phase 1 Bikeway 2000)
	6 (NSP)	6 (IVGID)
	3.5 (CSP)	2.5 (USFS)
		0.5 (CSLT)

By June 30, 2007	20 (TRT)	34 as follows:
		19 (Phase 2 Bikeway 2000)
		10 (IVGID)
		5 (USFS)

<u>Paved Bike Trails</u>	
Class 1:	<u>38.5 miles</u>
Class 2:	<u>32 miles</u>
Class 3:	<u>13 miles</u>

<u>Multi-use Trails</u>	<u>25 miles</u>
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- c. Develop the Regional Recreation Plan at the following schedule:

- ~~By June 30, 1997-1998, prepare draft work program.~~
~~By June 30, 1998-1999, secure funding and staff commitments.~~
~~By December 31, 1998-1999, prepare administrative draft plan.~~
~~By June 30, 1999-2000, prepare administrative draft environmental document.~~
~~By December 31, 1999-2000, release draft plan and environmental document for public review and comment.~~
April 2003: New R1, R2 Threshold
November 2003: Regional Capacity Estimates
January 2004: New R3 Threshold
April 2004: Complete Master Plan
- d. ~~Annual maintenance and, where needed, rehabilitation of existing recreation facilities and resources. Not all facilities can be fully maintained or rehabilitated each year, however, all facilities should receive maintenance or rehabilitation (where needed) at least once every five years, or as based on the expected life of the structure or facility. Resources damaged by overuse should be restored where possible. Use of restored damaged resources may be subject to capacity and use controls.~~
- de. ~~By December 31, 1997, June 2002,~~ TRPA should amend the ~~Goals and Policies and the Code~~ Regional Plan, and evaluate appropriate permit application requirements to ensure preservation of existing legal public rights-of-way and easements which provide public access to public ~~lands~~recreation areas, including Lake Tahoe.
- e. In 2001, 46% of Lake Tahoe's shoreline was in public ownership. Tahoe land management agencies shall attempt to increase this inventory to 50% of the shoreline by 2007.
8. COMPLIANCE MEASURES: ~~(See Section II for inventory)~~
- a. MEASURES IN PLACE: RECREATION ~~-01 through 15-16 inclusive, including measures of other agencies and recreation providers described in 7 above.~~ Compliance Measures in place for the recreation resources include: 8, 13, 16, 36, 40, 41, 42, 62, 63, 65, 68, 71, 72, 91, 92, 152, 175, 177, 178, 191, 192, 193, 194, 198, 199, 200, 201, 203, 204, 205.
- b. EFFECTIVENESS OF MEASURES IN PLACE: ~~The existing control measures in place are moderately effective in attaining and maintaining the threshold.~~ Refer to Table 10-4 of the Recreation Chapter for a complete evaluation of each Compliance Measure.
- c. SUPPLEMENTAL MEASURES: The following Supplemental Compliance measures should be implemented by TRPA to enhance threshold attainment and maintenance: ~~RECREATION -01, and 02 and 03~~ 107, 108, 206, 207, 208, 209.
- d. ~~EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Supplemental measures are generally expected to be highly effective to enhance threshold attainment and maintenance.~~
9. ADEQUACY OF COMPLIANCE MEASURES: The adequacy of existing compliance measures in place, ~~combined with implementing the recommended revisions to them~~ and implementing the supplemental measures, is expected to attain and maintain the threshold, provided that adequate funding and other resources can be obtained to support staff and the measures in place and supplemental measures. See Table 10-4 for specific information regarding each measure.

B. R-2: FAIR SHARE OF RESOURCE CAPACITY

The R2 indicator partially possesses numeric standards for threshold attainment in terms of PAOT disposition. However, values for other resources necessary for implementation of the threshold have not been quantified. Previous research was unable to recommend quantifiable indicators for water and sewer demand, in addition to land coverage, VMT and air and water quality capacity reserves. Therefore, in terms of PAOT disposition, the threshold status can be determined, but the reserved capacity status for the remaining quantifiable resource limitations is unknown.

When considering threshold attainment in terms of overall facility development, regardless of PAOT assignments, the status of the R2 indicator is much brighter than if only PAOT disposition was considered.

1. Evaluation Criteria

Threshold-specific evaluative criteria have not been adopted for the Recreation program. The attainment status of the threshold is determined by the ability of recreation providers to develop needed recreation facilities as outlined by the EIP, and the indicators in the 1996 Compliance Forms. Additionally, the progress made in realizing the performance standards established by the interim targets in 1996 is also used to discern threshold status. Status of the threshold is partially determined by the disposition of PAOTs and quantification of reserved resource capacity for recreation facility development.

Interim Targets

The 1996 Compliance Forms established two interim targets for the R-2 threshold. One was for PAOT disposition, and the second was establishing fair-share estimates of water and sewer resource capacity, necessary to complete the recreation portion of the Environmental Improvement Program. The status of these targets is discussed below.

2. Measurement and Monitoring

Tracking the disposition of PAOTs has not been adequately accomplished over the life of the Regional Plan. Research concludes that the R2 indicator, as assessed by PAOT allocations, is behind the attainment schedule established in 1996.

Despite prior reports, TRPA has not tracked PAOT allocations via TEGIS (Tahoe Environmental Geographic Information System). In an effort to clarify how many PAOTs have actually been assigned to projects since the inception of the Regional Plan, staff undertook the task of reviewing project files for potential PAOT-allocated projects during the past 15 years. To minimize the scale of this undertaking, assumptions were made in an effort to efficiently report total PAOTs assigned. At each step in the process assumptions were necessary, (five steps with a corresponding cumulative five assumptions). However, the numbers accounted here are more reliable than in past reports. Refer to Table 10-3 for the status of permitted and available PAOTs.

3. Results of Measurement and Monitoring Efforts

Beyond the inherent limitations of the PAOT capacity limitation system, the Recreation Advisory Group did not believe that PAOT allocations are an effective way to ensure outdoor recreation facility development or, ensuring that available resource capacity is reserved for future recreation facility development. Historically, water, sewer treatment capacity and VMT absorption were thought to be the limiting factors in recreation facility development. While these are still of concern, the main obstacle to realizing facility development is capital funding and suitable land (high capability and minimal resource conflicts) for facility construction. Neither of these impediments have a direct correlation to PAOTs. Moreover, operation and maintenance costs have restricted the ability of recreation providers to gain already constrained capital improvement funding sources.

PAOT Type	Summer Day Use	Summer Day Use Pool ⁽¹⁾	Winter Day Use	Overnight Use	Overnight Use Pool ⁽²⁾
Regional Plan PAOT Allocations	4,761	2,000	12,400	5,114	1000
PAOTs Assigned	20	20	5,426	32	92
PAOTs Remaining	4,741	1,980	6,974	5,082	908
Notes:					
⁽¹⁾ 2,000 of the summer day-use PAOT pool shall be reserved for expansion of marinas and boat launching facilities.					
⁽²⁾ 1,000 of the overnight PAOT pool may be allocated to uses that are located in areas where there are no PAOTs specified in the plan area statement or the amounts specified are insufficient for the proposed use.					

Publicly Owned Shoreline

In 1971, approximately 13.5 of the 75 miles of shoreline were publicly owned. By 2001, approximately 34.76 miles (46.2%) of Lake Tahoe's shoreline is in public ownership, a 28 percent increase since 1971 (source: TRPA GIS, April 2001). While a substantial amount of this property is not developed for recreation activities, virtually all of the publicly owned shoreline is available for dispersed recreation activities.

In addition to other public agency land acquisition programs, the California Tahoe Conservancy (CTC) has aggressively pursued the purchase of property within the California portion of the Tahoe Region. Since the beginning of their acquisition program in 1985, the CTC has purchased 6,130 acres. While not all of this land is located on the lakefront and many parcels are found within residential neighborhoods, a large majority of this land is open to the public for dispersed recreation opportunities. Many of the urban lots maintain access routes into other publicly held lands. Moreover, nearly 9,000 linear feet of shoreline property is included in these purchases (source: personal communication with Ray Lacey, Program Coordinator for the Recreation and Access Program, CTC).

Non-PAOT Allocated Projects

There are many projects that have been developed or are currently in the planning phase which do not require PAOT assignments. The large majority of these projects do not fall within the definition of, or are not owned/operated by, a qualifying public agency for PAOT allocations.

The Kahle Community Center (Douglas County) and ball fields are an excellent example of an urban recreation facility development realized in the past few years, which did not require PAOTs. The BMX (bicycle motor-cross) track (City of South Lake Tahoe) is another good example of urban type of recreation, serving local residents, which does not require PAOTs. The City also plans to have a Community Ice Rink open to the public in January 2002, another non-PAOT allocated project.

The community of Tahoe City (TCPUD), with financial assistance from the CTC, has been working on a redevelopment plan for Commons Beach in Tahoe City, scheduled for implementation in the near future. The CTC is also intimately involved in linking the existing pieces of bike trails throughout the California portion of the Basin.

While much less glamorous than facility construction, all recreation providers are involved in maintenance and upgrades of existing facilities. It has been observed that the lack of funds limits these types of activities, and is negatively influencing facility construction. This is still true; however, providers are doing everything within their means to address the operation and maintenance issues of the facilities currently built, and are actively seeking alternative means for funding these activities. It should be noted that efficiently operated and well maintained facilities assist meeting all of the recreation threshold standards.

4. Trends

TRPA has been unable to sufficiently track information to definitively report significant trends relative to the recreation threshold, either positive or negative. However, there are certain trends that have been empirically recorded and reported to the TRPA via the Recreation Advisory Group as well as numerous conversations with other recreation providers. These include:

- Increased mountain bike use on unpaved trails
 - Subsequent proliferation of 'way-trails' in-part due to trail user conflicts
 - Mountain bike user groups continue to diversify (demographics)
- Lack of O&M funds to gain capital improvement funding
- Ski resorts continue to upgrade facilities and programs
 - Annual skier counts have increased 15 percent since the early 1990's

5. Threshold Attainment Status

R2: Fair Share of Resource Capacity

Staff research has accounted for the disposition of PAOTs from 1987 to the present (see Table 10-3.) The interim targets for PAOT allocations in the 1996 Evaluation have not been realized. Moreover, the PAOTs will not be dispersed by

the 2007 Regional Plan termination, nor by the target date for complete disposition of 2017 as established by the 1996 Evaluation. Additionally, there has been little in the way of facility expansion or creation from the main public recreation providers in the past five years, and opportunities to allocate PAOTs to private vendors that provide public recreation opportunities have been neglected due to the limited definition of recreation providers and uses that are eligible to receive PAOTs.

Given that R-2 indicator's attainment status is partially measured by PAOT allocations, and the necessary reserved capacity of resources for the development of recreation facilities is unknown, the R2 indicator would not appear to be in attainment. Moreover, there is a fair amount of concern that the limiting resource for facility development is funding and not necessarily natural or municipal resources, such as, land coverage and sewer/water capacity. If other facility developments (non-PAOT assigned projects) were considered, and maintenance and rehabilitation efforts recognized, it could be reported that the R2 indicator is in attainment. Therefore, facility development is not limited by resource constraints and there are inherent limitations to the PAOT capacity system. Despite these issues the R2 threshold is in attainment.

6. Effectiveness of Measures in Place

Compliance measures are programs, regulations or other measures such as capital improvements, operational improvements, or controls on additional development to reduce, avoid, or remedy an environmental impact of activities within the Tahoe Region or to promote attainment or maintenance of any threshold or standard. In the case of recreation, these measures would be aimed at ensuring a quality recreation experience, additional access to recreation lands and ensuring that adequate resources are available for public recreation facility construction.

Supplemental measures are compliance measures that are not being implemented at a given time, but that TRPA may employ to attain or maintain a threshold or standard at a later date.

Category: recreation
Parameter: outdoor recreation capacity available to the general public.

1. STANDARD: It shall be the policy of the TRPA Governing Body in development of the Regional Plan to establish and insure a fair share of the total Basin capacity for outdoor recreation is available to the general public.
2. INDICATOR (UNITS): ~~Public recreation capacity including urban recreation (design capacity and PAOTs, where applicable). Resource capacity usage by public and private recreation uses contained in the Recreation Resource Allocation and Capacity Study, and in the cumulative accounts maintained by TRPA.~~ Cumulative accounts of PAOT disposition, when applicable (units)
Facility development of non-PAOT projects.
Land acquisition for recreation use purposes (acres).
3. MONITORING SUMMARY: ~~TRPA monitors recreation capacity, including the distribution and use of PAOT capacities, through its parcel database, annual updates of the TRPA Five-Year Recreation List and implementation of other recreation master plans.~~ TRPA is to monitor the status of resource capacities through maintenance of cumulative accounts pursuant to Chapter 32. In the past ~~fifteen~~ five years, ~~substantial~~ additional recreation opportunities have been developed in the Region. Most of the additional opportunities, however, have not been ~~accurately tracked by TRPA-allocated PAOTs~~ due, in large part, to the limited definition of PAOT allocations and a lack of resources in the recreation program.
4. ATTAINMENT STATUS: Attainment. Most of the additional recreation capacity which has been added in the last five years is available to the general public. Additional PAOTs, however, have not been allocated at a rate which will insure threshold attainment by July 1, 2007.
5. TARGET DATE: Not applicable
6. EVALUATION INTERVAL: Five years

7. INTERIM TARGETS: Due to this threshold being determined to be in attainment, there is no need for interim targets. ~~A study of recreational resource allocation and reservation of a fair share of the Region's capacity for additional development for recreation has been completed. Additional capacity presently exists in certain resources for additional development, including outdoor recreation projects. TRPA, in cooperation with public service providers, should establish fair share estimates of water and sewer resource capacity, by local jurisdiction or public utility district, necessary to implement the recreation projects which are included in the EIP.~~

The following PAOT development targets are recommended to achieve the additional recreation capacity targets:

	Summer Day Use	Winter Day Use	Overnight
Estimated Existing Alloc.	100	900	150
July 1, 2002	1,000	2,000	1,000
July 1, 2007	1,500	2,500	1,000
July 1, 2012	2,000	3,000	1,864
July 1, 2017	2,161	4,000	2,000
Totals	6,761	12,400	6,114

8. COMPLIANCE MEASURES: ~~(See Section II for inventory)~~ Refer to Table 10-4 of the Recreation Chapter for a complete evaluation of the Compliance Measures.
 - a. MEASURES IN PLACE: RECREATION ~~-01 through 14-16, inclusive~~ Compliance Measures in place for recreation resources include: 8, 13, 16, 36, 40, 41, 42, 62, 63, 65, 68, 71, 72, 91, 92, 152, 175, 177, 178, 191, 192, 193, 194, 198, 199, 200, 201, 203, 204, 205.
 - b. EFFECTIVENESS OF MEASURES IN PLACE: Refer to Table 10-4 of the Recreation Chapter for a complete evaluation of each Compliance Measure. ~~Measures in place at this time are moderately effective in attaining and maintaining the threshold. The existing allocation of winter day use and overnight PAOTs through the plan area statements containing public recreation facilities is generally effective in insuring that additional recreation which may be developed is available to the public. No Regional Plan implementation mechanisms exist which:~~

- ~~i. Give PAOT allocation priority to recreation projects requiring PAOTS which are available to the general public (especially reserve pool PAOTs); or~~
- ~~ii.i. Reserve a fair share of additional resource capacities for recreation projects which are available to the general public.~~

c. SUPPLEMENTAL MEASURES: The following Supplemental Compliance measures should be implemented by TRPA to enhance threshold attainment and maintenance: 107, 108, 206, 207, 208, 209.

~~The following supplemental measures are recommended to be added to the Region Plan package to maintain the threshold.~~

~~RECREATION - 02 and 03, 04 and 05~~

~~d. EFFECTIVENESS OF SUPPLEMENTAL MEASURES: Supplemental measures are generally expected to be highly effective if properly implemented.~~

9. ADEQUACY OF COMPLIANCE MEASURES: The adequacy of existing compliance measures in place, ~~combined with implementing the recommended revisions to them~~ and implementing the supplemental measures, is expected to attain and maintain the threshold, provided the adequate funding and other resources can be obtained to support staff and the measures in place and supplemental measures. See Table 10-4 for specific information regarding each measure.

Table 10-4. Effectiveness of Measures in Place for the Recreation Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(8) Limitations on new subdivisions: No new divisions of land are permitted within the Tahoe Region that would create development potential inconsistent with the Goals and Policies. (See Goals and Policies, p. 113.) TRPA's intent is to avoid the impacts of new lot and block subdivisions while allowing mechanisms such as re-subdivision to lessen the potential impacts of existing approved but unbuilt subdivisions.	Marginal	The "two-step subdivision process" has seen its fair share of political controversy resulting in inconsistent application of the subdivision rules. These types of subdivisions, as well as other types of parcel boundary manipulations (i.e., lot-line-adjustments and parcel consolidations), have resulted in the loss of access routes to lands that provide opportunities for dispersed recreation activities.	See Chapter 3, Water Quality, Section V.
(13) Restrictions on SEZ encroachment and vegetation alteration: No new land coverage or other permanent disturbance is permitted in SEZs except for certain public outdoor recreation facilities, public service facilities, projects which require access across SEZs, new development in man-modified SEZs, and SEZ restoration and erosion control projects, provided the TRPA makes required findings and offsetting restoration is provided. See Chapter 20 of the Code.	Yes	Making exceptions for public outdoor recreation facility development has been a successful approach to limit SEZ disturbance, and has allowed the prudent development of recreation facilities.	
(16) Fertilizer reporting requirements: TRPA may request uses that require regular fertilizer maintenance (e.g., golf courses, parks, cemeteries, ball fields, and residential yards) to submit fertilizer management plans for review and approval. Large users of fertilizer shall initiate a tracking program for lands under their control and present annual reports to TRPA. See Chapter 81 of the Code. Additional restrictions on fertilizer use could include bans on fertilizer applications in some situations, such as golf courses in SEZs, or lake front properties, or requirements to use only slow-release fertilizers.	Marginal	Since this is a 'voluntary' program, or a program that is only required as a conditional approval when a golf course applies for a development permit, it is inconsistently applied. Any developed and/or urban recreation facilities which have, by their location or operational nature possess large areas of managed turf must promote and participate in these types of programs that ensure the continued attainment and maintenance of the Regions thresholds, in this case the water quality and Soils/SEZ thresholds.	See Chapter 3, Water Quality, Section V.
(36) BMP implementation program-outdoor recreation: Outdoor recreation uses are subject to the BMP requirements of Chapter 25 of the Code. The required practices are described in the BMP Handbook.	Yes	Fulfilling BMP requirements concurrent with project development aids in maintaining a healthy environment, critical to the continued high-quality recreational experience at Tahoe.	

Table 10-4. Effectiveness of Measures in Place for the Recreation Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(40) Land use planning and controls-outdoor recreation: Beach recreation, boat launching facilities, cross-country skiing courses, developed campgrounds, golf courses, group facilities, off-road vehicle courses, outdoor recreation concessions, marinas, RV parks, riding and hiking trails, rural sports, skiing facilities, snow mobile courses, undeveloped campgrounds, and visitor information centers are primary recreational uses and are permissible uses as set forth in the Plan Area Statements (Code, Chapter 18). Expansion of existing ski facilities and marinas must be based on an approved master plan.	Yes	The list of defined recreation use types is adequate for recreation planning and site assessments of project proposals.	
(41) Land use planning and controls-OHV use: Off-road vehicle use is prohibited in the region except on specified trails, roads, or designated areas where impacts can be mitigated. (See Goals and Policies, p. V-3).	Marginal	OHV user groups have begun to take ownership of maintenance duties in areas still available for OHV use. Water Quality concerns have taken priority over this user groups activities.	See Chapter 3, Water Quality, Section V.
(42) Control of encroachment and coverage in sensitive areas: Public outdoor recreation facilities may encroach into sensitive lands, provided TRPA makes required findings designed to protect water quality and ensure mitigation of impacts. Projects that by their nature need not be sited in sensitive lands, are identified in the 208 Plan, Table 16.	Yes	The exceptions made for public outdoor recreation facility development has been a successful approach to limit SEZ disturbance, and has allowed the prudent development of recreation facilities.	
(62) Fixed Route Transit-South Shore: STAGE provides fixed route, scheduled, service within the City of South Lake Tahoe. Ridership in FY 99/00 was approximately 506,934 annual passengers. Area Transit Management operates STAGE under contract to the City of South Lake Tahoe.	Marginal	While STAGE does provide service along the US Hwy 50 corridor in the South Shore, visitors tend not to utilize this means of transportation, therefore there is an unmet potential to increase ridership simply through tapping into the visitor market.	See Chapter 2, Air Quality/Transportation Section V.
(63) Fixed Route Transit-North Shore: TART provides fixed route, scheduled service from Tahoma to Incline Village with connections to Truckee, and seasonal extensions to Meeks Bay. Ridership in FY 99/00 was 245,269 annual passengers. TART is operated by Placer County.	Marginal	While TART does provide service along the SR 28 and 89 corridors in the North Shore, visitors tend not to utilize this means of transportation, therefore there is an unmet potential to increase ridership simply through tapping into the visitor market.	See Chapter 2, Air Quality/Transportation Section V.

Table 10-4. Effectiveness of Measures in Place for the Recreation Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(65) Seasonal Trolley Services – North and South Shores: South Shore TMA and Truckee-North Tahoe TMA provide seasonal and special event trolley services to recreational and commercial destinations and provide connector service to North and South Shores. Ridership in FY 99/00 for the South Shore Trolley was 63,603 annual riders. Ridership in FY 99/00 for the North Shore Trolley was 15,630 annual riders. Service has been expanded to Incline Village.	Yes	The summer trolley service provided on the south shore has seen a steady increase in ridership, partly due to increased service routes and inventory. Initially, the seasonal trolley service on the north shore had experienced operational difficulties, but has since addressed those difficulties with an increased ridership during the summer of 2000.	See Chapter 2, Air Quality/Transportation Section V.
(68) Ski shuttle services: Ski shuttles transport skiers from lodging to ski areas. Almost all ski areas in and around the region provide ski shuttles. The services are provided by public and private providers on a contract basis or with vehicles purchased by the ski areas.	Yes	This has been an effective means of transporting skiers from their lodging to the ski resorts. Conversion of these vehicles to CNG or electricity should be pursued to further reduce the impacts of internal combustion engines.	See Section V.2
(71) Bikeways: Bikeways consist of separated rights-of-way, restricted rights-of-ways, and shared rights-of-way. Bikeways can serve transportation and recreation purposes. There are good local bicycle systems in the region, but the region-wide system needs to be connected so that there is a continuous facility circling the Lake.	Yes	Although many gaps between bike paths exist in the urban areas of the region, many programs and agencies are pursuing projects to rectify this situation.	
(72) Pedestrian facilities: Pedestrian facilities (sidewalks, crosswalks, landscaping, etc.) are nonexistent or are in poor condition in many commercial and other high-pedestrian use areas. Examples include but are not limited to the South Shore casino core, U.S 50, Kings Beach, and South “Y”.	Marginal	Some areas within the urban cores of the region have recently seen improvements in pedestrian walkways (especially Tahoe City); but there are far too many areas with substandard or without walkways. Visitors to the region expect these types of facilities and are disappointed when they do not encounter them.	See Section V.8.
(91) Waterborne excursions: Waterborne excursions are one to four hour boat trips, usually to Emerald Bay. There are four vessels with a capacity of greater than 100 passengers, and a number of smaller vessels. All are privately operated.	Yes	Tour boats are an effective means for getting people out onto the lake, rather than smaller, private vessels. The largest impediment for boaters to get their vessel onto the Lake is a lack of launching facilities.	See Section V.10.
(92) Waterborne transit services: Currently limited transit services operate on Lake Tahoe. The primary service is a ski shuttle service provided by the Tahoe Queen from south shore to Tahoe City several days per week, during the winter months. Expansion of these services may include (but are not limited to): Tahoe City to South Lake Tahoe, Tahoe City to Kings Beach and Incline Village.	No	It is a stretch to say that the ski shuttle to Tahoe City is transit, but it does offer a unique recreational experience and an alternate means of getting to the North Shore. There are currently numerous agencies pursuing true waterborne transit service not only from north to south, but also around to major urban and recreation areas around the Lake.	See Chapter 2, Air Quality/Transportation Section V.

Table 10-4. Effectiveness of Measures in Place for the Recreation Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(152) OHV limitations: Prohibit OHV uses within sensitive species disturbance zones and during critical breeding seasons.	Marginal	There are inadequate staff and resources to monitor this restriction.	See Chapter 7, Wildlife, Section V.
(175) Boat noise enforcement program: Marinas and boat launching facilities open to the public shall post conspicuous notices of single-event noise standards. Rental and excursion operators shall not operate or offer for use of rent marine craft not in compliance with single-event noise standards.	Marginal	There are inadequate staff and resources to monitor this restriction.	See Chapter 9, Noise, Section V.
(177) ORV restrictions: Public agencies responsible for the administration of public lands and recreation areas shall post notices of the single-event noise standards in conspicuous locations at access points to use areas. Rental and excursion operators shall not operate or offer for rent or use any off-road vehicle not in compliance with single-event noise standards.	Marginal	There are inadequate staff and resources to monitor this restriction.	See Chapter 9, Noise, Section V.
(178) Snowmobile Restrictions: Public agencies responsible for the administration of public lands and recreation areas shall post notices of the single-event noise standards in conspicuous locations at access points to use areas. Rental and excursion operators shall not operate or offer for rent or use any over-snow vehicle not in compliance with single-event noise standards.	Marginal	There are inadequate staff and resources to monitor this restriction.	See Chapter 9, Noise, Section V.
(191) Chapter 33, Allocation of Development: Sets a ceiling on additional recreational development by allocating recreational PAOTs (persons-at-one-time) to summer and winter day use and overnight recreational uses. TRPA uses the PAOT ceiling to predict future recreational growth in transportation and air quality modeling and related EISs.	No	Interim targets for PAOT disposition are not being met, moreover, PAOTs are an ineffective way of controlling the level of visitation for a particular recreation site, especially those that are not "closed systems," in addition to dispersed recreation areas such as Desolation Wilderness.	See Section V.7
(192) Master Plan guidelines: Master Plan guidelines have been prepared for ski areas and marinas. The guidelines will assist in meeting high standards for new or upgraded facilities.	Marginal	Although Master Plans are a prudent planning technique for developed recreation sites, the lengthy and sometimes costly process has lead to apprehension on the part of private project applicants as well as public agencies desiring facility expansion.	See Section V.8

Table 10-4. Effectiveness of Measures in Place for the Recreation Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(193) Permissible recreation uses in the shorezone and lakezone: Beach recreation, boat launching facilities, marinas, water-oriented outdoor recreation concessions, buoys, piers, floating docks and platforms, boat ramps, and recreational boating are regulated uses and structures in the shorezone and lakezone of Lake Tahoe. See Chapter 51 of the Code.	Yes	The list of defined recreation use types is adequate for recreation planning and site assessments of recreation project proposals in the shorezone.	
(194) Public Outdoor recreation facilities in sensitive lands: Public outdoor recreation facilities which by their very nature must be located on sensitive lands may be permitted additional permanent disturbance and new land coverage under certain circumstances, but they must be mitigated by BMPs and must be offset at a 1.5:1 ratio.	Yes	The exceptions made for public outdoor recreation facility development has been a successful approach to limit SEZ disturbance, and has allowed the prudent development of recreation facilities.	
(198) Hiking and riding facilities: Hiking or riding trails and rural roads serve many parts of the Basin.	Marginal	There is a need for all land management agencies to take a more proactive approach to managing trails and dirt road networks, for maintenance and signage.	See Section V.6, V.7, V.8.
(199) Scenic quality of recreation facilities: Recreation facilities are to maintain or enhance scenic threshold standards related to preservation of views and the design and appearance of on-site buildings and structures.	Yes	The scenic quality of the region has a direct effect on the quality of the recreation experience overall, and specifically affects sightseeing activities.	
(200) Density standards: Recreation development shall comply with the density standards set forth in Chapter 21 and plan area statements.	Yes	Density standards have been established to ensure that crowding is not caused by the physical layout and design of the facility.	
(201) Bonus incentive program: Public access to recreation areas, streams, lakes, or vista points may count toward bonus points and mitigation for tourist accommodation units.	No	To staff's knowledge, this program has never been taken advantage of, although it may be an affective means of gaining additional recreation access.	See Section V.9
(203) Required Findings: Chapter 6 of the Code requires TRPA to make findings prior to approving any project or taking any other action, that the project or action is consistent with and will not adversely affect implementation of applicable provisions of the Regional Plan and thresholds.	Marginal	Not all thresholds are thoroughly considered when making these required findings, especially the lower profile thresholds of recreation, noise and vegetation.	See Section V.6
(204) Lake Tahoe Recreation Sign Guidelines: the Recreation Sign Guidelines will enable the public to clearly identify public recreation facilities and the available activities present. Additionally these guidelines shall assist the public in navigating and locating the numerous recreation facilities in the region .	Unknown	TRPA recently adopted these Guidelines in January 2001. Successful implementation of this program needs to be monitored over the next five years.	See Section V.8.

Table 10-4. Effectiveness of Measures in Place for the Recreation Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(205) Annual user surveys: Provide funding assistance and technical support (data compilation) for annual user satisfaction/ perception surveys related to evaluating the threshold.	Marginal	Surveying on an annual basis and during the winter as well as the summer recreation seasons has not occurred over the life of the Regional Plan, therefore, recreation trends are difficult to account for other than via empirical observations of recreation providers.	See Section V.5
(Supplemental Measure 107) Pedestrian and Bicycle Facilities--South Shore: Including but not limited to Park Avenue redevelopment area; Ski Run redevelopment area; U.S.50-Stateline to Kahle Drive; U.S.50-Stateline to South Y; Al Tahoe Boulevard; Johnson Boulevard; Lyons Avenue; lower Kingsbury Grade; Bijou Park Bike Trail; Pioneer Trail-Ski Run Boulevard to U.S.50; Rufus Allen/Tree Haven Bike Trail; Lake Tahoe Bikeway 2000; and projects pursuant to the Bicycle Master Plan for Lake Tahoe Region.	Not in place	Once implemented, this will be an effective means for meeting the expectations of recreationists seeking pedestrian and bicycle paths.	
(Supplemental Measure 108) Pedestrian and Bicycle Facilities--North Shore: Including but not limited to Tahoe City urban area; Tahoe City Lakeside Bike Trail; Kings Beach area; Incline Village; North Stateline area; Dollar Hill to North Regional Park Bike Trail; Tahoe Vista; Lake Tahoe Bikeway 2000; and other projects pursuant to the Bicycle Master Plan for the Lake Tahoe Region.	Not in place	Once implemented, this will be an effective means for meeting the expectations of recreationists seeking pedestrian and bicycle paths.	
(Supplemental Measure 206) Regional Recreation Plan: Develop a detailed Regional Recreation Plan in cooperation with TCORP. Develop a research agenda to provide necessary data to develop the plan. EIP # 511. (C list)	Not in place	It is believed that the development of this plan will lead to the reduction in resource and user conflicts and give clear direction to land managers as to the compatible recreation activities in the various portions of the region . Only pieces of this plan exist today; pieces can be found in each element of the Regional Plan, i.e., the Compact, Goals and Polices, Code of Ordinances, Plan Area Statements, and the EIP.	
(Supplemental Measure 207) Establish fair share resource capacity estimates: Following adoption of the EIP, TRPA and the public utility districts should establish fair share estimates of water and sewer resource capacities necessary to implement EIP recreation projects.	Not in place	Previous efforts to quantify the required resources for recreation facility development have failed to accurately estimate the needs of recreation providers. Moreover, recent research concludes than available land and funding may be greater impediments to facility development and expansion than water and sewer capacity.	

Table 10-4. Effectiveness of Measures in Place for the Recreation Threshold

Compliance Measure	Effectiveness	Explanation	Recommendation
(Supplemental Measure 208) Reserve additional resource capacity: Following adoption of the EIP, TRPA should establish a method by which to ensure additional resource capacities remain available to meet the recreation goals and policies of the Regional Plan when approving non-recreation projects.	Not in place	Previous efforts to quantify the required resources for recreation facility development have failed to accurately estimate the needs of recreation providers. Moreover, recent research concludes that available land and funding may be greater impediments to facility development and expansion than water and sewer capacity.	
(Supplemental Measure 209) Economic Modeling: Procure funding for additional economic modeling, which highlights the importance of the recreation/tourism economy of the region and link economic viability to the attainment of the Recreation Thresholds.	Not in place	Information which highlights the importance of the recreation/tourism economy of the region and links economic viability to the attainment of the Recreation Thresholds is invaluable information for gaining a higher profile and receiving greater funding for recreation research and facility development.	

IV. STATUS OF 1996 RECOMMENDATIONS

Below is a list of recommendations made in the 1996 Threshold Evaluation. Following, in italics, is a summary of the status of that recommendation.

R-1: Quality Experience and Additional Access:

1. TRPA and TCORP should conduct annual user satisfaction surveys. The surveys conducted at a variety of locations or facilities should ask consistent questions, which permit evaluation of the threshold. TRPA should include the completion of a minimum number of annual surveys as an interim threshold target. Collecting user demographic information should be considered. *Individual recreation providers periodically conduct these types of surveys; however, TRPA has completed this type of Regional survey in 1999 and 2000 (summer season). There still is the need for annual surveying to track recreation trends.*
2. Revisions are recommended to the Environmental Threshold Compliance Form R-1, as shown in Appendix A. The revisions are intended to provide a clearer understanding of how to measure the threshold and should assist with future evaluations of threshold attainment. *It is assumed that this recommendation was acted upon. However, the previous Evaluation did not adequately document these changes.*
3. Continued support of, and participation in, TCORP is vital to threshold attainment and maintenance. TCORP serves several important functions in the region and directly supports TRPA in its efforts to attain and maintain the thresholds. TRPA should become a continuing sponsor of TCORP. *TRPA has continued to participate in TCORP; however, TCORP is not as active as it once was or could be. There is the need in the Basin for a recreation advocacy group to assist in the development of recreation facilities, as well as a group to function as an advisory group to its membership and assist them in reaching recreation providers goals, insofar as they are consistent with the Basin's thresholds. TCORP can be this entity.*
4. Many of the recreation projects currently found in adopted community plans, and those proposed to be included in the Environmental Improvement Program, will only be implemented in the next several years provided funding and other resources are devoted to them. TRPA can assist in realizing the projects by acting as a project facilitator and advocate. *This recommendation is consistent with the new vision of TRPA being an advocate and project facilitator in addition to its original penchant for regulatory oversight of development.*
5. By the 2001 evaluation, TRPA should take a leadership role and work with TCORP to develop and complete a regional recreation plan. Specific targets for completing the plan are shown in the threshold compliance form. The plan should include priority projects from TRPA's Environmental Improvement Program, which assist in attaining and maintaining the recreation thresholds. *Very little in the way of tangible work products have been completed to date in achieving this recommendation. A course of research action has been established to eventually create the Recreation Master Plan for the Tahoe Region.*

6. California, Nevada, the Forest Service, and other land conservancies (e.g., the Nature Conservancy, the Trust For Public Lands) should cooperatively prepare a priority list of high quality lands suitable for low density recreation to be acquired or developed for use by the general public. Strategies for acquisition and development, which could include providing public access or fee in lieu as forms of mitigation, should be developed. Priorities for acquisition should be coordinated with other regional planning documents (e.g., RTP/AQP). *This recommendation was not acted upon. Elements of this recommendation have been worked into the work program for the development of the Regional Recreation Master Plan.*
7. It is critical that recreation providers allocate adequate resources to the upkeep and repair of existing recreation facilities. At a minimum, resources, which are being overused should be temporarily retired and restored where possible. A comprehensive and systematic program of maintenance and repair should be provided by each recreation entity. TCORP and TRPA may be able to assist in seeking funding support for public agency budgets for these activities. Adopt-a-park type programs or partnerships with others who could provide the needed services for litter control and maintenance of state and federal facilities, similar to the annual lakeshore clean-ups, should be considered. *Aside from individual providers having their own maintenance programs and budgets, there are no region -wide standards or programs. This is, however, a very important issue as the results of the Recreation User Surveys indicate that expectations of maintenance at Tahoe recreation sites are not being met.*
8. The TRPA Governing Board should adopt a policy statement and supporting implementing strategies that encourage or require local governments to retain existing public rights-of-way or easements that provide, or can provide, public access to the Lake. *No substantive action has been taken on this issue, although it is still a very important issue and needs to be addressed.*

R-2: Fair Share of Resource Capacity:

1. Revisions are recommended to the Environmental Threshold Compliance Form for this threshold, known as R-2, as shown in Appendix A. The revisions are intended to provide a clearer understanding of how to measure the threshold and to allocate PAOTs to additional uses, which implement the threshold target. This will assist with future evaluations of threshold attainment. The revisions will also provide TRPA and regional recreation providers with measurable, interim performance targets regarding development of additional PAOTs. Supplemental measures are recommended to comply with the existing Regional Plan policy to ensure adequate resource capacity and to give priority to projects available to the general public. *It is assumed that this recommendation was acted upon, however, the previous Evaluation did not adequately document what these changes were.*
2. TRPA should integrate recreation projects into the Environmental Improvement Program, which implement the threshold. TRPA should provide assistance to facilitate these projects. The technical advisory committee recommends streamlining of the review of recreation projects, although no

specific changes have been suggested. The payment of air and water quality mitigation fees is a problem for some recreation project applicants. The ability to provide offset mitigation, rather than payment of fees, should be considered as a cost saving option and used more than it is today. *Aside from the EIP update process, which incorporated a fair number of new projects and research endeavors since the 1998 version was released, the remaining parts of the recommendation have not been acted upon.*

3. TRPA and TCORP should consider the recommendations made in the Recreation Resource Capacity and Allocation Study in developing the regional recreation plan. *Development of the Regional Recreation Master Plan has not been undertaken.*
4. TRPA should improve its internal tracking and information gathering for developed recreation projects to accurately measure threshold implementation. This should include estimates of PAOTs where applicable, estimates of other design capacities which may not be measured in PAOTs, water and sewer use, traffic measures, land coverage, SEZ disturbance and amount of shoreline. These categories of information should be collected for all developed projects and activities in the region so that TRPA can accurately track the threshold status through a real-time monitoring program. TRPA should amend Chapter 33 of the Code to allocate PAOTs to additional summer day uses that implement the threshold. *Accurate tracking of PAOTs and other resources (specific to recreation facility development) has not occurred during the life of the Regional Plan.*
5. TRPA should convene the recreation and utility service providers to amend Chapter 6 of the Code to determine how TRPA can ensure that sufficient water, sewer, and VMT resource capacity remain to achieve the Regional Plan's recreation goals when approving non-outdoor recreation projects. Utility service providers may provide assistance in ensuring that sufficient water and sewer capacity remains available. *This recommendation has not been acted upon; moreover, there is insufficient evidence indicating a need to make such a determination concerning water, sewer, and VMT as being limiting resources in project implementation. As was discussed earlier, operations and maintenance funding and staffing appear to be the main impediments to recreation facility development.*
6. TRPA should serve as an information clearinghouse to collect, compile and make available information on recreation facilities, rates of participation, and other recreation data. Recreation providers, particularly those in the private sector, are encouraged to contribute to the database so it can be more complete than it currently is. The database should be accurate and should be updated regularly. Information stored in the database should be able to be accessed electronically. *The TRPA Recreation Program does house a fair amount of this type of information; however, a database containing all of this information is yet to be created.*

V. 2001 RECOMMENDATIONS

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~A. Complete Shorezone Ordinance/EIS~~

~~Responsible Entity: TRPA
Funding/Cost: Staff/\$50,000
Completion Date: April 2002
Threshold Indicator: R1 and R2~~

~~**Recommendation:** Complete the Shorezone Ordinance Amendments EIS and present to TRPA's Governing Board.~~

~~**Product:** Updated Code sections relative to shorezone development; EIP # 17.~~

~~B. Expand recreation shuttle service~~

~~Responsible Entity: STAGE, TART, Ski Resorts
Funding/Cost: STAGE, TART, Ski Resorts/ Cost Undetermined
Completion Date: 2003/04 Ski Season
Threshold Indicator: R1 and R2~~

~~**Recommendation:** Ski areas should encourage increased ridership of ski shuttle buses through an incentive program, and shall be required to employ these measures concurrent with Master Plan and/or expansion activities/implementation. Incentives may include: 1) discounts for lift tickets and ski packages when the shuttle system is used for access; 2) parking fees at base areas; 3) reduced parking supply at the existing base areas to reduce vehicle parking at the site; and 4) increase employee shuttle services to maximize the use of shuttles by employees.~~

~~**Product:** Increased ridership, reduction in peak time traffic, increased access to recreation facilities. Accomplishes elements of numerous Air Quality/Transportation and Recreation EIP projects.~~

~~C. Preservation of legally existing public access~~

~~Responsible Entity: TRPA
Funding/Cost: TRPA Staff Time
Completion Date: June 2002
Threshold Indicator: R1~~

~~**Recommendation:** Add appropriate Code language and/or a new section to address subdivision and other development actions that may result in the loss of legal public access, i.e., lot-line adjustments, change of use and multi-family developments. Consider procedural modifications and application material requirements for the Project Review Division of TRPA to more effectively address this issue.~~

~~**Product:** EIP # 538. No net loss of legally existing public access to the to the shorezone and other undeveloped areas.~~

D. Project approvals

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~TRPA Staff time~~
Completion Date: ~~March 2004~~
Threshold Indicator: ~~R2~~

Recommendation: ~~Chapter 6 of the Code of Ordinances requires TRPA to make findings prior to approving any project, that the project or action is consistent with and will not adversely affect implementation of applicable provisions of the Regional Plan including thresholds. To address this issue, the following steps need to be taken:~~

- ~~1. Define 'commitment of significant resources'.~~
- ~~2. Consider amending Chapter 6 to include an additional finding that ensures additional resource capacities remain available to meet the recreation goals and policies of the Regional Plan and implementation of the EIP when reviewing projects that commit significant resources to non-outdoor recreational uses.~~
- ~~3. Alternatively, consider modifications to TRPA's Initial Environmental Checklist, which would trigger the necessary mitigation for the loss of potential recreation facility development.~~

Product: ~~Assurance that non-recreation projects do not compromise or preclude the ability of recreation facility development.~~

E. Recreation experience surveys

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~TCORP/\$30,000 per survey~~
Completion Date: ~~December 2007~~
Threshold Indicator: ~~R1~~

Recommendation: ~~Conduct surveys to gain an understanding of recreation users' experiences in Tahoe, and track any negative or positive trends. At least four surveys should occur between 2001 and 2007 (two winter and two summer activity oriented surveys). Engage TCORP members for annual funding.~~

Product: ~~Survey information leading to the ability to track trends and understand deficiencies in the recreation experience. Identify problem areas for recreation providers and provide user information regarding opportunities that are or perceived to be lacking in Tahoe.~~

F. Recreation Master Plan and research

Responsible Entity: ~~TCORP~~
Funding: ~~TRPA Staff Time/\$150,000~~
Completion Date: ~~April 2004~~
Threshold Indicator: ~~R1 and R2~~

Recommendation: ~~Gather and compile the necessary data to develop a detailed recreation GIS. Leading to the development of the Regional Recreation Plan in cooperation with TCORP.~~

~~Data Collection – Anticipated Products:~~

- ~~• Accumulate existing recreation related data sets from Tahoe land management agencies~~
- ~~• Identify data gaps, fill as much as possible~~
- ~~• Identify remaining data gaps~~
- ~~• Gather and incorporate data into Recreation GIS.~~

~~Regional Recreation Master Plan – Anticipated Products~~

- ~~• A priority list of facilities and lands for recreation.~~
- ~~• Develop strategy to acquire or develop needed facilities.~~
- ~~• Coordinate priority acquisitions and facility development with other Regional planning documents, i.e., RTP/AQP.~~
- ~~• Spatial analysis of existing and potential recreation facilities, and coordination with mass transit efforts to identify preferred/targeted facility development locations and type.
– Incorporate into EIP~~
- ~~• Sub-Regional recreation areas with compatible recreation uses~~
- ~~• Develop a “design capacity” (desired levels of visitation) for the Basin on a sub-regional basis.~~

~~**Product:** Recreation Master Plan, Updated Recreation Thresholds, Capacity Estimates consistent with other thresholds for sub-watershed areas of the Tahoe Basin, EIP # 511.~~

~~**G. Historic resource research**~~

~~Responsible Entity: TRPA~~

~~Funding/Cost: State and Federal Grants/\$80,000-~~

~~Completion Date: August 2003~~

~~Threshold Indicator: R1 and R2~~

~~**Recommendation:** Conduct necessary research of historical resources that may lend themselves to recreation opportunities. Conduct site assessments, determine suitability for recreation use and determine appropriate level of visitation. Incorporate findings into Recreation GIS and Regional Recreation Master Plan.~~

~~**Product:** Increased knowledge of the Historical resources located in the Tahoe Basin leading toward a cohesive report that could be used to develop and expand recreation programs aimed at diversifying the passive recreation experiences at Tahoe.~~

H. Bonus Unit incentive program

Responsible Entity: ~~TRPA~~
Funding/Cost: ~~TRPA Staff Time~~
Completion Date: ~~December 2007~~
Threshold Indicator: ~~R1 and R2~~

~~**Recommendation:** In order to gain tourist accommodation Bonus Units, certain conditions must be met, which includes various mitigation measures. One of these mitigations measures is to “provide public access to public recreation areas, lakes, streams, or vista points to which access was previously nonexistent.” TRPA Code of Ordinances subparagraph 35.3.D (4). To staff’s knowledge, this program, specifically recreation access has not been taken advantage of.~~

~~Promote this incentive program as an alternative means for gaining additional public access to the shoreline of Lake Tahoe. News releases, consultant contact and public agency education, as well as TRPA Project Review Division advising of this Code provision may accomplish this.~~

~~**Product:** Additional Public access to the shorezone and/or other areas for recreation opportunities.~~

I. Waterborne excursions

Responsible Entity: ~~Private Providers/Marinas, TRPA~~
Funding/Cost: ~~Private Operators/Undetermined~~
Completion Date: ~~May 2003~~
Threshold Indicator: ~~R1 and R2~~

~~**Recommendation:** TRPA should work with Marinas and Tour boat operators to expand operations, where financially feasible and environmentally sound, to increase access directly to Lake Tahoe.~~

~~**Product:** Increased access to boating (recreation) opportunities.~~

J. Operations and maintenance

Responsible Entity: ~~TCORP~~
Funding/Cost: ~~TCORP/Undetermined~~
Completion Date: ~~December 2007~~
Threshold Indicator: ~~R1 and R2~~

~~**Recommendation:** Research and develop a program to secure funding annually for facility improvement, maintenance and operation. May include different approaches, such as grant applications, fundraisers, community volunteer work, etc.~~

~~**Product:** Recreation O&M Plan.~~

VI. EIP INTEGRATION

TRPA should take a leadership role in facilitating the realization of projects, programs, research and operations and maintenance funding found within the Environmental Improvement Program (EIP). TRPA should also streamline the application process for new and/or modified EIP projects, programs and research.

EIP AND THRESHOLD ATTAINMENT

The original EIP listed recreation projects which were contained in numerous documents; Community Plans, Master Plans, TRPA's Five-year List of Additional Recreation Facilities and the 1996 Threshold Evaluation all supported projects for inclusion. Descriptions have been developed to demonstrate the major aspects of the project that address the recreation threshold. Unique to the recreation threshold, the physical development of facilities and accessory improvements is promoted to offer heightened recreational opportunities.

Projects contained in the Recreation Element of the EIP are necessary to implement the goals of the recreation threshold. The major project implementing agencies include the California Department of Parks and Recreation, the Nevada Division of State Parks, and the USFS - Lake Tahoe Basin Management Unit. Many local recreation providers such as the City of South Lake Tahoe and the regional utility districts (TCPUD, NTPUD) also play important roles in supporting the recreation threshold by implementing projects. The California Tahoe Conservancy has been instrumental in funding regionally significant recreation projects within the California portion of the Tahoe Basin.

RECREATION EIP PROJECT ACCOMPLISHMENTS

Since the adoption of the EIP in 1997, over \$80,340,000 has been spent in capital improvements. Capital projects directly benefiting the recreation program contributed over \$3,480,000, approximately four percent of the total expenditures. It is important to note that all EIP projects have an indirect benefit to the quality of the recreational experience. The quality of the natural environment directly correlates to the positive experience of recreationists and affects their expectations and experiences. This is truer for some types of projects than others, namely air quality/transportation projects that address traffic and congestion on the region's road network.

As of May 2001, six recreation EIP projects had been completed. They include:

CSLT Ski Run Public Beach Access, # 294 – 200 LF of Shoreline, 10,000 sq. ft. beach

USFS/CA Parks Eagle Falls-Vikingsholm Trail, # 512 - .5 mile improved trail

Emerald Bay State Park Lake Side Trail, # 513 – 3 miles of improved trail

CTC Carnelian Bay Access Phase II & III, # 621 – 1,085 LF of shoreline, increased access and capacity for the general public.

Rainbow Trail Rehabilitation, # 859 – rehabilitate 1 mile of interpretive trail

Memorial Point Overlook Improvements, # 862 – Additional shoreline access, vista point development and supporting amenities.

In regards to EIP programs and studies, over \$4,150,000 has been spent to date. Of this amount, \$350,000 or approximately eight percent was directly spent in the recreation program, \$150,000 of which was spent on land acquisitions by the USFS.

FUTURE RECREATION EIP PRODUCTS

An important point, which is fundamental to the concept of adaptive management, is that the EIP is a dynamic program that will experience change as projects are completed and new information and data are gathered and analyzed. Therefore, it is important to remember that any discussion of the future of EIP recreation programs and projects is likely to change over time, and this discussion is a snapshot in time.

The current mix of recreation projects in the EIP are intended to assist in achieving and maintaining thresholds. The major improvement categories of EIP include capital needs, science and research, program costs, and the newly created operations and maintenance. The project codes indicate a fair amount of projects are aimed at the disposition of summer and winter PAOTs (facility construction/expansion); however, overnight PAOTs are under-represented. This is likely due to the fact that the major public landholders in the region (USFS, California State Parks, etc.) have not been pursuing the construction of developed campgrounds.

There are also a fair amount of projects that will result in greater capacity for the recreating public; however the facilities are of such a type to not require PAOT allocations. Other project types include marina and/or boat ramp expansions, access trails, master plans for resort expansions, research, and operation and maintenance. While there currently is clarity as to the need and vision for capital expenditures, the research slated to occur in the next five years may provide information that could potentially shift this vision or modify the types of capital projects that are pursued and/or their proposed location.

It is projected that approximately \$72,300,000 will be spent on all areas of the recreation EIP program between the years 2000 and 2007. This represents 66 different capital, research, program, and operations and maintenance projects. As was previously mentioned, these numbers represent a snap-shot in time, as the number of projects and dollars spent will, in all likelihood, change over time as a result of the adaptive management nature of the EIP.

The following list of EIP Projects address, to varying degrees, all three indicators of the Recreation Thresholds:

100089, 984, 622, 624, 863, 865, 10094, 10149, 10092, 284, 141, 494, 538, 632, 511, 860, 10095.

The following list of EIP projects are intended to improve the indicators for the R1 threshold (High-quality recreation experience; additional recreation access):

10043, 10127, 371, 611, 618, 10140, 294, 10091.

The following list of EIP projects are intended to improve the indicator for the R2 threshold (fair share of resource capacity remains available for the general public):

983, 369, 389, 861, 509, 517, 866, 287, 982, 516, 817, 619, 864, 10090, 10093, 10096, 10098, 10100, 10101, 10102, 285, 286, 10097, 114, 613, 615, 616, 625, 868, 208, 867, 617, 623, 612.

VII. SUPPLEMENTAL INFORMATION

SUMMER 2000 RECREATION USER PREFERENCE SURVEY

The survey findings represent data analysis for 602 respondents, with 59.8 percent visitors (i.e., they do not live in the Lake Tahoe Region) and the remaining 40.2 percent residents (i.e., those who live within the region). Intercept sampling resulted in 311 returns from a variety of pre-selected sites including beaches, trail heads, day use areas, campgrounds, town sites, and public and private attractions; a mailed sample of 291 returns was derived from a mailing of 3,000 surveys, with an even sample balance between 1,500 residents and 1,500 to visitors. The mailed portion yielded a response rate of approximately 10 percent. The mailed sample was assembled after reviewing the intercept portion that was reflective of the somewhat larger resident and visitor populations, as well as intensity of use observed on the south and southwestern reaches of the region. As a result, the follow-up mailed portion was comprised of those who either lived in or visited the region 's north shore.

Demographic Characteristics

As indicated in Table 10-5, the bulk of respondents derive from the middle age categories, predominately those in the 35-44, and 45-54 age groups (32.9% and 27.9% respectively). The 25-34 age group – typically a fairly active age cohort in terms of outdoor activities – follows these middle-aged users. Both the youngest and two oldest age groups each comprise less than ten percent of recreation respondents. These data are not surprising as the wide range of outdoor recreation offerings at Lake Tahoe presumably appeal to either a family-oriented visitor or the younger, more active recreation seeker.

Overall, those recreating in the region are relatively well educated, with the combined majority having completed either college (39.7%) or graduate studies (23.6%). In addition, more than one-quarter had some college or technical training (27.1%). Finally, a minority of those surveyed had advanced through high school or had not yet completed their high school coursework (9.3% combined). These data are consistent with the higher education levels typical among those recreating at destination resort communities.

Complementing data regarding age are household composition findings. With a majority of recreation users in the middle age groups we would expect to find household composition with children a predominant category. Accordingly, a majority (53.2%) reported households with children living at home. The next most mentioned house type is couple without children, comprising nearly one in four respondents (24.2%), followed by single persons with no children at home (17.2%). Finally, a minority resides in households of multiple adults. While the majority of those surveyed are families, a significant proportion are not in a child-raising situation, thus freeing time and disposable income for outdoor recreation pursuits.

Income is typically quite high among visitors to, and many residents of, destination resort communities. Higher household incomes are related to the higher costs of housing or lodging within destination recreation areas, transportation to resorts, and the greater amounts of disposable income and leisure time required for resort area use. The survey data are consistent with this trend. A relatively few respondents are from lower income

groups in comparison to those in middle or higher income categories. (Keep in mind that a survey of an outdoor destination and its attendant cost is expected to generate a proportion of incomes higher than the population at large.) Accordingly, the majority of respondents are from categories exceeding \$50,000 per annum household income.

Regarding ethnic composition, the vast majority of surveyed recreation users are from the Caucasian/white group. Ethnic diversity among region recreation users is most likely to derive from those of Hispanic ancestry. Given the increasing proportion of Hispanic ethnicity in the population at large, this recreation user group can be expected to increase in the future. Likewise, those of Asian-American or Pacific Island ancestry, while only a minority in this sampling (3.4%), are likely to increase as a future proportion of region recreation use. Finally, those of African-American or American Indian ancestry comprise a very small portion of respondents. Note that this portion of the survey is not intended to profile or otherwise categorize users by culture, but rather are intended to lend insight into current and future population trends that may be available to recreation planning.

Table 10-5 Lake Tahoe Recreation Demographics

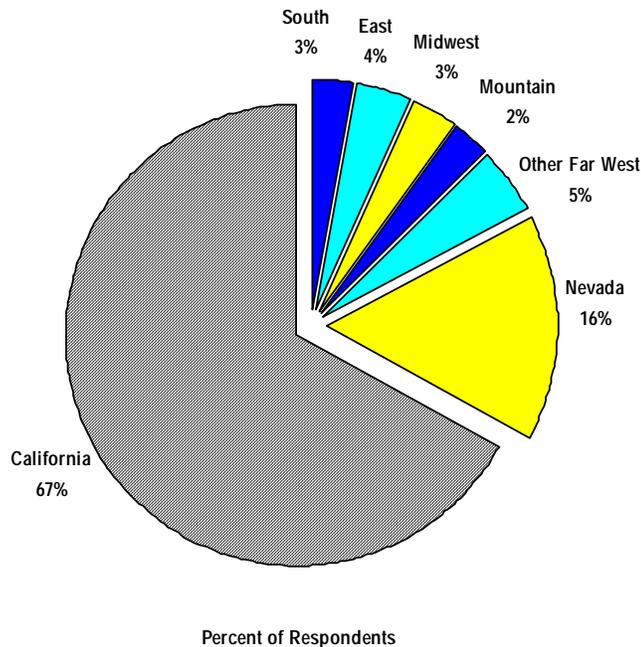
	Resident	Visitors	Overall
GENDER			
Male	51.7	45.8	48.1
Female	48.3	54.2	51.9
AGE			
Under	3.9	9.7	7.4
25-34	13.4	18.0	16.2
53-44	26.8	36.9	32.9
45-54	30.3	26.3	27.9
55-64	11.7	5.7	8.1
65 and	13.4	3.4	7.4
EDUCATION			
No high	2.6	2.0	2.2
High school	4.7	8.7	7.1
Some	26.8	27.8	27.1
College	46.4	35.1	39.7
Graduate	19.6	26.4	23.6
HOUSEHOLD			
Single no children at	20.5	15.0	17.2
Household with	44.9	58.9	53.2
Couple with no	27.8	21.8	24.2
Multiple	6.8	4.2	5.3
HOUSEHOLD			
Under	4.7	2.6	3.6
\$2029.9	3.8	3.8	3.8
\$30-39.9k	7.5	8.6	8.2
\$40-49.9k	13.2	8.9	10.6
\$5074.9	28.8	20.6	23.9
\$7599.9	17.5	20.6	19.4
\$100-149.9k	13.7	18.1	16.3
\$150k or	10.8	16.5	14.2
ETHNIC			
Mexican	1.7	6.8	4.8
Other	1.7	3.7	2.9
Caucasian/wh	96.1	83.0	88.2
African	0.9	1.1	1.0
American	1.7	0.3	0.9
Asian/Pacific	1.7	4.5	3.4
Othe	1.3	3.4	2.6

Visitor Origin

As indicated in Figure 10-5, the bulk of visitors arrive in the region from residences in California (67%). Of course, the proximity and huge population in this state guarantee this market share. Also of notable importance is the portion residing in Nevada (16%), the second most popular source of visitation. Visitors from other states in the Far West comprise 5 percent of surveyed visitors recreation users. The Far West segment is dominated by those from Oregon and Washington, but includes a small portion from Arizona and Alaska. 12 percent of the sample arrived from other regions of the country. International visitors comprised 1.8 percent of the total and principally arrived from Canada, Europe and, to a lesser extent, Asia.

Given the size of California's population and the recognized popularity of Lake Tahoe as a recreation destination for the state's residents, origin data by county can be useful. Among those who visited Lake Tahoe, Northern California counties are most often mentioned. Among these Alameda, Contra Costa, El Dorado, Placer, Sacramento, San Joaquin, San Francisco, San Mateo, Solano, Santa Clara, and Stanislaus counties are among the most frequently mentioned. Likewise, those from Washoe, Carson, and Douglas counties dominate Nevada recreation users. A small portion of recreation users also arrive from Southern California, principally Los Angeles, Orange, and San Diego counties though, given the size of the Southern California population, this is a proportionally limited penetration of those markets.

Figure 10-5. Visitor Origin By State/Region



Activity Participation Rates

Given the observed high rate of use at Lake Tahoe's shore during the peak season, it is not surprising that beach activities (76%) have the greatest proportion of participation compared to other listed summer season recreation uses. Following the beach, a majority of those surveyed indicated participation in walking (73%), trail hiking (63%), swimming (62%), and sightseeing (51%). Trail hiking in particular has an especially high level of response, though this includes hiking along local trails as well as backcountry use. Keep in mind that beach goers may also hike or bike while those who use trails may spend time at the Lake's beaches. These data indicate that Lake Tahoe hosts a relatively active population of recreation users.

A second tier of activities included bicycling on paved and unpaved surfaces (44% and 32% respectively), shopping (42%), driving for pleasure (37%), and picnicking (36%). Note that driving for pleasure is a frequently mentioned activity and may in part be associated with the sightseeing response. At least one-quarter also mentioned attending cultural attractions and cultural events (28% and 25%), power boating (28%), nature study (28%), gaming (27%), canoeing and kayaking and rafting (26% and 25%). With the exception of off road bicycling and paddle sports, this grouping reflects a segment of recreation users that is oriented to somewhat more developed activities compared to users who may prefer more physically demanding recreation options. See Figure 10-6.

A diverse range of more demanding outdoor activities had lower participation rates including camping, backpacking, climbing, and sailing, among other activities. While an active user may participate in several of these activities as part of one outing, for many enthusiasts certain pursuits require special skills or time commitments, thus limiting participation in multiple activities. Accordingly, response rates for these items are comparatively modest.

Figure 10-6. Recreation Activity Participation

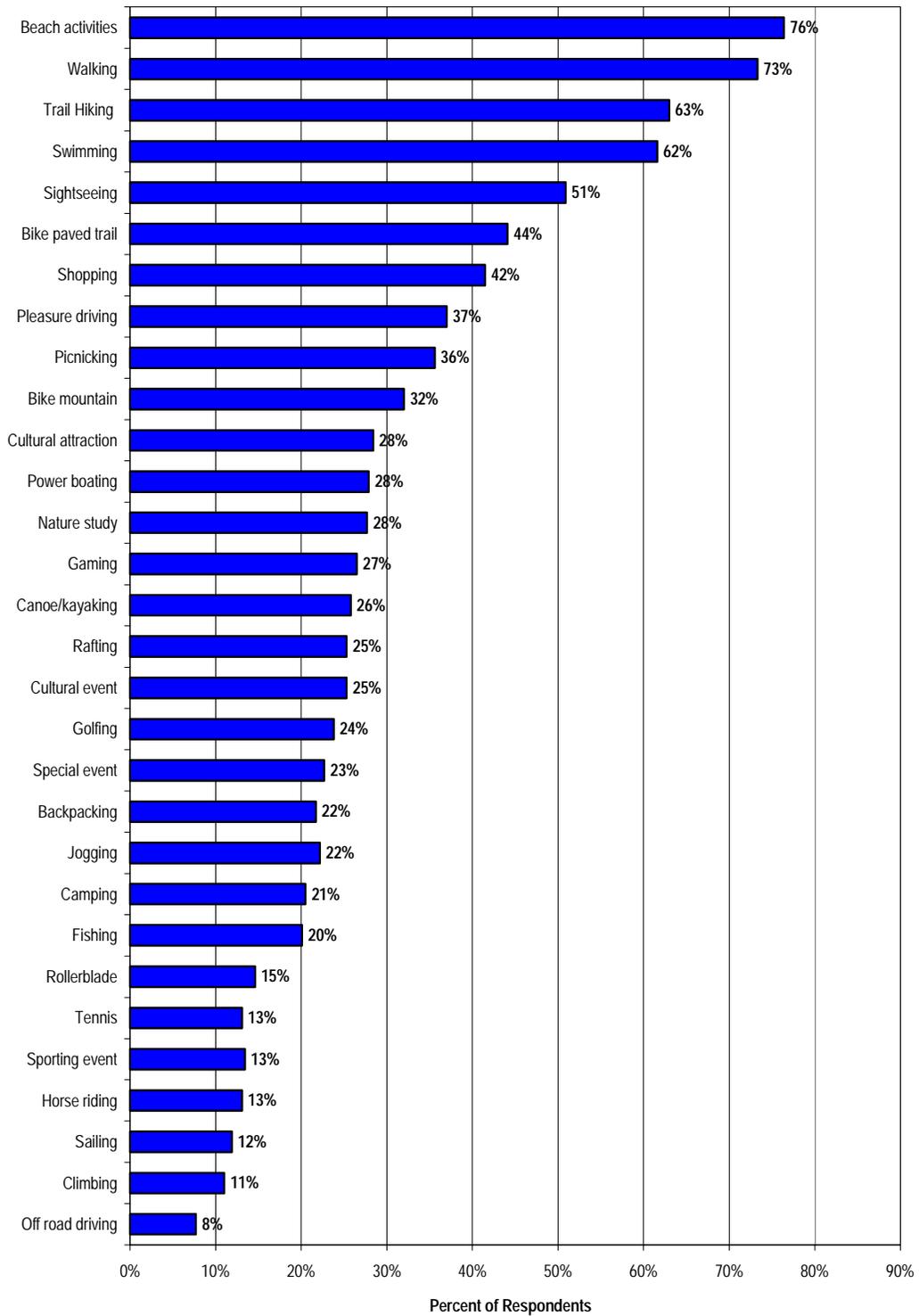


Figure 10-7 shows responses for the percent of respondents rating the importance of selected attributes for recreation destinations in general; the figure shows attributes rated somewhat or very important (“4” or “5” responses). The overall ratings illustrate a relatively large proportion of importance scores, with most attributes receiving a majority of responses. This indicates users with high expectations for their recreation experience.

These findings are strictly limited to the expectations of current visitors and residents and do not reflect the *objective* importance of certain policy issues, such as access for the disabled— the findings simply indicate that individual respondents did not view these attributes as important relative to their individual recreation needs. While these data will later be used in comparison with importance ratings, they can also be viewed as an independent measure of perception.

Recreation Conditions – Recreation Destinations

As indicated in figure 10-7, beach quality (94%) is the most important attribute on the scale. (This survey is a sample of summer users so will be slanted toward summer-related attributes compared to other seasonal preferences.) Following are a range of other general concerns related to the conditions found at recreation destinations – recreation site maintenance (89%), traffic congestion (88%), security and safety (87%), the level of crowding (86%), costs (83%), and the attitudes of recreation area staff (81%). Of somewhat less importance is the *quality* of day use/picnic areas and campgrounds (70% and 66% respectively).

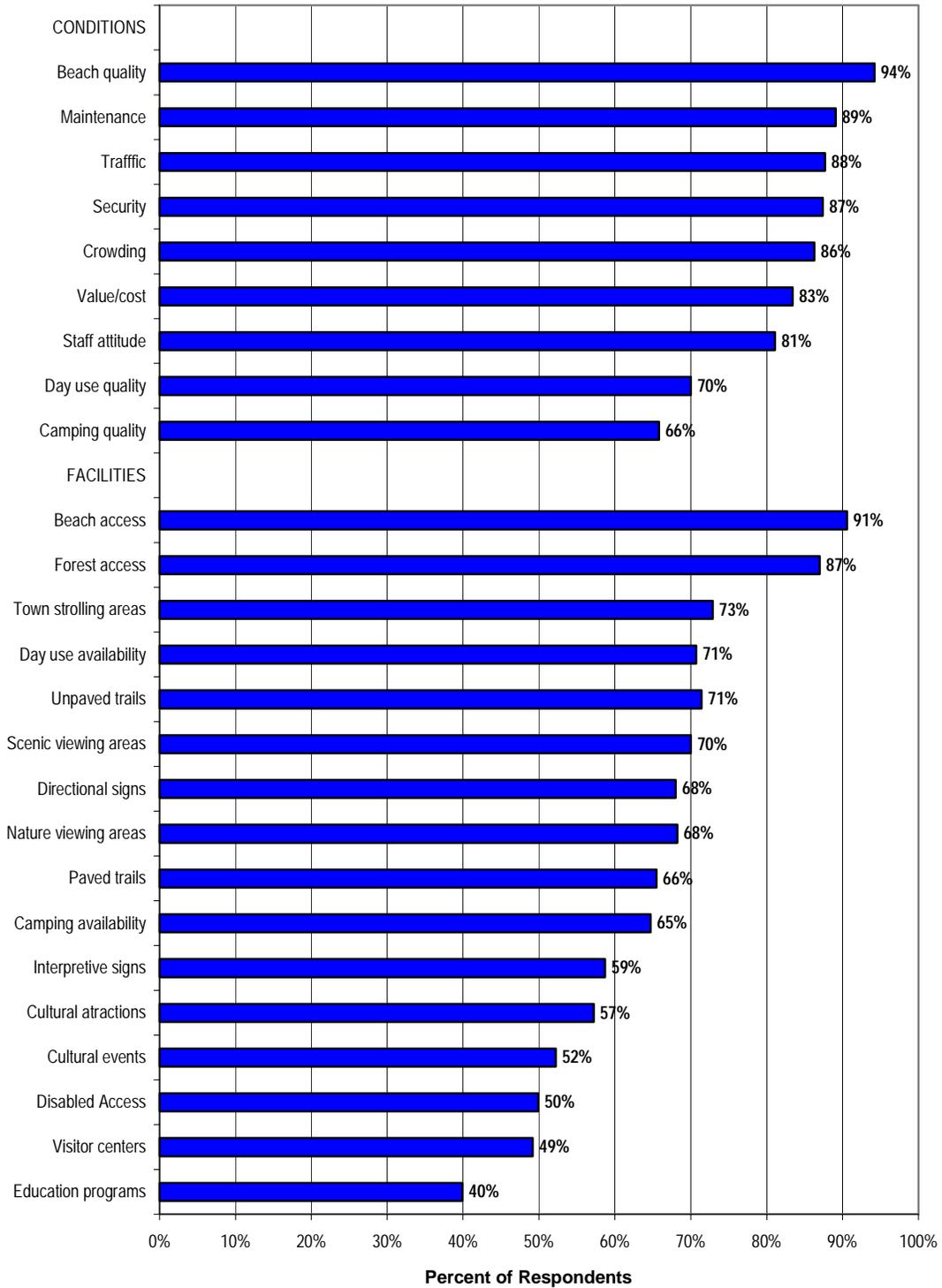
Recreation Facilities – Recreation Destinations

Within the first tier of attributes, access attributes were rated most important (see Figure 10-7.) Access to beach areas combined with forest access (91% and 87% respectively) indicated that access was perceived as the most critical user concern when rating facility importance. Access may also be viewed in the context of crowding and traffic congestion issues – less crowding may allow for easier access to the most desired recreation sites.

A second tier of important facilities attributes included pedestrian-oriented areas to stroll in towns (73%), reflecting an increasing interest in village-type environments. Others in this second tier included the *availability* of day use and camping areas (71% and 65%), unpaved and paved trails (71% and 66%), and scenic viewing areas (70%). Of particular interest is directional signage (68%), which was previously noted as a recreation information source. Other attributes related to information were visitors center (49%) and education and interpretive programs (40%). Finally, half (50%) of the respondents rated access for disabled persons as important.

Cultural amenities, including attractions such as museums and historic sites (57%), and cultural events (52%), while garnering majority responses were rated as relatively less important for surveyed recreation users. However, these specific ratings reflect current cultural offerings. Improved or expanded cultural attractions and events could attract new user groups and garner higher importance ratings overall. Moreover, cultural recreation development during the spring and fall could help redistribute peak summer use toward these “shoulder” seasons.

Figure 10-7. Attribute Importance Rating



Rating the Lake Tahoe Recreation Experience

Figure 10-8 shows recreation experiences at Lake Tahoe that were rated as either good (4) or excellent (5). While these data will later be used in comparison with importance ratings, they can also be viewed as an independent measure of perception.

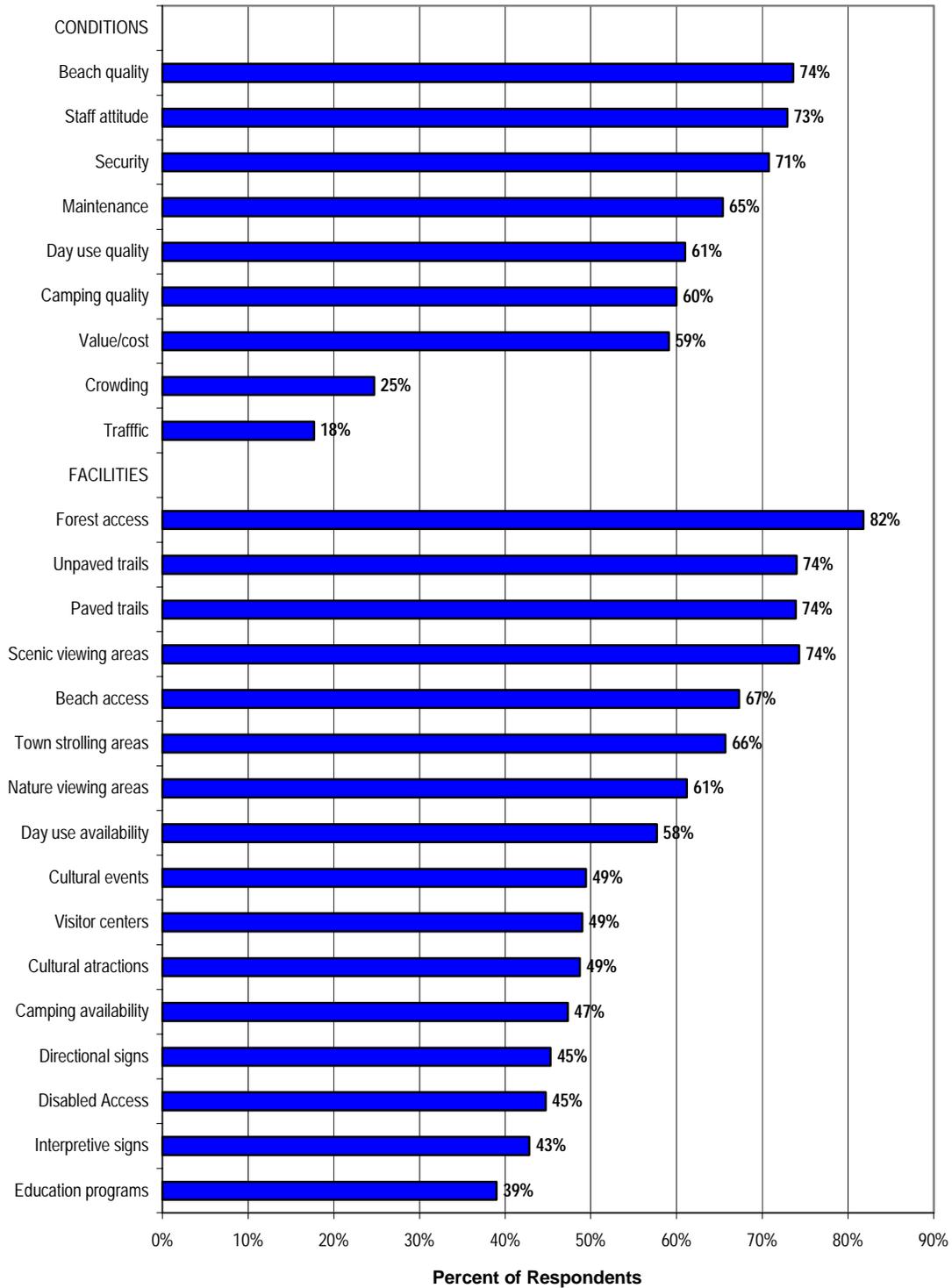
Recreation Conditions – Experience

Within the conditions category, the most highly rated recreation experiences at Lake Tahoe are the quality of the Region's beaches (74%), the attitude of staff at parks and recreation areas (73%), and security (71%). A second cluster of attributes with majority ratings included the quality of day use areas and campgrounds (61% and 60%) and the cost or value of recreation (59%). Of special note, only a minority of respondents rated crowding (25%) and traffic (18%) as positive.

Recreation Facilities - Experience

Access to forest areas is the most positive element of the Lake Tahoe recreation experience with (83%) giving forest access a "4" or "5" rating. Respondents' experience with the Region's trails system was also highly rated (unpaved 74% and paved 74%). A second tier of experiences also received a majority of responses including beach access (67%), town pedestrian areas (66%), nature and wildlife viewing areas (61%) and the availability of day use areas (58%). Somewhat fewer than half rated the Region as positive for cultural offerings (attractions and events each 49%). Note that campground availability, signage, disabled access and education and interpretive programs also did not receive a majority response.

Figure 10-8. Recreation Experience Ratings for Lake Tahoe

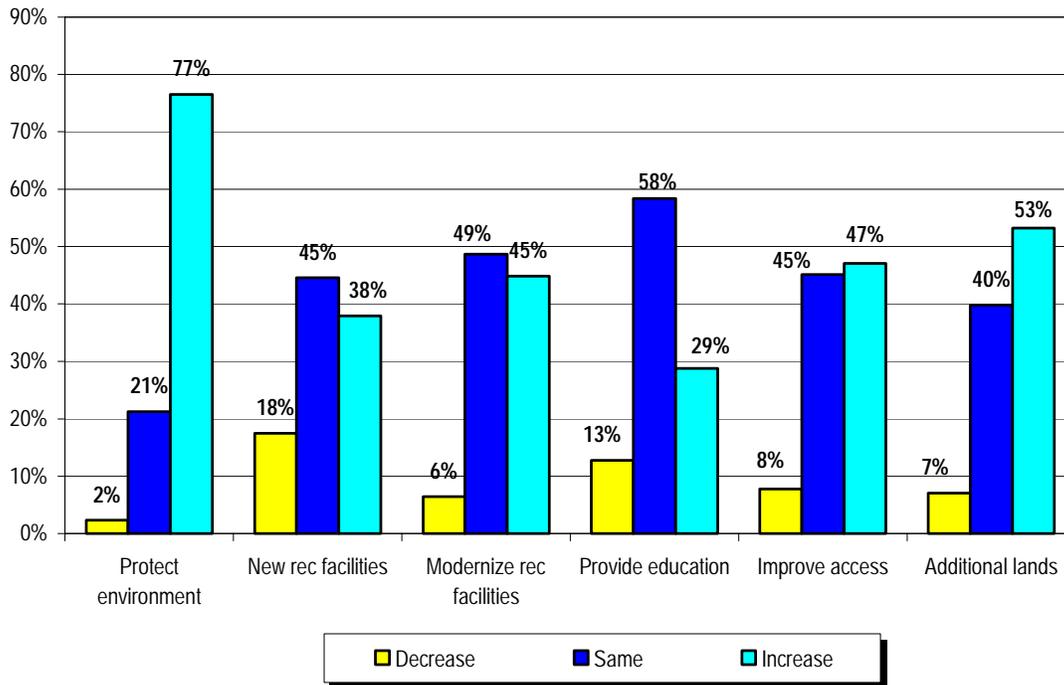


Attitudes Towards Public Expenditures

Respondents were asked whether public spending should increase, decrease, or remain the same for the listed recreation issues. Very few of those surveyed recommended a reduction in the commitment of public funds to recreation. However, the emphasis by policy area does vary. Clearly, most respondents regarded environmental protection as needing additional public spending. It may be assumed that the general public is not yet aware about committed EIP funds. See Figure 10-9.

Following environmental protection, a slim majority of those responding also mentioned increased spending for land acquisition (53%). Improved access and the need to modernize/rehabilitate recreation facilities also garnered strong support for increased or, at least, maintained levels of public expenditure. The majority was satisfied with current educational facilities and programming while expenditures for new recreation amenities had somewhat more modest support. Overall, public investment levels are favored to remain at current levels, with a substantial proportion desiring increased investment.

Figure 10-9. Attitudes On Public Expenditures



FOCUS GROUP STUDY

Focus Group research is a qualitative process and, as such, ascertains respondent *perceptions* and can reveal an emotional *tone* regarding particular issues. This information provided *insights* into selected issues and thus may allow recreation policy makers an opportunity to understand the motivations of resident user groups.

The region's recreation users in these sessions are intended to represent residents from both the south shore and north shore regions of the region; however, this is not a statistically valid sampling of the population at large and was only intended to provide qualitative support to additional statistical studies.

Focus Group One (FG1) was conducted on January 3, 2001, at the Timber Cover Resort in South Lake Tahoe and consisted of south shore residents; Focus Group 2 (FG2) was conducted at the North Lake Tahoe Conference Center on January 4, 2001 and consisted of north shore residents. Perspectives between the two groups compared in the following respects:

- FG1 participants were somewhat more concerned with access to town amenities, particularly bike paths, sidewalks and beaches. This is not surprising given the more extensive urbanization of the south shore communities of Stateline, Nevada and South Lake Tahoe, California. In comparison, FG2 participants were more concerned with user conflicts in outlying recreation areas and on the water. For example, FG2 respondents mentioned conflicts between cross-country skiing and snowmobiles, sailboats and powerboats, and hikers and mountain bicyclists.
- FG1 participants perceived a public policy tilt toward tourism interests to the detriment of resident interests. This may reflect the presence of several larger casino properties on the south shore and the recent construction work and associated press coverage of the redevelopment district. FG2 participants recognized the economic contributions made to their communities by tourism, but also desired great environmental mitigation. Increased recreation use on the somewhat less developed north shore may be affecting these FG2 responses.
- FG1 participants were somewhat more resistant to the proposition that recreation users pay a portion of site maintenance and development costs. For example, these respondents were particularly pointed in their concern about increased use fees at local boat ramps. However, both groups felt that any considered user fees should employ some resident-oriented elements to protect their more regular, even daily use patterns – resident season passes were given as an example. In any case, all expected local resistance to additional use fees.
- Both FG1 and FG2 participants felt that traffic and crowding were the primary problems within the region. FG2 discussions examined alternative transport modes such as better bike paths and buses, while the FG1 participants did not engage in discussions about specific solutions. All participants recognized the challenge that personal vehicle use patterns present, and perceived unwillingness by drivers to use alternative transport.

- Area closures were not a well-accepted resource protection alternative, particularly by FG1 participants. Specifically, a net loss of recreation resources was not popular, with acquisition of additional lands favored by FG1 respondents. FG2 participants, though somewhat more comfortable with closures or use limits, were nonetheless not happy about limiting access to their usual and accustomed places. FG2 respondents did suggest limits by use type – particularly for motorized vehicles and vessels.
- Access of all types (community recreation amenities such as bike paths and backcountry access) was an overall concern voiced by those in both the FG1 and FG2 groups. Respondents felt that access was most negatively impacted by overuse, traffic and crowding. Respondents also discussed the impact of unaware or environmentally uneducated recreation users. Damage to fragile wetlands or crosscut trails by careless hikers were given as examples.
- Both groups called for greater public awareness development and user education. Suggestions included interpretive and regulation signage, as well as directional signage. FG1 participants called for increased resource agency presence and enforcement. FG2 participants were interested in a wider information publication that would identify managers for specific resources. Both groups felt that there was limited understanding in the region about who managed what recreation areas.

Chapter 11

ECONOMICS

I. INTRODUCTION

Tahoe Regional Planning Agency (TRPA) recognizes that its policies and regulations affect economic conditions for residents living in and visitors traveling to the Lake Tahoe Region. This *Economics* section of the 2001 Evaluation Report is intended to assist TRPA in monitoring the socio-economic development of the Lake Tahoe Region. TRPA's goals are to monitor economic conditions, develop a framework from which to consider economic impacts associated with policies and regulations, and assist in strategies for economic development and diversification consistent with the established environmental threshold carrying capacities.

This chapter describes the Lake Tahoe Region economy and provides consistent and reliable indicators to monitor economic trends and conditions of the region including: population, housing, employment and earnings, commercial development, gaming, and the economic impacts of visitors.

OBJECTIVES

Specific objectives for this report include:

- Update the economic description of the Tahoe Basin that was prepared as part of the 1996 Threshold Evaluation.
- Evaluate progress-to-date, with respect to the recommendations contained in the 1996 Threshold Evaluation.
- Analyze TRPA policies and regulations as they pertain to economic conditions and trends.
- Develop a means for evaluating proposals and recommendations to TRPA regarding policy and capital expenditures.

CHAPTER CONTENTS

Following the Introduction, Section II provides a socio-economic profile of the Lake Tahoe Region, analyzing demographic characteristics and trends such as population, age distribution, education level, and household income. Section II also investigates economic measures of employment, earnings, personal income, demand for housing and commercial development, as well as transportation related trends. Section III specifically examines the travel and tourism generated portion of the economy, including both direct and indirect impacts.

Sections IV and V focus on the external areas affecting the Lake Tahoe Region (i.e., where most of the visitors live) and the volume of visitor days to the region. Section VI investigates the influence of TRPA on the Lake Tahoe Region economy, providing an overview common perceptions and perceived economic constraints. Section VII provides a framework by which to evaluate economic considerations related to grant proposals and capital expenditures. Finally, Section VIII, reviews progress on 1996 recommendations and offers additional recommendations for 2001.

STUDY AREA CONSIDERATIONS

For the purposes of economic analysis, it is important to distinguish between two primary areas: Lake Tahoe Region (defined by the TRPA Compact, 1980) and Greater Tahoe Area. Zip codes were selected as boundaries (see Appendix A for a list of zip codes) to define these geographic areas. A further description of each area follows below, with geographic boundaries illustrated in Figure 11-1 on the following page.

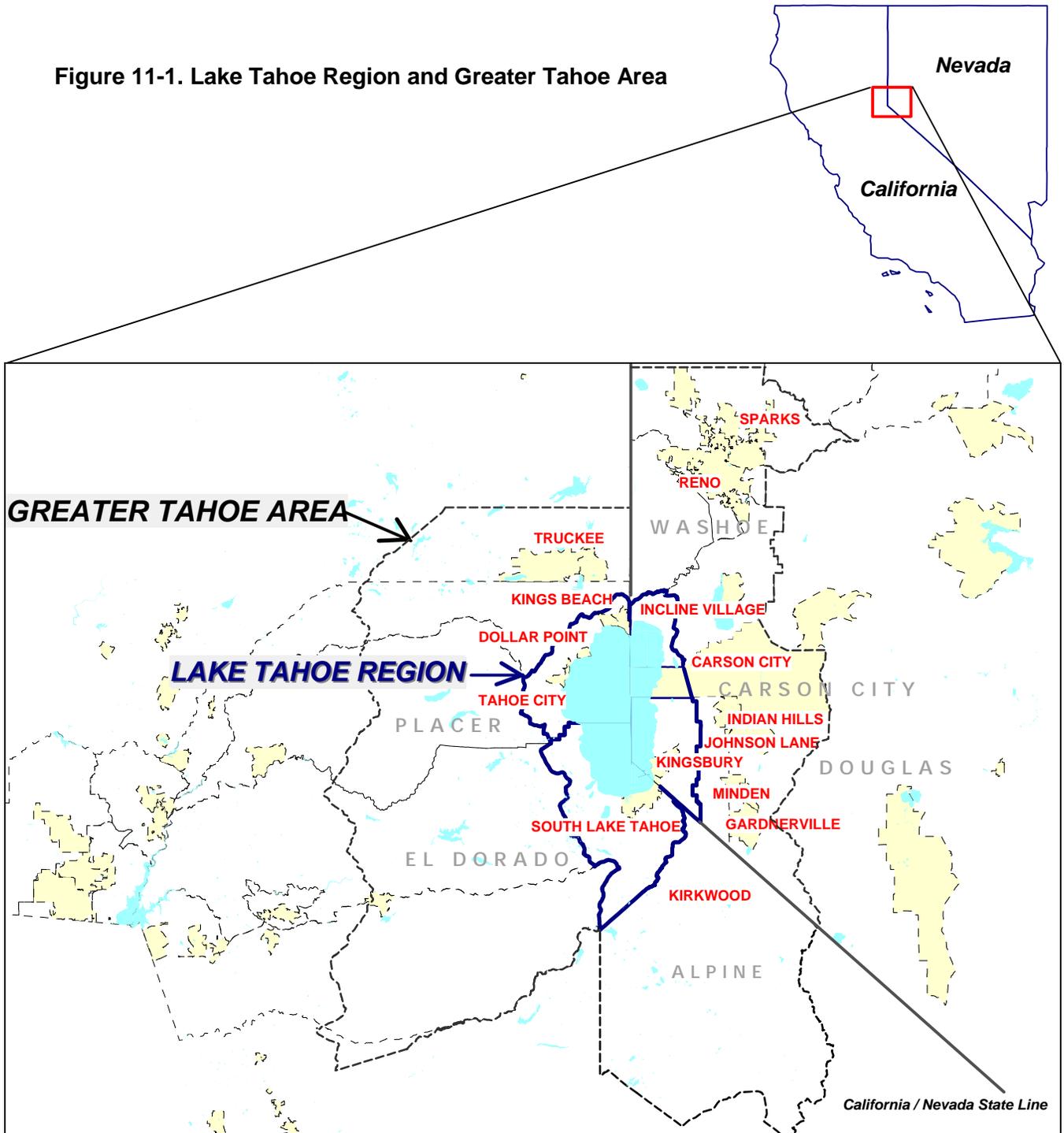
Lake Tahoe Region

The Lake Tahoe Region is intended to represent the area of TRPA management jurisdiction, which encompasses a large portion of the Lake Tahoe Basin. The region includes portions of El Dorado and Placer Counties in California – including the incorporated City of South Lake Tahoe – as well as portions of Washoe, Douglas and Carson City Counties in Nevada. (The Carson City portion of the region is unpopulated and is composed of U.S. Forest Service and Lake Tahoe Nevada State Park lands). Many of the popular ski resorts in the Lake Tahoe Area are located a short driving distance outside the region.

Greater Tahoe Area

The Greater Tahoe Area includes the Lake Tahoe Region, as well as the communities and areas surrounding Truckee-Donner, Olympic and Squaw Valleys, Reno-Carson City, and Minden-Gardnerville. The Greater Tahoe Area includes all the Lake Tahoe area ski resorts, as well as other locations for recreation activities associated with Lake Tahoe. The Greater Tahoe Area also includes the primary locations where Lake Tahoe Region businesses and employees are most likely to purchase a significant portion of goods, services and housing.

Figure 11-1. Lake Tahoe Region and Greater Tahoe Area



Source: Dean Runyan Associates

II. SOCIO-ECONOMIC PROFILE OF LAKE TAHOE REGION

This section of the report describes demographic and economic conditions of the Lake Tahoe Region including population, sources of employment and earnings, unemployment rate, sources of personal income, and trends in housing, commercial development, and transportation. The bulk of information contained in this section pertains specifically to the Lake Tahoe Region; however, certain data was not available on a sub-county level and is reported for the collection of counties with populations in the Lake Tahoe Region (i.e., Placer, El Dorado, Douglas and Washoe).

A. POPULATION CHARACTERISTICS AND TRENDS

1. Population Growth

Currently about 56,000 people reside year-round in the Lake Tahoe Region. Table 11-1 shows the current (2000) and projected population (2010) for Lake Tahoe Region in each of the four populated counties. Over the next decade, the population of the Lake Tahoe Region is expected to grow moderately, rising from a current (2000) population of 56,000 to nearly 59,000 by 2010, representing an average annual growth rate of .04%. These projections account for residents and would not include temporary workers or those who own vacation and second homes in the Lake Tahoe Region (see Section 4 for a discussion of vacation and second home ownership).

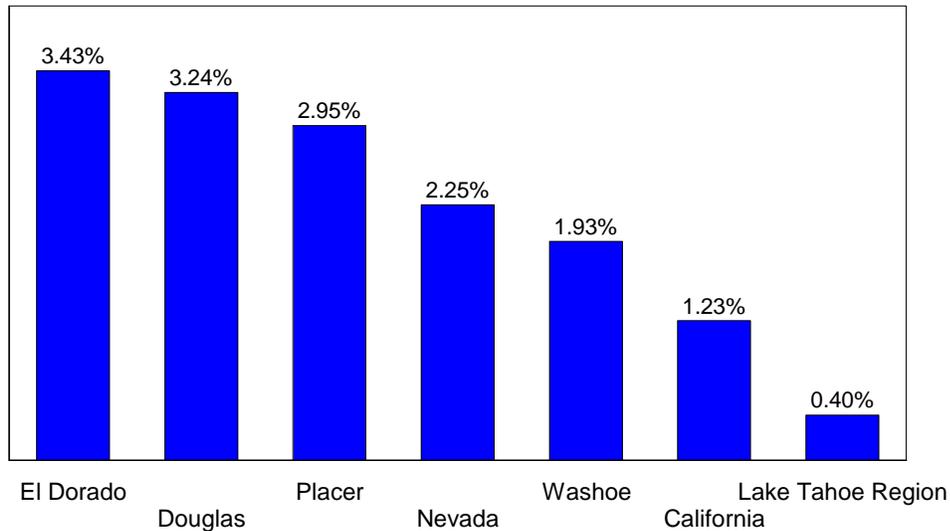
Table 11-1. Population by County, Lake Tahoe Region, 1990-2010

County	1990	2000	2010
Douglas	6,115	6,551	6,817
El Dorado	29,652	31,514	32,793
Placer	9,257	9,838	10,241
Washoe	7,567	8,266	8,607
Total	52,591	56,169	58,458

Source: Dean Runyan Associates & US Census Data

Compared to the Lake Tahoe Region, the overall population for the four counties – Placer, El Dorado, Douglas, and Washoe – is expected to grow at a significantly faster rate. The combined population of these four counties is projected to grow from about 780,000 in 2000 to over 1 million by 2010, representing an average annual growth rate of 2.7%. In terms of the number of new residents, much of this growth is expected to occur on the western slopes of the Sierra Nevada along the Auburn/Nevada City corridor and within the Folsom/Placerville area in El Dorado and Placer counties, as well as the Reno-Sparks area in Washoe County. Figure 11-2 shows the average annual population growth rate for the Lake Tahoe Region as compared to growth for each of these four counties, as well as state-level data for California and Nevada.

Figure 11-2. Projected Average Annual Rate of Population Growth, 2000-2010



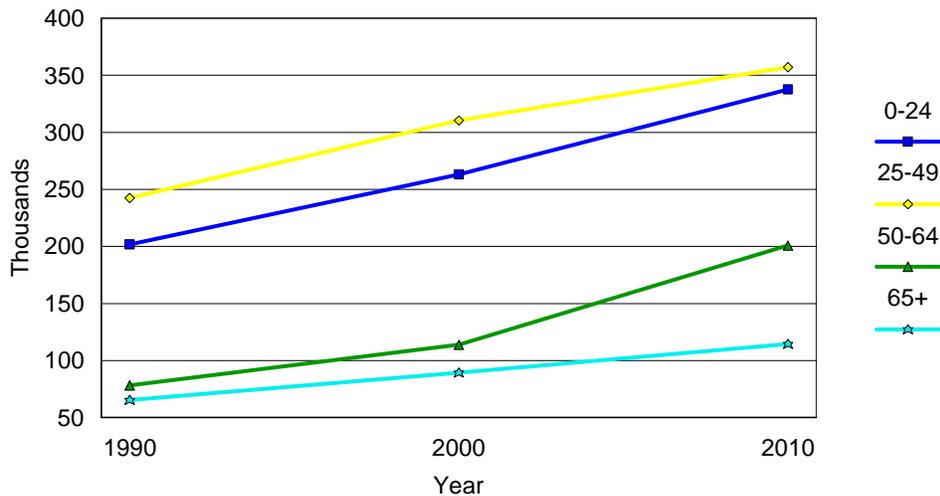
Source: US Census Bureau & Dean Runyan Associates

2. Components of Population Change

The composition of the population in the counties surrounding the Lake Tahoe Region will influence the profile of visitors to the region, as participation rates and preferences for specific recreation activities will often vary among certain age groups. Due to close proximity and ease of access, the population within the five counties (Placer, El Dorado, Washoe, Carson City and Douglas) will have a strong influence on demographic changes, traffic patterns, and visitor trends in the region.

Some notable changes in the overall composition of the surrounding population are expected to occur over the next decade. While population growth will occur within each of the selected age groups, people aged 50-64 –“baby boomers”– will become a more significant segment of the population (see Figure 11-3).

Figure 11-3. Population by Age Group, 1990-2010



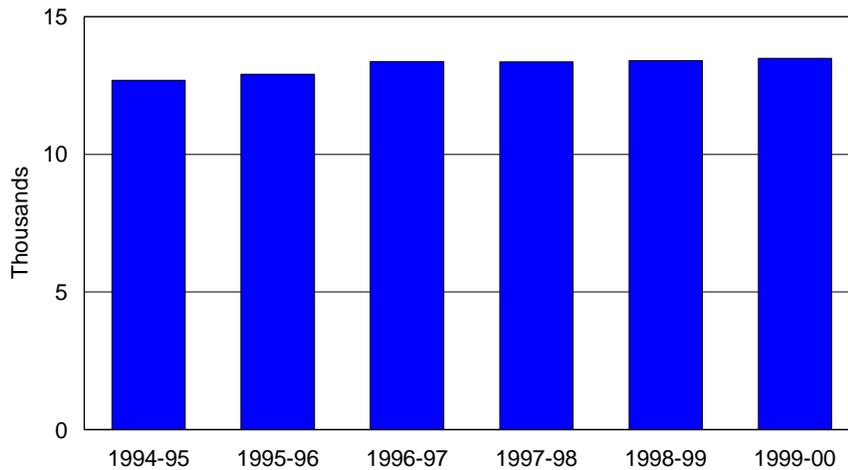
Source: U.S. Census Bureau

It is also interesting to note that the population growth in the younger age segments will be most prominent among populations of Latino and Asian Americans. These types of demographic changes are likely to influence development and marketing decisions made by businesses that choose to locate in the Lake Tahoe Region.

3. School Enrollment

Figure 11-4 shows the school enrollment in grades K-12 for the Lake Tahoe Region (includes Tahoe-Truckee Joint Unified School District). As this figure shows, school enrollment in the region has grown moderately over the last six years. School- aged children generate demand for day care, after school programs, pedestrian-friendly communities, and opportunities for recreation and cultural activities. When making location and employment decisions, business owners and working professionals with children will consider the opportunities for their youth, as well as the overall economic conditions of the region.

Figure 11-4. School Enrollment K-12 in Lake Tahoe Region, 1994-2000

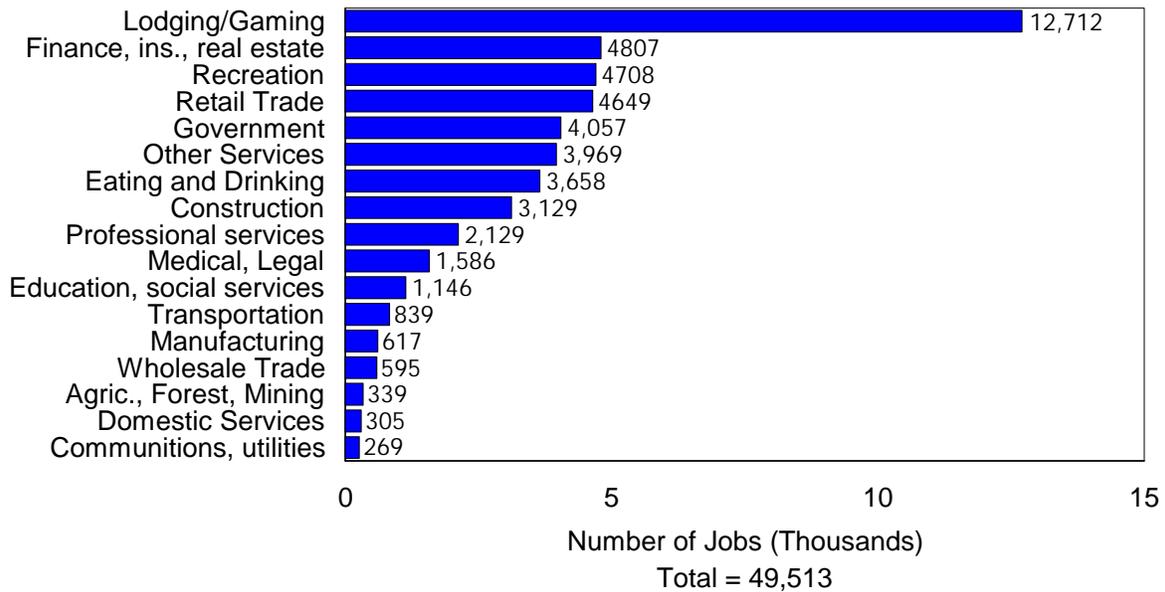


Source: California Dept. of Education, Nevada Dept. of Education, & Dean Runyan Associates

B. EMPLOYMENT AND EARNINGS

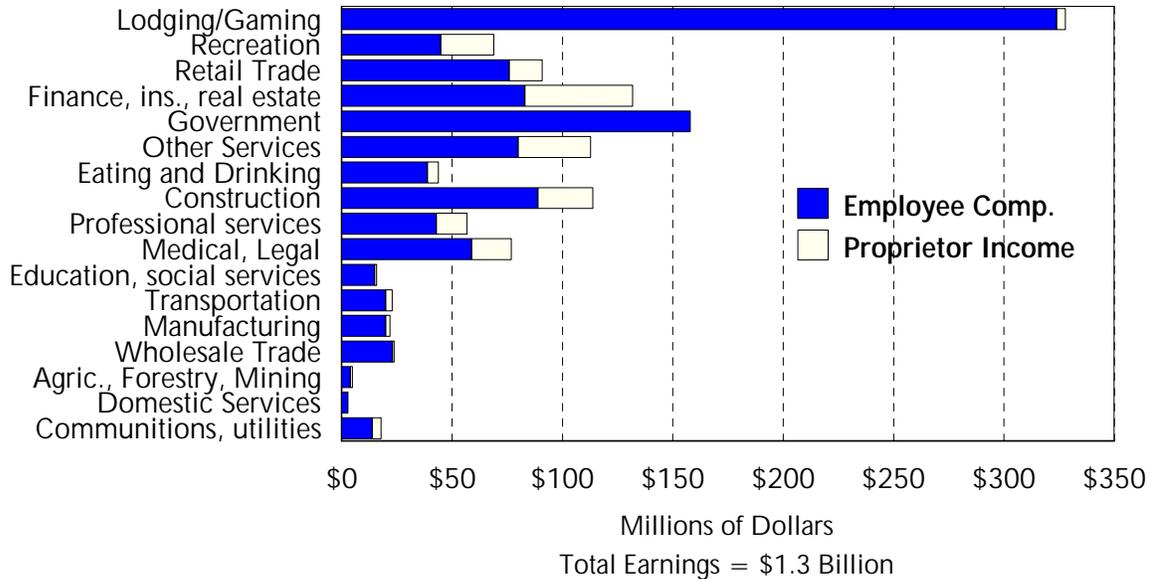
Employment and earnings provide a measure of the degree to which people living in the Tahoe Region can support themselves and their families. Approximately 49,000 people work within the Lake Tahoe Region. Employment and payroll figures are based on County Business Patterns Data for firms located within zip code areas selected to define the Lake Tahoe Region (see Appendix B). Businesses that depend primarily on travel and tourism – lodging establishments, gaming, restaurants, and recreation services – provide a major source of employment and payroll in the Lake Tahoe Region. As shown in Figure 11-5, lodging/gaming represents the largest employment category, which accounts for the casino-hotels located primary in South Lake Tahoe and other lodging establishments throughout the region. As shown in Figure 11-6, lodging/gaming establishments also generate a major source of the region’s total earnings through employee compensation (i.e., wages, salaries, and benefits). It is also interesting to note the business types such as recreation establishments, other services, and finance, insurance, and real estate establishments provide the primary source of proprietor income in the region.

Figure 11-5. Lake Tahoe Region Employment by Major Industry Group, 1998



Source: Dean Runyan Associates and Minnesota IMPLAN Group, Inc.

Figure 11-6. Lake Tahoe Region Earnings by Major Industry Group, 1998

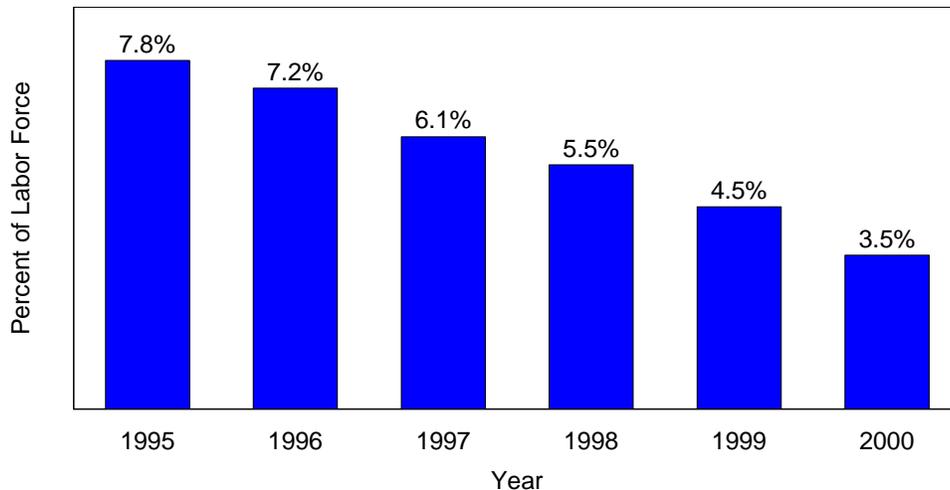


Source: Dean Runyan Associates and Minnesota IMPLAN Group, Inc.

C. UNEMPLOYMENT RATE

The unemployment rate represents the portion of the labor force looking for work. Between 1995-2000 the unemployment rate in Lake Tahoe Region fell from 7.8% to 3.5% of the labor force, see Figure 11-7. This trend indicates an increasing demand for labor in the region (i.e., a fairly tight labor market), which will tend to increase average wages and attract employees to the region. Over this same time period, statewide unemployment in California and Nevada has also fallen, but remains at a slightly higher rate of 4.9% and 4.4%, respectively.

Figure 11-7. Lake Tahoe Region Unemployment Rate, 1995-2000



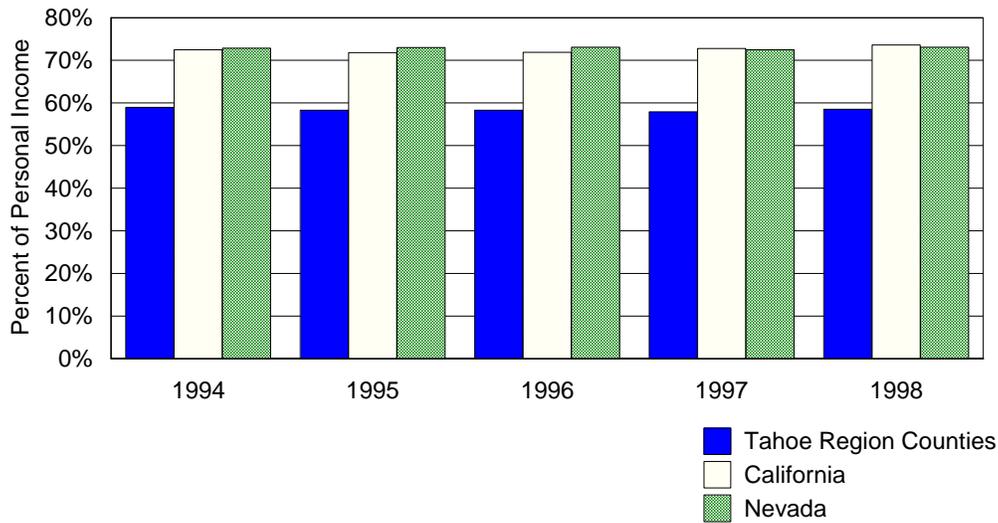
Source: US Census Bureau, California Employment Development Dept., Nevada Dept. of Employment, Training, & Rehabilitation, & DRA

D. SOURCES OF PERSONAL INCOME

Personal income, a measure of all income earned by residents living in an area, can be described in terms of four primary sources: 1) Local wages, representing wages earned inside an individual's county of residence 2) Transfer payments, including income from sources such as social security, welfare, disability and unemployment 3) Capital payments, including income from sources such as interest, dividends and rental income 4) Commute wages, representing wages earned outside an individual's county of residence. The composition of personal income is highly influenced by the economic and demographic trends for a particular area.

The degree to which personal income is composed of sources other than local wages (i.e., capital payments, transfer payments and commute wages) provides an indication of the economic contribution of retirees, commuters and others with primary income generated from sources outside the counties of the Lake Tahoe Region. Income derived from outside the area provides a buffer of protection against local economic shocks, as well as reducing fluctuations in business caused by seasonal trends. In California and Nevada as a whole, local wages make-up a significantly larger portion of personal income as compared to the four counties with populations in the Lake Tahoe Region (i.e., Placer, El Dorado, Douglas and Washoe). As shown in Figure 11-8, local wages represent about 58% of personal income for the four counties, as compared to about 73% for both California and Nevada.

Figure 11-8. Local Wages as a Percent of Total Personal Income, 1994-98



Source: Bureau of Economic Analysis & Dean Runyan Associates

E. ECONOMIC MEASURES OF VISITOR TRENDS

1. Transient Occupancy Tax Receipts

Transient occupancy taxes (TOT), the most direct means by which local governments can collect revenue from visitors, are an extremely useful measure of travel activity in the Lake Tahoe Region. Table 11-2 breaks out room tax receipts by jurisdiction for the Lake Tahoe Region in 1999.

Table 11-2 Lake Tahoe Region Room Tax Receipts and Rates by Jurisdiction, 1999

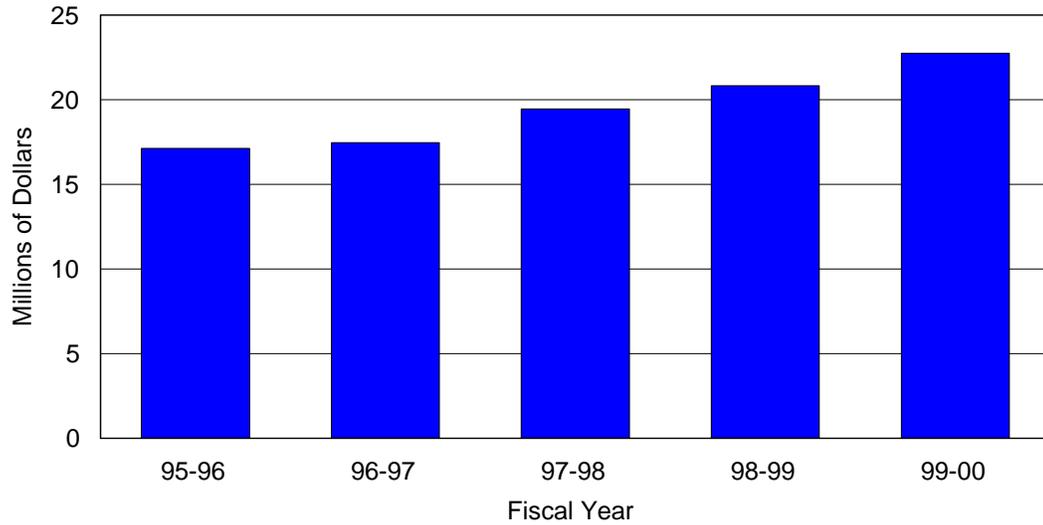
JURISDICTION	TAX RECEIPTS	TAX RATE
Douglas County	6,550,871	10%
City of South Lake Tahoe	9,194,888	10%
Placer County *	3,380,000	10%
Washoe County	3,611,834	12%
TOTAL	22,737,593	

* Placer County tax receipts do not include those collected at Squaw Valley USA and Northstar, which are outside the area of TRPA management.

Source: Dean Runyan Associates & local jurisdictions

The transient occupancy taxes collected in the Lake Tahoe Region for the years 1996 through 2000 are shown in Figure 11-9, providing a measure of growth in spending on overnight accommodations in the Lake Tahoe Region. Changes in TOT receipts are influenced by changes in the tax rates of individual jurisdictions, as well as increases in room sales; however, in the Lake Tahoe Region, the TOT growth was due primarily to increased spending on overnight accommodations.

Figure 11-9. Lake Tahoe Region, Transient Occupancy Tax Receipts 1995-2000



Source: Dean Runyan Associates

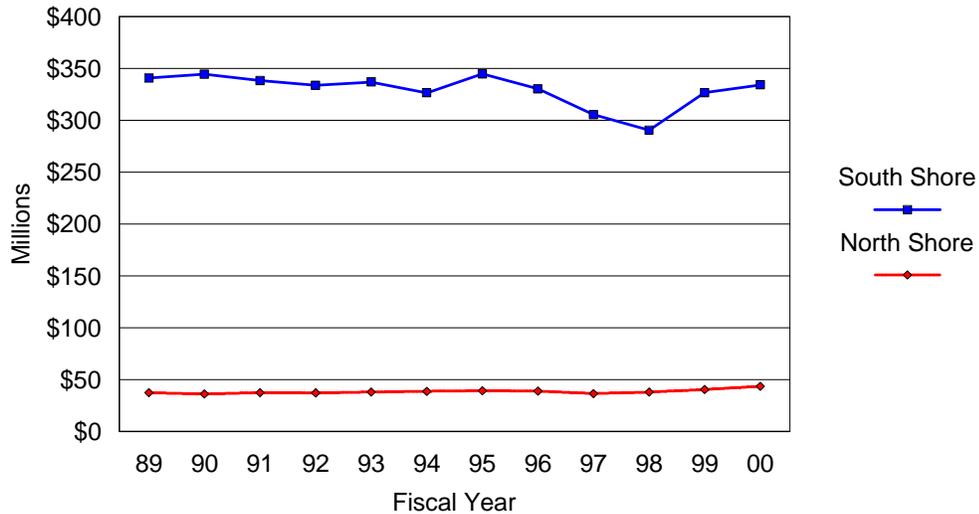
2. Gaming Revenue

As discussed previously, the gaming industry plays a substantial role in generating jobs and income throughout the Lake Tahoe Region. Gaming revenue for the Lake Tahoe Region can provide a measure of both the strength and direction of economic conditions for the Lake Tahoe Region gaming establishments. The casino establishments in the Lake Tahoe Region include:

South Shore	Harrah's Lake Tahoe, Harveys Resort, Bills Casino, Caesars Tahoe, Lake Tahoe Horizon Casino Resort, Lakeside Inn & Casino
North Shore	Hyatt Regency Lake Tahoe, Tahoe Biltmore Lodge & Casino, Crystal Bay Club & Casino, Jim Kelly's Tahoe Nugget, Cal-Neva Resort

With the exception of a slight downturn between 1995-98 for South Shore casinos, gaming revenue for the Lake Tahoe Region has held fairly steady over the last decade, amounting to about \$378 million per year. Given the high proportion of jobs associated with lodging/gaming establishments, significant changes in gaming winnings would signal a change in the overall composition of the region's economy. See Figure 11 – 10.

Figure 11-10. Lake Tahoe Region Annual Gaming Revenue (winnings), 1989-2000

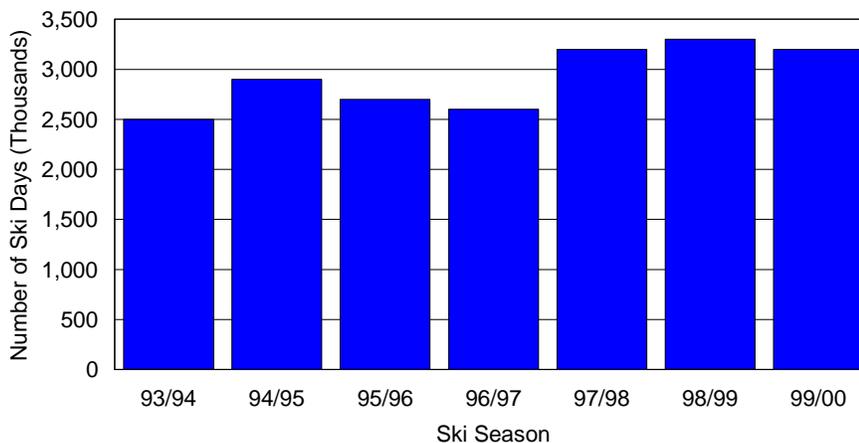


Source: Nevada Gaming Control Board & Dean Runyan Associates

3. Skier Days

Alpine ski resorts in the Lake Tahoe Basin serve as a primary visitor draw attracting large numbers of skiers and snowboarders during the winter months. Although several of the ski resorts in the Lake Tahoe Basin are outside the Lake Tahoe Region (resorts include Alpine Meadows, Northstar, Squaw Valley USA, Kirkwood, and Sierra Tahoe), many of the skiers and snowboards contribute to the Lake Tahoe Region economy through their spending on lodging, eating and drinking, and gaming. The annual number of alpine skier days provides a useful gauge of the economic conditions in the Lake Tahoe Region, particularly during the winter months of the year. As shown in Figure 11-11, total alpine ski days totaled about 3.2 million during the 1999-00 ski season and have grown by about 500,000 since the early 1990s.

Figure 11-11. Alpine Ski Days in Lake Tahoe Basin, 1993-2000



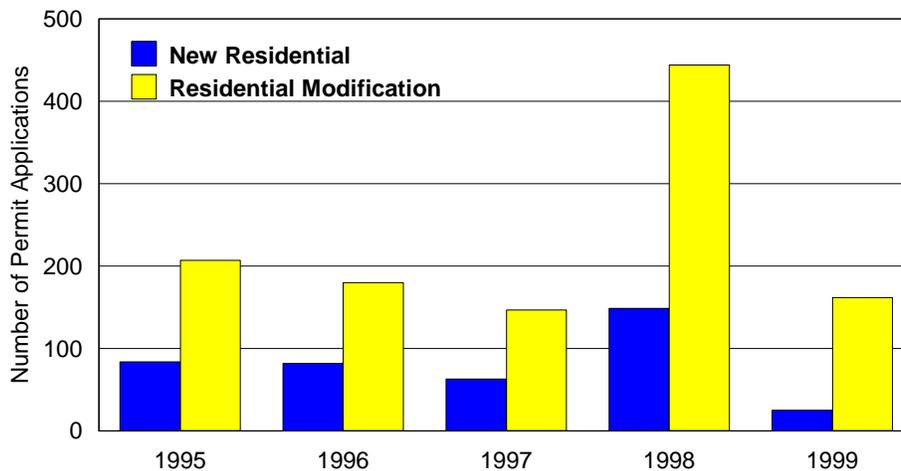
Note: Each ski year includes the Nov. - Dec. period from the previous year.
 Source: California Ski Industry Association & Dean Runyan Associates

F. HOUSING AND COMMERCIAL DEVELOPMENT

1. Residential Construction

Construction of new homes significantly impacts the economic conditions of the Lake Tahoe Region. New residents bring income from outside the region into the local economy, helping to generate employment and earnings both directly and indirectly. Construction jobs, a very cyclical sector of the economy, make up a significant percentage of the jobs in the Lake Tahoe Region. Since 1987, the Regional Plan has limited additional residential construction to 300 units per year. As shown in Figure 11-12, demand for permit applications during the last five years has been relatively stable with particularly strong during 1998. Permit applications for residential modification exceeded those for new residential construction nearly two to one. It is important to note that through memorandums of understanding (MOUs) residential construction permit applications are also received by each of the three counties (excluding Douglas County) and the City of South Lake Tahoe in the TRPA Region.

Figure 11-12. Number of Residential Construction Permit Applications Received by TRPA

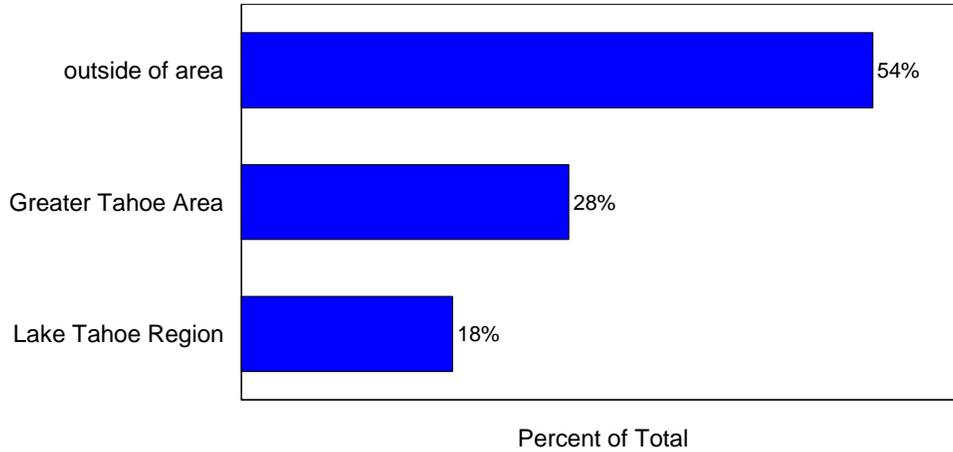


Source: TRPA & Dean Runyan Associates

Much of the housing construction appears driven by demand for vacation and second homes from part-year residents. An examination of the addresses reported by owners of Lake Tahoe homes provides a rough indication of the potential number of second homes in the region. In 1999, 54% of the owners of residential property in Lake Tahoe Region reported addresses with zip codes outside the Greater Tahoe Area. Based on 1990 US Census data, about 9,000 housing units were classified as seasonal, recreation and occasional use, representing about 40% of the total inventory of housing units in the Lake Tahoe Region. See Figure 11-13.

Figure 11-13. Single Family Homes, Condominiums, & Time Shares in Lake Tahoe Region, 1999

Mailing address of Property Owner



Source: Dean Runyan Associates & DataQuick

2. Sale Price of Residential/Vacation Home Units

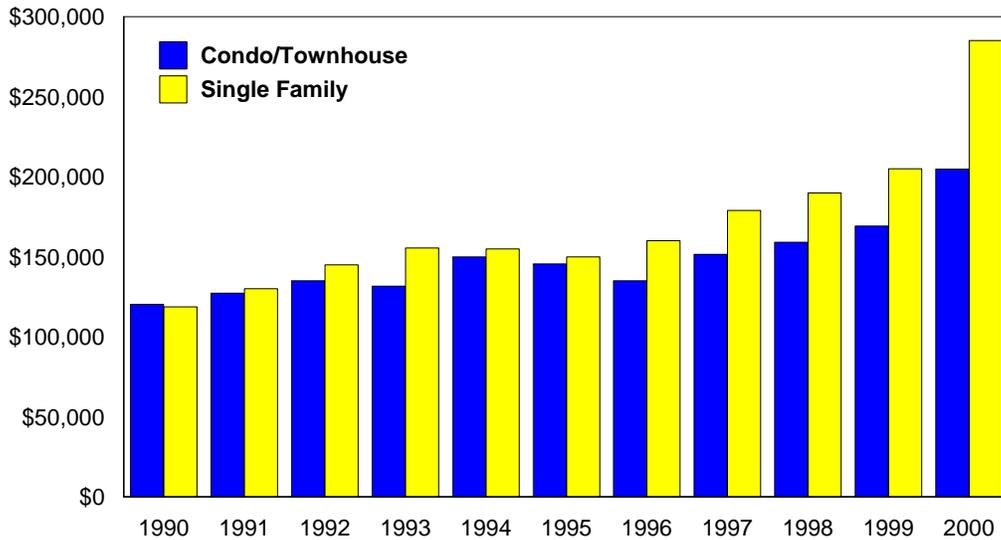
Among single-family homes and condominiums in the Lake Tahoe Region, there is a wide discrepancy between average and median sales prices—both of which have risen steadily over the last decade. The median is more representative of typical sales prices and provides a better indicator of overall affordability, while the average is influenced more by the sales of very high-priced units at the high end of the market. As shown in Table 11-3, the median prices in the Lake Tahoe Region were \$285,000 for single-family homes, and \$204,750 for condos during calendar year 2000. Sales of single-family homes outpaced sales of condominiums/townhouses.

	Single-Family	Condominiums/ Townhouses
Number of Sales	1,738	662
Average Price	\$489,294	\$278,349
Median Price	\$285,000	\$204,750

Sources: Dean Runyan Associates & DataQuick

As shown in Figure 11-14, the median sales price of both condominiums and single-family homes has steadily increased over the last decade. In 2000, single-family homes sold for a median price of \$285,000, up from \$119,000 ten years ago, representing an average increase of 9.1% per year over the last decade. Median home sales price provides an indication of the affordability of housing, particularly for business owners and employees in the region. Strong growth in home prices suggests that many of the region's workers may find it necessary to live outside the region in order to find affordable housing. Housing is generally considered to be affordable if no more than 30% of a household's gross income is used for rent or mortgage payment.

Figure 11-14. Median Sale Prices in Lake Tahoe Region, 1990-2000

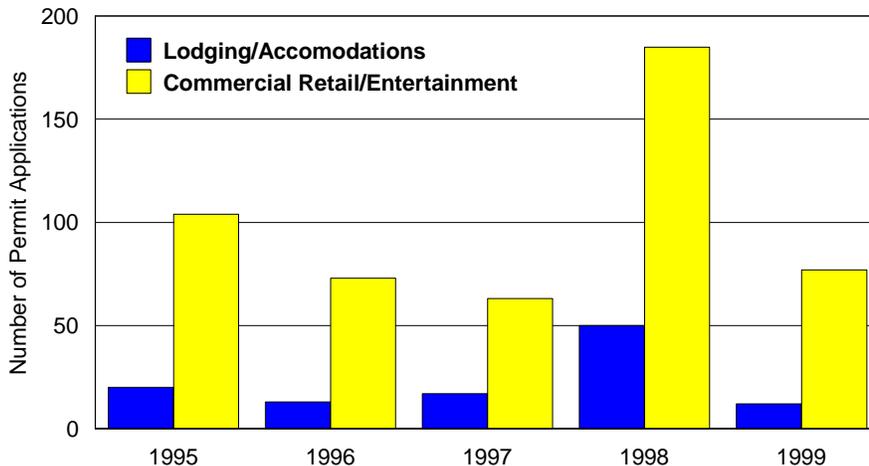


Source: Dean Runyan Associates & DataQuick

Nonresidential Construction

Trends in nonresidential construction provide an important indicator of the level of consumer demand in the Lake Tahoe Region. Nonresidential construction projects also impact the number of jobs in construction, one of the more volatile sectors of the local economy. Figure 11-15 shows the total number of nonresidential construction building permits between 1985-1998. TRPA distributes commercial allocations of 150,000 square feet for a five-year period among the various jurisdictions based on a variety of land use and environmental factors. It is interesting to note that most of the permit applications were for commercial retail/entertainment with a small portion for lodging/accommodations.

Figure 11-15. Number of Non-Residential Construction Permit Applications Received by TRPA



Source: TRPA & Dean Runyan Associates

G. Highway Traffic

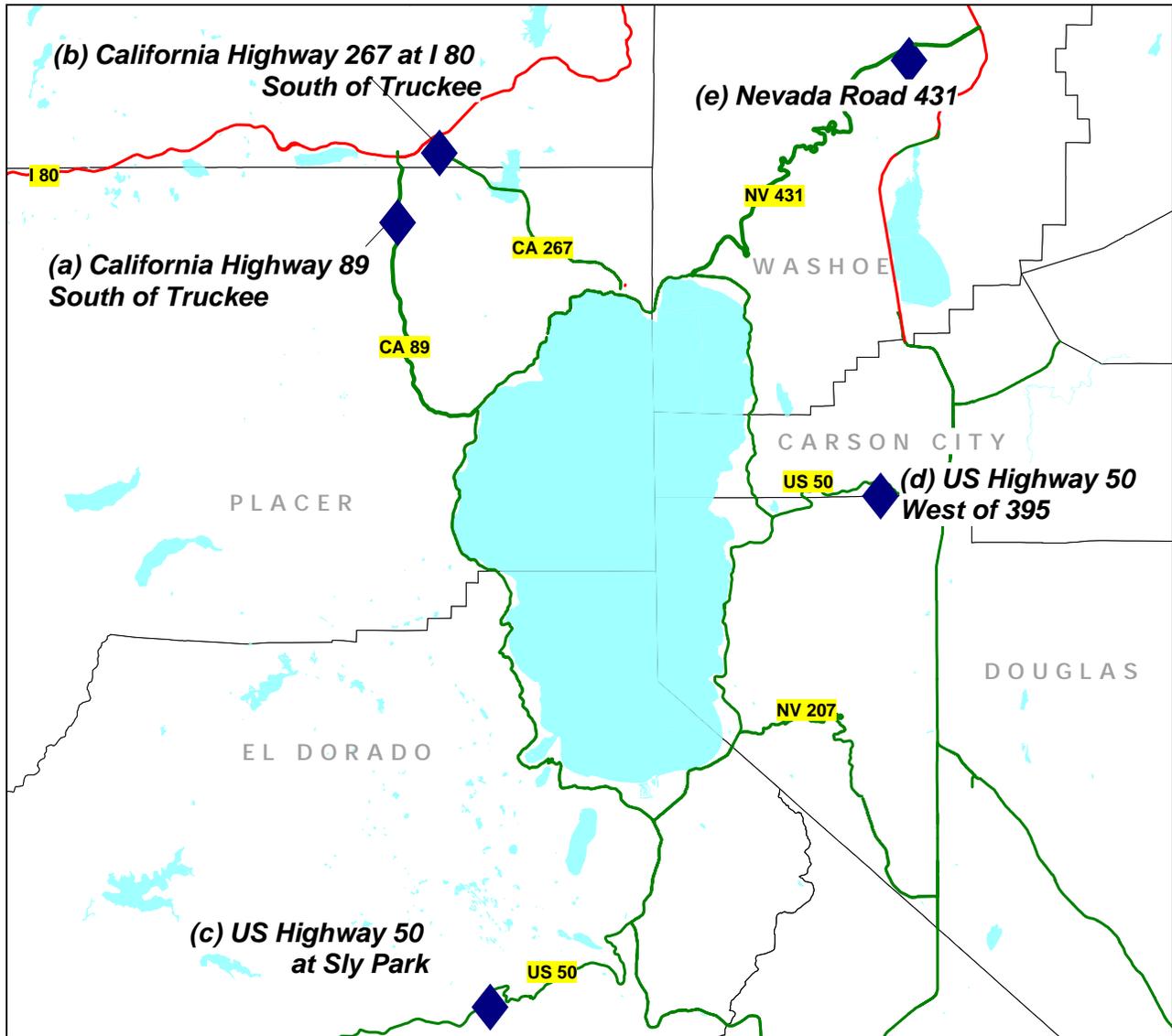
1. Travel Routes to Lake Tahoe Region

Highway traffic counts along primary access routes into the region can provide an important gauge of overall economic activity and a useful indicator of the seasonal variation related to travel, tourism, and recreation activity. The California and Nevada Departments of Transportation maintain year-round traffic counts along five highways that serve as the primary access routes into the Lake Tahoe Region:

- California State Highway 89 (a)
- California State Highway 267 (b)
- US Highway 50 (c)
- US Highway 50 (d)
- Nevada State Highway 431 (e)

A large portion of San Francisco Bay/Northern California visitor traffic travels via I-80, then south on California State Highway 89 to the Lake Tahoe Region. Highway 267, which parallels Highway 89, also carries a relatively large volume of traffic into the region. US Highway 50 provides a primary access to the Lake Tahoe South Shore via Sacramento from the west, and Reno/Tahoe International Airport in Nevada from the east. Nevada Highway 431 provides direct access from the Southern Reno area to Tahoe's north shore and Incline Village-Crystal Bay. These primary highways, along with the location of each traffic counter, are shown in Figure 11-16 on the following page.

Figure 11-16. Highway and Traffic Count Locations



Source Dean Runyan Associates

2. Average Daily Traffic

A common measure used to describe traffic volumes is Average Daily Traffic (ADT), which represents the total count of vehicles at a given location in both directions on a given day. ADT includes counts for all types of vehicles such as automobiles, trucks and recreational vehicles. Traffic related to leisure, tourism or recreation is included in ADT counts, as is commercial truck traffic. ADT counts also include traffic due to local area residents and employees traveling into and out of the region, going to and from work, shopping or other routine activities.

Table 11-4 shows ADT for the five highways in 1999. The two parallel routes off I-80 (CA State Highways 89 and 267) account for nearly two-thirds of the total traffic volume. I-80 provides day travelers with limited time the most convenient access to Lake Tahoe, particularly west shore locations. Highway 89 provides access to the town of Truckee, which has grown rapidly in recent years and now accounts for a resident population of about 13,000. Most likely, a significant portion of this traffic volume relates to resident and visitor activity associated with Truckee.

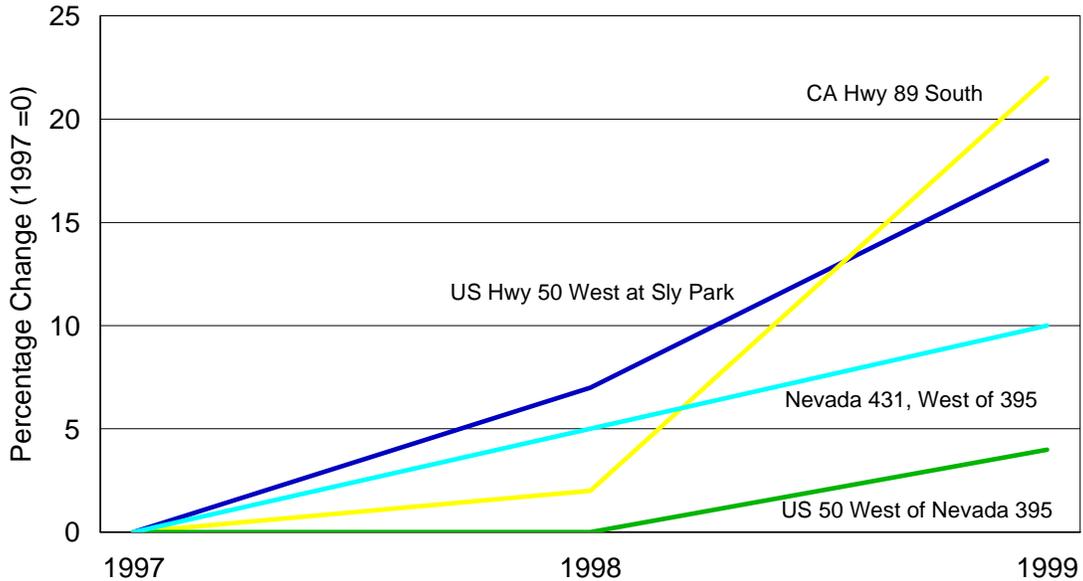
US Highway 50, which provides convenient access to the south shore of Lake Tahoe, accounts for about 14% of the total volume. Travel routes from Nevada carried the remaining quarter of the measured traffic volume. Visitors traveling from Reno would use either of these Nevada highways to access the region. Tahoe-Reno-Express, which offers year-round bus service from Reno, travels along US Highway 50 averaging 14-18 buses a day. As shown in Figure 11-17, ADT along each of the primary access routes has grown significantly over the past three years. In particular, ADT along California State Highway 89 has increased by nearly 23%—the highest rate of increase among the four¹. Over the last several years, the volume of traffic into the region from the California highways has grown faster as compared to the volume of traffic traveling into the region from Nevada.

Table 11-4. Annual Average Daily Traffic, 1999

Highway	ADT	Percent of Total
California State Highway 89	29,076	36
California State Highway 267	20,438	25
US Highway 50 (at Sly Park)	11,178	14
US Highway 50 (West of NV 395)	11,103	14
Nevada State Highway 431	8,757	11

¹ Historical data for California State Highway 267 was not available.

Figure 11-17 Change in Average Daily Traffic, Selected Access Points 1997-1999

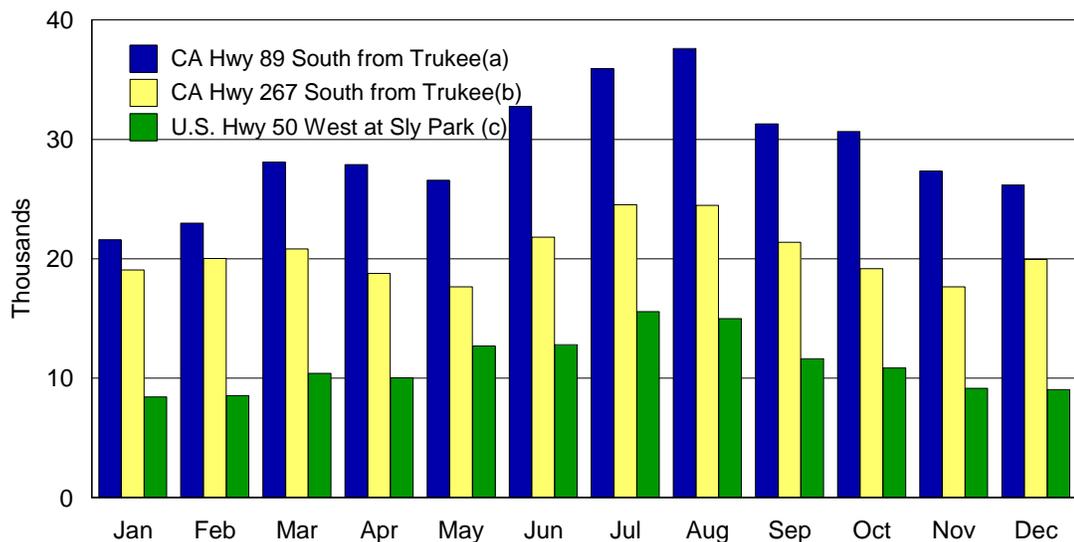


California/Nevada Department of Transportation and Dean Runyan Associates

3. Seasonal Variation

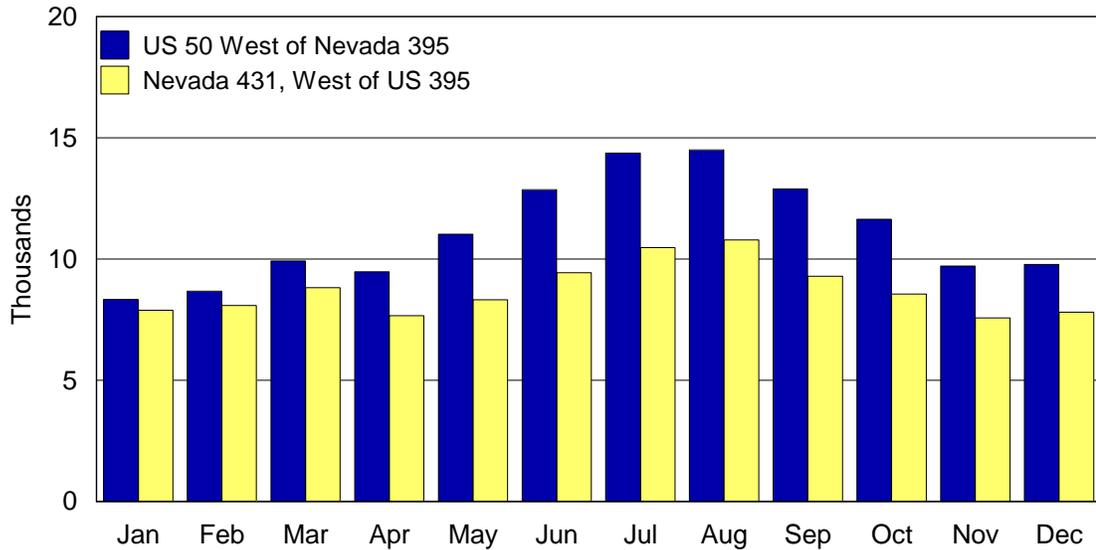
Given that each of these highways serves as an access route for visitors to the Lake Tahoe Region, seasonal variations in traffic can provide a useful indication of seasonal visitation patterns for the region. As shown in Figures 11-18 and 11-19, monthly ADT data for the five highways show a fairly consistent seasonal pattern with a peak period during the summer months (Jun-Sept).

Figure 11-18. Average Daily Traffic, 1999 California Access



Source: California Department of Transportation & Dean Runyan Associates

Figure 11-19. Average Daily Traffic, 1999 Nevada Access



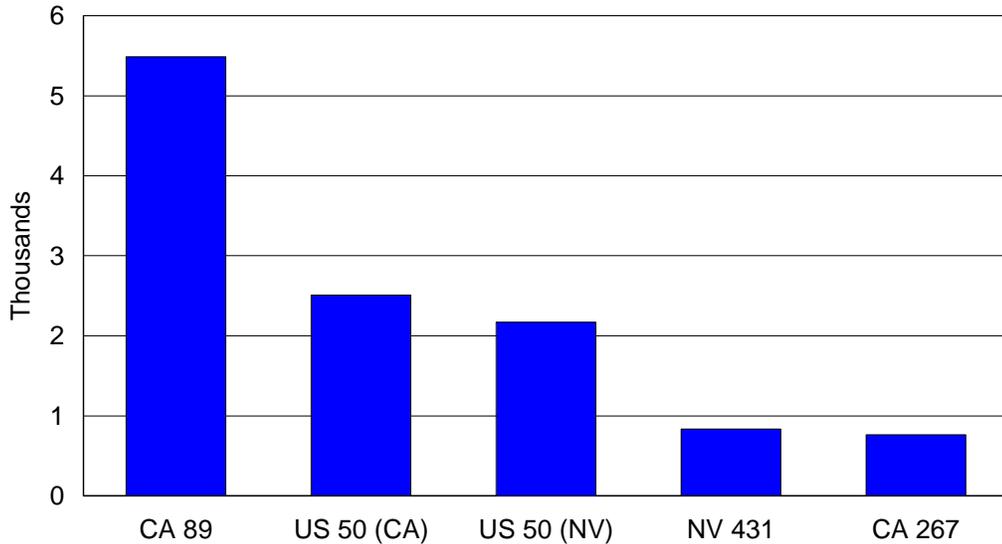
Source: Nevada Department of Transportation & Dean Runyan Associates

Table 11-5 shows the percent change from the annual average for each of the highways during the summer and winter months. Overall, during the summer months (Jun-Aug) ADT averaged 29% to 15% above the annual ADT, while winter months (Dec-Feb) averaged 22% to 4% below annual ADT. US Highway 50 shows the most seasonal variation followed closely by highway 89—an indication that visitors to the region have particularly strong influence on the traffic volume of these two highways. Highways 431 and 267 show significantly less seasonal variation, an indication that visitor traffic volume is less of a factor in the overall traffic volume.

Table 11-5. Percent Change in Seasonal ADT from Annual Average 1999		
Highway	Summer	Winter
US Highway 50 (at Sly Park)	29%	-22%
US Highway 50 (West of NV 395)	25%	-20%
California State Highway 89	22%	-19%
Nevada State Highway 431	17%	-9%
California State Highway 267	15%	-4%

Figure 11-20 illustrates the 1999 *summer visitor* ADT, i.e., the increase above the winter months, for each of the five highways. For example, Highway 89 carried, on average, 29,076 automobiles per day in 1999. During the average of the low months (Dec, Jan. and Feb.), it carried 23,588 per day. The difference (5,489) above the average low can be attributed to additional traffic, primarily during the peak summer period. Monthly ADT and increments above or below the average seasonal low are shown for each of these highways at the end of this chapter in the Supplemental Information section, Appendix B.

Figure 11-20. Visitor Traffic, 1999 (Annual ADT Increment Above Average Seasonal Low)

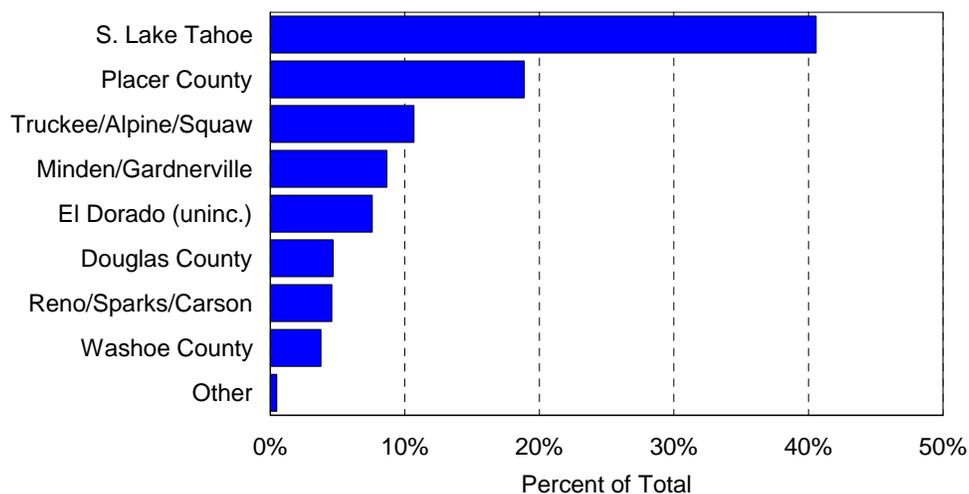


Source: California/Nevada Dept. of Transportation, & Dean Runyan Associates

4. Commuting Patterns

Commuting patterns are another important transportation indicator with potential implications for air quality and traffic congestion—both strong influences on quality of life for residents, as well as the level of satisfaction for visitors. Residents and employees commuting into and out of the region may account for significant vehicle traffic, influencing perceived quality of life factors, as well as environmental thresholds related to air quality. Understanding patterns of commuting can also help identify the extent of the market area in which business owners and employees spend income earned in the region.

Figure 11-21. Location of Residence, Lake Tahoe Region Employees, 1992



Source: TRPA 1992 Short Range Transit Program Study & Dean Runyan Associates

A 1992 TRPA transportation survey (most recent data available) revealed that approximately 24 percent of the employees in the Tahoe Region are choosing to live outside of the region. As shown in Figure 11-21, Lake Tahoe Region employees reside in a number of nearby locations including: Truckee, Reno, Sparks, Carson City, Minden, and Gardnerville. Additionally, the survey data reveals that nearly 9 percent of the region's residents were employed outside the region, primarily in the areas of Truckee, Alpine and Squaw Valley. These findings illustrate the extent to which residents of these nearby communities are integrated into the Lake Tahoe Region economy.

H. AIR TRANSPORTATION

The Reno-International Airport provides scheduled air service to Reno, with over 200 daily flights offered by a selection of major commercial air carriers. During 1999, the airport received over 3 million passenger arrivals with approximately 500,000 (17%) of the passengers reporting Lake Tahoe as their primary destination. Rental car, shuttle and limousine service is available at the airport, with about a 1-hour drive to Lake Tahoe via well-maintained Nevada State Highways.

Located in South Lake Tahoe, Lake Tahoe Airport maintains a single runway serviced by a parallel taxiway and six connecting taxiways. The runway is constructed to service intermediate-sized commercial jet aircraft. The Lake Tahoe Airport operates within an environmentally sensitive area, and is required to operate under strict guidelines – in particular noise abatement standards – that exceed those at the national level. Due to a variety of circumstances, it has been difficult to attract and maintain scheduled commercial air carriers willing to serve the airport. Allegiant Air, which served the airport up until November of 2000, has suspended all flights as a result of financial difficulties.

During 2000, the Lake Tahoe Airport received about 21,000 incoming general aviation passengers who flew on private (unscheduled) aircraft. General aviation passengers represent visitors, and do not include the incoming flights made by residents and business owners who may store their planes in hangars at the airport. The City of South Lake Tahoe is working to attract another scheduled air carrier and is committed to the continued operation of the airport and its facilities.

III. ECONOMIC IMPACTS GENERATED BY TRAVEL SPENDING IN THE LAKE TAHOE REGION

Previously discussed employment data by industry type shows that many of the businesses that provide goods and services to visitors (i.e., lodging/gaming, recreation, retail and eating & drinking) generate a substantial portion of the jobs and earnings in the region. However, this industry type data does not provide the detail necessary to examine the unique components of visitor spending by visitor type or by specific activities associated with visitor spending. In addition, it is difficult to describe the full extent of the economic impacts generated by visitor spending since many of the “indirect” impacts flow through types of businesses that are not directly associated with visitor activities.

This section describes the direct and indirect economic impacts of travel spending in the Lake Tahoe Region. Travel is defined as an overnight or day trip that is not of a routine or commuting nature. The purpose of such travel can be for recreation, business, shopping, to attend meetings, to visit with friends and family, or another personal reason. All overnight trips are defined as travel. Day travel is defined as a trip of over 50 miles, one-way, from the traveler’s home. Thus, most of the travel that occurs in the Lake Tahoe Region is included in the scope of this analysis, provided that it is not travel by residents of the region, or commuting or other routine travel by persons that reside outside of the region.

A. DIRECT ECONOMIC IMPACTS

The estimates are for 1996 through 2000 (preliminary) for the Lake Tahoe Region and the Greater Lake Tahoe area (which includes Truckee, Reno, Carson City, Alpine County, and portions of El Dorado and Placer counties). These estimates of the direct impacts associated with traveler spending were produced using the Regional Travel Impact Model (RTIM) developed by Dean Runyan Associates. The input data used to detail the economic impacts of the travel sector were derived from various local, state and federal sources.

The economic impact measurements of travel reported in this section represent direct economic impacts. Direct economic impacts include only the spending by travelers and the employment generated by that spending. Indirect or “multiplier” effects refer to the additional spending of businesses and employees induced by travel spending, which are also discussed in this section.

Direct Travel Impacts are broken out by Spending by Type of Accommodation, Spending by Type of Activity, and Employment Generated by Travel Spending, as well as Total Earnings and Tax Receipts. Spending by Type of Accommodation refers to the total travel spending in the Lake Tahoe Region for each type of traveler. For example, the total spending of travelers staying in a hotel, motel or Bed & Breakfast includes room expenses, meals, recreation, and so on. Spending by Type of Activity refers to the travel spending of all travelers for a particular type of activity such as skiing, gaming, eating and drinking, and accommodations. Accommodations spending includes all expenses attributable to rooms, rents and campground fees. Similarly, accommodations employment includes the lodging staff attributable to room sales, and the realtors and other personnel attributable to the rental and maintenance of vacation homes and

condominiums. However, accommodations employment does not include the food service employees that work in a hotel. Those employees are classified in the Eating and Drinking category. Similarly, employees related to gaming activities or skiing are classified in Recreation, even if they are employed by a resort hotel or lodging establishment. The specific categories of direct travel impacts included in this analysis are identified in the following tables.

<u>Impact Category</u>	<u>Description</u>
Expenditures	Purchases by travelers during their trip, including lodging taxes and other applicable local and state taxes, paid by the traveler at the point of sale.
Total Earnings	The earnings (wage and salary disbursements, earned benefits, and proprietor income) of employees of businesses that receive travel expenditures. Only the earnings attributable to travel expenditures are included; this typically is only a portion of all business receipts.
Employment	Employment associated with the above earnings; this includes both full- and part-time positions of wage and salary workers, as well as proprietors.
Local Tax Receipts	Point of sale tax receipts (transient occupancy taxes and local sales taxes) collected by counties and municipalities, as levied on applicable travel-related purchases. Property taxes are not included.
State Tax Receipts	State taxes attributable to travel expenditures (retail sales, motor fuel, gaming winnings in Nevada), business taxes levied on travel industry firms in California and personal income taxes attributable to travel-generated employment in California.

Travelers are classified according to the type of accommodation in which they stay. The types of visitors are as follows:

<u>Type of Visitor</u>	<u>Description</u>
Hotel, motel, or B&B	Travelers staying in commercially operated hotels, motels, resorts and bed & breakfast establishments where transient occupancy taxes are collected.
Rented vacation home or condominium	Travelers staying in rented vacation homes and condominiums where transient lodging taxes are collected.
Campgrounds	Travelers staying in commercial or public campgrounds.
Unpaid Accommodations	Travelers using their own vacation home or timeshare, and those borrowing or renting a vacation home, where a transient lodging tax is not collected. Travelers staying overnight in the private homes of friends or relatives are also included in this category
Day Visitor	A trip by a visitor 50 miles or more, one way, from home that does not include an overnight state at the destination.

Travel Impacts for the Lake Tahoe Region are summarized below in Table 11-6. Preliminary estimates for 2000 indicate that visitors spent more than \$1.5 billion on travel-related goods and services. This visitor spending generated \$435 million in earnings (payroll, benefits and proprietor income) and 22,100 jobs. The tax receipts generated by this spending included \$28 million in local transient occupancy and sales taxes, and \$89 million in state taxes. The state taxes include sales, motor fuel, gaming taxes (Nevada only), and personal and corporate income taxes (California only). Property taxes are not included in this analysis.

Table 11-6. Lake Tahoe Region Travel Impact Summary

Year	Travel Spending (\$Million)	Earnings (\$Million)	Employment (jobs)	Tax Receipts	
				Local (\$Million)	State (\$Million)
1996	1,235	348	19,900	21	77
1997	1,295	368	20,500	22	76
1998	1,380	386	21,100	24	78
1999	1,454	405	21,400	25	83
2000p	1,564	435	22,100	28	89
Average Annual Change					
96-00p	6.1%	5.7%	2.7%	7.0%	3.8%
99-00p	7.6%	7.3%	3.3%	8.6%	6.8%

Note: p= preliminary.

Source: Dean Runyan Associates

More than 80 percent of all travel expenditures in the Lake Tahoe Region was for accommodations, eating and drinking, and recreation, with the remainder going to a variety of retail businesses and local transportation. More than four out of every ten dollars was spent on recreation, including gaming and skiing. Detailed travel impacts for the Lake Tahoe Region are provided in Table 11-7 below.

Table 11-7. Lake Tahoe Region Travel Impacts, 1996-2000p

	1996	1997	1998	1999	2000p
Travel Spending by Type of Traveler Accommodation (\$Million)					
Paid Accommodations	933	978	1,046	1,101	1,181
Hotel, Motel, B & B	643	664	708	740	778
Rented Home, Condo.	260	280	308	328	369
Campground	29	34	30	32	34
Unpaid Accommodations *	109	113	118	124	130
Day Travel	194	204	216	229	253
TOTAL SPENDING	1,235	1,295	1,380	1,454	1,564
Travel Spending by Type of Activity (\$Million)					
Accommodations	228	238	255	268	286
Eating, Drinking	259	274	293	307	330
Recreation	532	556	593	625	676
Gaming	391	409	436	459	497
Skiing & Other Recreation	141	148	157	166	179
Retail and Other	216	227	240	253	271
TOTAL SPENDING	1,235	1,295	1,380	1,454	1,564
Earnings Generated by Travel Spending (\$Million)					
TOTAL EARNINGS	348	368	386	405	431
Employment Generated by Travel Spending (Jobs)					
Accommodations	5,700	5,700	5,900	5,900	6,100
Eating, Drinking	6,200	6,300	6,400	6,400	6,600
Recreation	6,000	6,300	6,700	6,900	7,200
Gaming	2,500	2,600	2,800	2,900	3,000
Skiing & Other Recreation	3,500	3,700	3,900	4,000	4,200
Retail and Other	2,000	2,100	2,100	2,100	2,200
TOTAL EMPLOYMENT	19,900	20,500	21,100	21,400	22,100
Tax Revenues Generated by Travel Spending (\$Million)					
Local Taxes	21	22	24	25	28
State Taxes	77	76	78	83	89
TOTAL TAXES	98	98	102	109	117

Table 11-7. Lake Tahoe Region Travel Impacts, 1996-2000p (continued)

Spending by Type of Accommodation refers to the total travel spending in the Lake Tahoe Region for each type of traveler. For example, the total spending of travelers staying in a hotel, motel, or B&B includes room expenses, meals, recreation, etc.

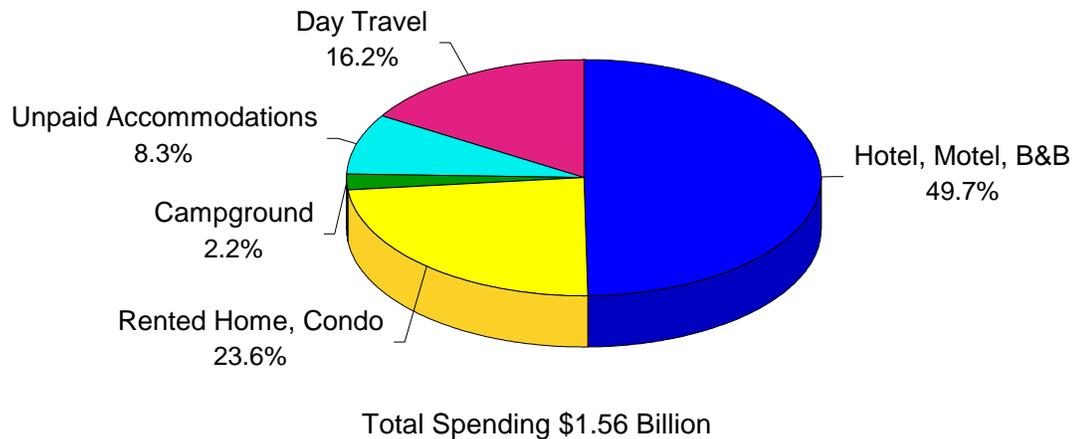
Spending by Type of Business refers to the travel spending of all travelers for a particular type of business activity. For example, accommodations spending includes all expenses attributable to rooms, rents and campground fees. Similarly, accommodations employment includes the lodging staff attributable to room sales and the realtors and other personnel attributable to the rental and maintenance of condos.

Details may not add to totals due to rounding.

*Unpaid accommodations includes second homes and visits in private homes where transient occupancy taxes are not collected.

Travel impacts reported by the type of accommodation in which travelers stay reveal the relative contribution of each traveler type to total travel impacts. Overnight visitors to the Lake Tahoe Region spend the night in a variety of accommodations, including hotels, motels, rented homes and condos, homes of friends and relatives, and campgrounds. As shown in Figure 11-22, visitors that stayed in paid accommodations spent three out of every four dollars in the Lake Tahoe Region. This includes \$778 million by visitors that stayed in hotels, motels and Bed & Breakfast establishments, \$369 million by those that stayed in rented vacation homes or condominiums, and \$32 million by those staying in campgrounds. In addition, seasonal visitors who stayed in second homes or personal vacation homes spent about \$130 million. Day visitors also made a significant contribution to the region's economy spending about \$253 million.

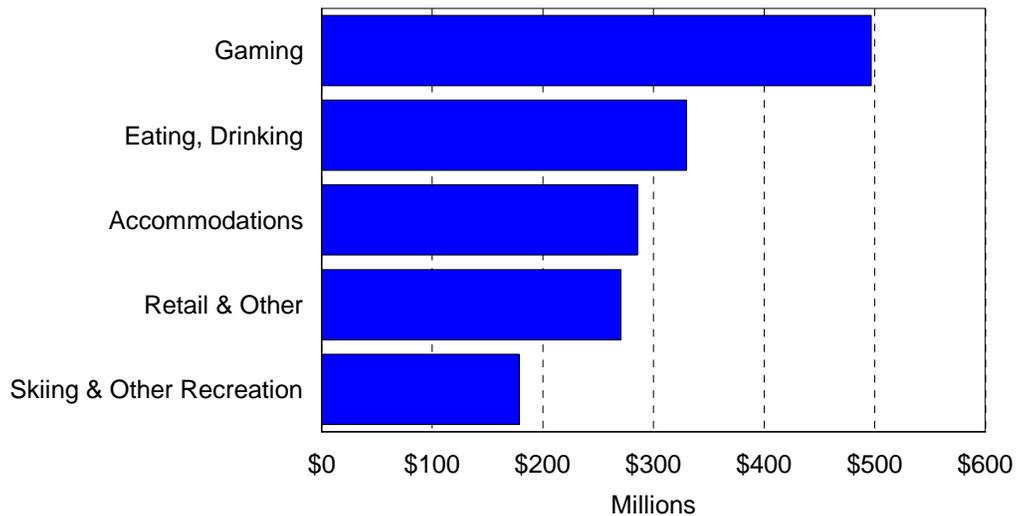
Figure 11-22. Travel Spending in Lake Tahoe Region by Type of Accommodation, 2000



Source: Dean Runyan Associates

As shown in Figure 11-23, travel spending is broken out by the type of activity in which visitors make their expenditures. The largest share of visitor spending in the Lake Tahoe Region occurred for gaming. In 2000, visitors to the Lake Tahoe Region spent about \$497 million on gaming, most of which occurred in gaming establishments located in Stateline, Nevada on the south shore of Lake Tahoe. Visitors also spent \$330 million on eating and drinking, and \$286 million on overnight accommodations in the region. It is important to note that spending on skiing & other recreation includes visitor spending made at ski resorts located in the Lake Tahoe Region, which includes Heavenly Valley, Homewood, and Diamond Peak. Recreation spending at ski resorts outside the Lake Tahoe Region is included in the economic impacts of the Greater Tahoe Area.

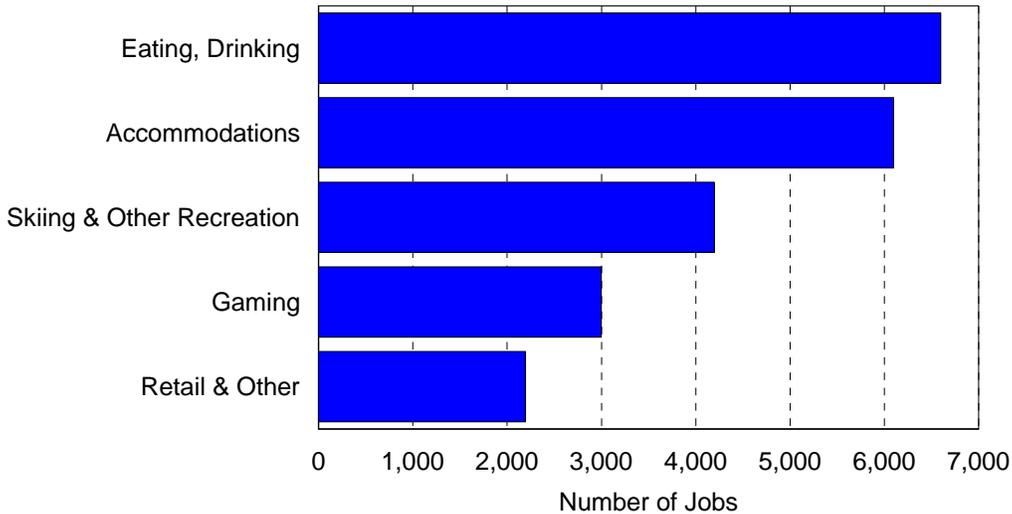
Figure 11-23. Travel Spending in Lake Tahoe Region by Type of Activity, 2000



Source: Dean Runyan Associates

Visitor spending in the Lake Tahoe Region directly supported 22,100 jobs (both full-and part-time) with total earnings of \$435 million. Figure 11-24 shows the distribution of travel-generated employment in the region. With the exception of gaming, the direct travel-generated employment impacts generally correspond to the distribution of travel spending, with more than half of the jobs generated by spending on accommodations and food services. As compared to more service-oriented activities, expenditures on gaming directly generate fewer jobs for each dollar spent.

Figure 11-24. Travel Generated Employment in Lake Tahoe Region, 2000



Source: Dean Runyan Associates

Comparison with Surrounding Regions

Comparing the travel-generated economic impacts for the Lake Tahoe Region with surrounding areas provides a perspective of the degree of economic significance of visitor-related spending in the Lake Tahoe Region. As shown in Table 11-8 and Figure 11-25, the Lake Tahoe Region accounts for about 30 percent of the travel impacts in the Greater Tahoe Area (includes Reno and Carson City), and 22 percent of the travel impacts for the entire Sierra-Nevada Region (defined in this analysis as 12 California counties and Douglas, Washoe and Carson City counties in Nevada; see list of counties below).

	<u>Travel</u>		<u>Employment</u> (jobs)	<u>Tax Receipts</u>	
	<u>Spending</u> (\$Million)	<u>Earnings</u> (\$Million)		<u>Local</u> (\$Million)	<u>State</u> (\$Million)
Lake Tahoe Region					
Greater Tahoe balance	3,424	812	38,800	36	303
<i>Greater Tahoe subtotal</i>	<i>4,878</i>	<i>1,218</i>	<i>60,200</i>	<i>62</i>	<i>386</i>
Sierra-Nevada balance	1,699	602	40,580	33	82
Total Sierra-Nevada	6,577	1,820	100,780	95	468

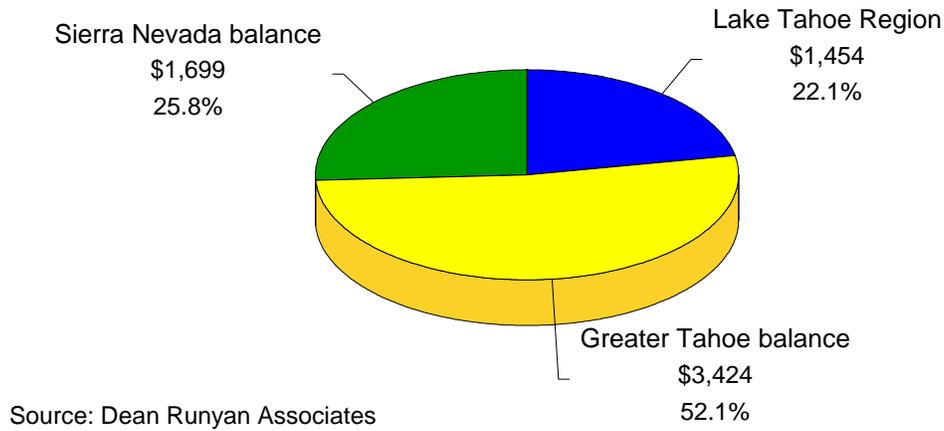
Source: Dean Runyan Associates

* Estimates for year 2000 are not available for Greater Tahoe Area and Sierra-Nevada Region.

The Greater Tahoe subtotal includes the Lake Tahoe Region plus Carson City, and the remainder of Washoe and Douglas counties in Nevada, and Alpine as well as portions of El Dorado, Nevada and Placer counties in California.

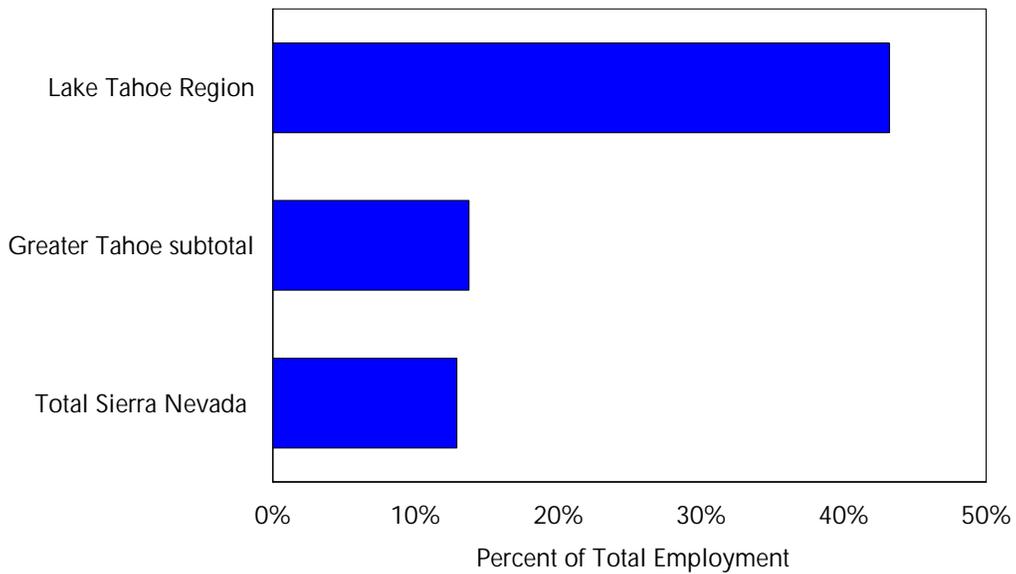
The Total Sierra-Nevada includes the Greater Tahoe subtotal plus Amador, Calaveras, Inyo, Mariposa, Mono, Plumas, Sierra, and Toulumne counties in California, as well as the remainder of El Dorado and Placer counties.

Figure 11-25. Travel Spending by Location: Lake Tahoe Region, Greater Tahoe Area, & Sierra Nevada Region, 1999



The significance of the travel industry for the Lake Tahoe regional economy is further illustrated in Figure 11-26 below. Almost one-half (43 percent) of all employment in the Lake Tahoe Region is directly generated by travel expenditures. The proportion is significantly lower for the Greater Tahoe Area and the Sierra-Nevada Region – which includes Reno and Carson City – due to the greater relative importance of non-travel related business and government activities in those regional economies.

Figure 11-26. Direct Travel-Generated Employment as Percent of Total Employment, 1999



B. INDIRECT IMPACTS

This section describes important indirect economic impacts generated by visitor spending in the Lake Tahoe Region. Part of the money spent by visitors in the Lake Tahoe Region is re-spent throughout the Greater Tahoe Area by visitor-related businesses, in purchasing services and supplies in the area, as well as the employees that work in those businesses. This section provides a picture of the magnitude and the types of businesses that generate these additional indirect impacts. Indirect impacts are discussed in terms of employment (jobs) and earnings (wages, benefits and proprietor income).

For the purpose of analyzing such indirect impacts, the Greater Tahoe Area is the appropriate economic area to consider. As illustrated in the map on page 3 (Figure 11-1), the Greater Tahoe Area includes the Lake Tahoe Region and surrounding areas including the communities of Truckee-Donner, Olympic and Squaw Valley, Reno-Carson City, and Garnerville-Minden. Lake Tahoe Region businesses and employees are likely to purchase some level of goods, services and housing in the Greater Tahoe Area.

Before proceeding, it is useful to clarify a few of the terms that appear in this discussion. Additional discussion, as well as a description of the IMPLAN methodology we used, can be found in the Supplemental Information section, Appendix D.

Direct impacts represent the employment and earnings attributable to travel expenditures made directly by visitors to the Lake Tahoe Region.

Indirect impacts represent the employment and earnings associated with businesses that supply goods and services to the businesses that directly serve visitors.

Induced impacts represent the employment and earnings that result from purchases for food, housing, transportation, recreation, and other goods and services made by employees of the businesses that directly serve visitors.

For purposes of discussion in this report, indirect and induced impacts are collectively called indirect impacts.

Direct and Indirect Travel Impacts

The magnitude and distribution of indirect employment and earnings highlight the connection between travel-generated jobs in the Lake Tahoe Region, and other businesses located both in the region and throughout the Greater Tahoe Area. As shown in Table 11-9, Lake Tahoe Region visitor-spending generates approximately 36,000 jobs in the Greater Tahoe Area, with about 14,000 of these jobs generated through indirect impacts. Employment estimates include both full-time and part-time workers. Also shown in Table 11-9, visitors generate about \$887 million in earnings, of which \$452 million is a result of indirect and induced impacts. A detailed breakdown of the distribution of employment and earnings appears in Tables 11-10 and 11-11.

Table 11-9. Employment and Earnings Generated by Lake Tahoe Region Travel Expenditures, 2000		
	Employment (Jobs)	Earnings (Millions)
Direct	22,100	435
Indirect	3,700	117
Induced	10,305	335
Total	36,105	887

Source: Dean Runyan Associates & Minnesota IMPLAN Group, Inc.

Overall, the direct and indirect visitor generated impacts represent about 74% of total employment and 68% of total earnings in the Lake Tahoe Region.

Table 11-10. Total Employment Generated by Lake Tahoe Region Visitor Expenditures, 2000

Industry Group	Employment (Jobs)			Total
	Direct	Indirect	Induced	
Agriculture, Forest, Mining	0	79	54	133
Construction	0	305	1,358	1,664
Manufacturing	0	139	245	384
Transportation	0	219	214	433
Communications, utilities	0	175	124	299
Wholesale Trade	0	138	318	456
Eating and Drinking	6,600	107	819	7,526
Retail Trade	2,200	61	1,727	3,988
Finance, insurance, real estate	0	582	544	1,126
Lodging/Gaming	9,100	108	110	9,318
Business & Personal Services	0	1,142	702	1,844
Recreation	4,200	82	181	4,464
Medical, Legal	0	61	1,069	1,130
Education, social services	0	15	1,415	1,430
Professional services	0	417	404	822
Government (non-education)	0	69	884	953
Domestic Services	0	0	136	136
Total	22,100	3,700	10,305	36,105

Source: Dean Runyan Associates & Minnesota IMPLAN Group, Inc.

¹Transportation includes air and local ground transportation

²Retail trade includes gasoline service and food stores

³Business and personal services includes a variety of business and personal services such as laundry, cleaning and supply services, personal supply services, computer and data processing services, electrical repair service, and services to buildings.

Table 11-11 Total Earnings Generated by Lake Tahoe Region Visitor Expenditures, 2000

Industry Group	Earnings (\$ 000)			Total
	Direct	Indirect	Induced	
Agriculture, Forest, Mining	0	1,383	1,120	2,502
Construction	0	13,230	53,244	66,474
Manufacturing	0	4,676	9,272	13,948
Transportation	0	7,056	7,663	14,719
Communications, utilities	0	10,364	8,119	18,482
Wholesale Trade	0	5,880	13,512	19,392
Eating and Drinking	82,651	1,384	10,576	94,611
Retail Trade	34,800	1,234	37,118	73,153
Finance, insurance, real estate	0	14,730	17,965	32,695
Lodging/Gaming	239,253	2,885	2,925	245,062
Business & Personal Services	0	28,049	17,519	45,568
Recreation	78,301	2,116	3,882	84,299
Medical, Legal	0	4,316	49,483	53,799
Education, social services	0	307	53,904	54,212
Professional services	0	15,046	12,715	27,762
Government (non-education)	0	3,932	34,792	38,723
Domestic Services	0	0	1,370	1,370
Total	435,005	116,589	335,178	886,772

Source: Dean Runyan Associates & Minnesota IMPLAN Group, Inc.

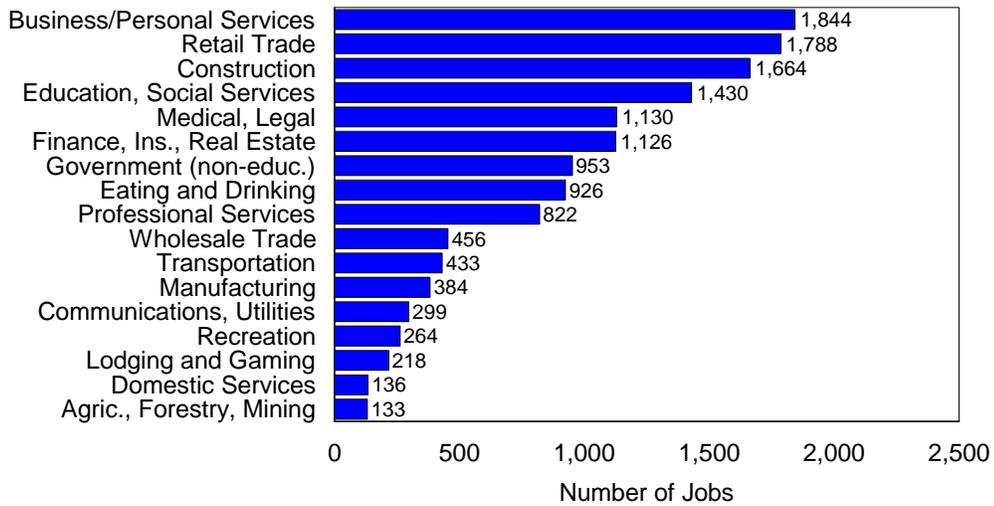
¹Transportation includes air and local ground transportation

²Retail trade includes gasoline service and food stores

³Business and personal services includes a variety of business and personal services such as laundry, cleaning and supply services, personal supply services, computer and data processing services, electrical repair service, and services to buildings.

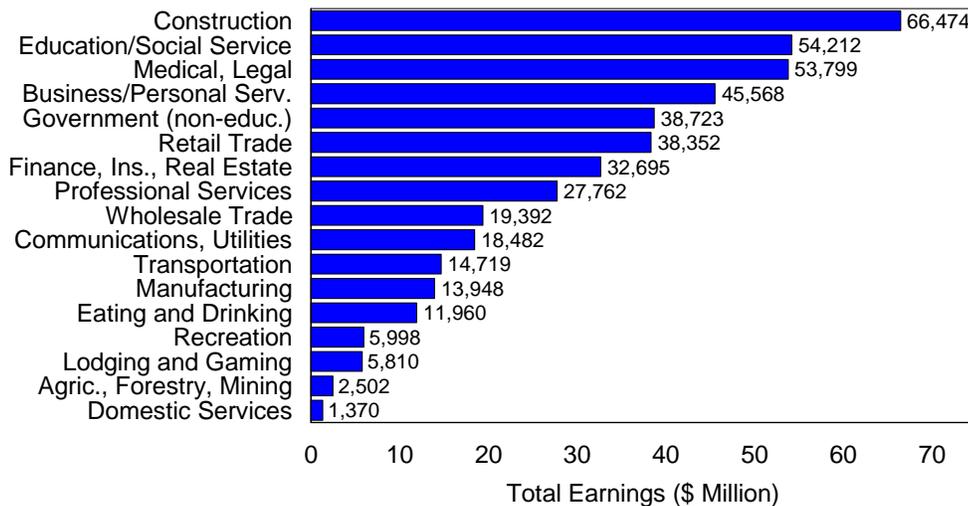
Employment indirectly generated through Lake Tahoe Region visitor spending occurs in a variety of business types including: business and personal services, retail trade, construction, and education/social services, medical/legal, and finance, insurance and real estate. As viewed in terms of total earnings (wages, benefits and proprietor income), those business types with relatively high wage jobs, such as construction, education/social services and medical/legal, generate a more significant proportion of the indirect earnings. Figures 11-27 and 11-28, below, show the distribution of indirect impacts for both employment and earnings.

Figure 11-27. Indirect Employment Generated by Lake Tahoe Region Visitor Spending, 2000



Source: Dean Runyan Associates & Minnesota IMPLAN Group, Inc.

Figure 11-28. Indirect Earnings Generated by Lake Tahoe Region Visitor Spending, 2000



Source: Dean Runyan Associates & Minnesota IMPLAN Group

IV. EXTERNAL AREAS AFFECTING THE LAKE TAHOE REGION

This section focuses on the primary areas where Lake Tahoe Region visitors live. Monitoring the demographic and economic conditions in these areas can provide useful indicators of trends likely to influence the Lake Tahoe Region. As previously described in terms of economic impacts, visitor spending generates a large portion of total employment and earnings in the Lake Tahoe Region.

Survey research shows that residents of California and Nevada are the primary source of visitors to the Lake Tahoe Region. As described below, four specific regions were identified as primary areas where Lake Tahoe Region visitors live. Economic and demographic conditions in these regions will influence the magnitude and pattern of economic activity for the Lake Tahoe Region.

Los Angeles Basin

The Los Angeles Basin Region is composed of five coastal counties – Los Angeles, Orange, San Diego, Santa Barbara and Ventura – located in the southern part of the state. With 16.8 million residents, the Los Angeles Basin region accounts for half of California's population. The region contains the state's two largest cities, Los Angeles and San Diego. Other cities with more than 100,000 residents are Long Beach, Glendale, Oxnard, Pomona, Torrance, Pasadena, Santa Clarita, Inglewood, El Monte, Thousand Oaks, and Lancaster.

San Francisco Bay Area

The San Francisco Bay Area Region is located in north-central California, with each of its nine counties bordering the San Francisco Bay. Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma are the counties comprising the Bay Area. With 6.8 million residents, it is the second most populous region in California. The greatest growth has occurred south of San Francisco in Santa Clara County, an area once famous for fruits and vegetables that is now the renowned Silicon Valley. The fastest growing city is San Jose, now California's third largest.

Sacramento Valley

The Sacramento Valley Region is located in Northern California, bounded by the Nevada border to the east and parts of the coastal range on the west. Seven counties comprise the region: Alpine, Amador, Calaveras, El Dorado, Placer, Sacramento, and Yolo. More than 1.8 million people live in the Sacramento Valley region, with almost two-thirds residing in the Sacramento Metropolitan Area. Between 1986 and 1996, population increased in the Sacramento area by almost 29 percent, with the foothill counties showing the fastest growth.

Northwest Nevada

The Northwest Nevada Region is comprised of five counties – Douglas, Carson City, Lyon, Storey, and Washoe – located in the northwestern part of the state. With 464,000 residents, it includes the urban areas of Reno-Sparks and Carson City. The residents of this region have convenient access to, and are within standard day-trip travel distance to, Lake Tahoe.

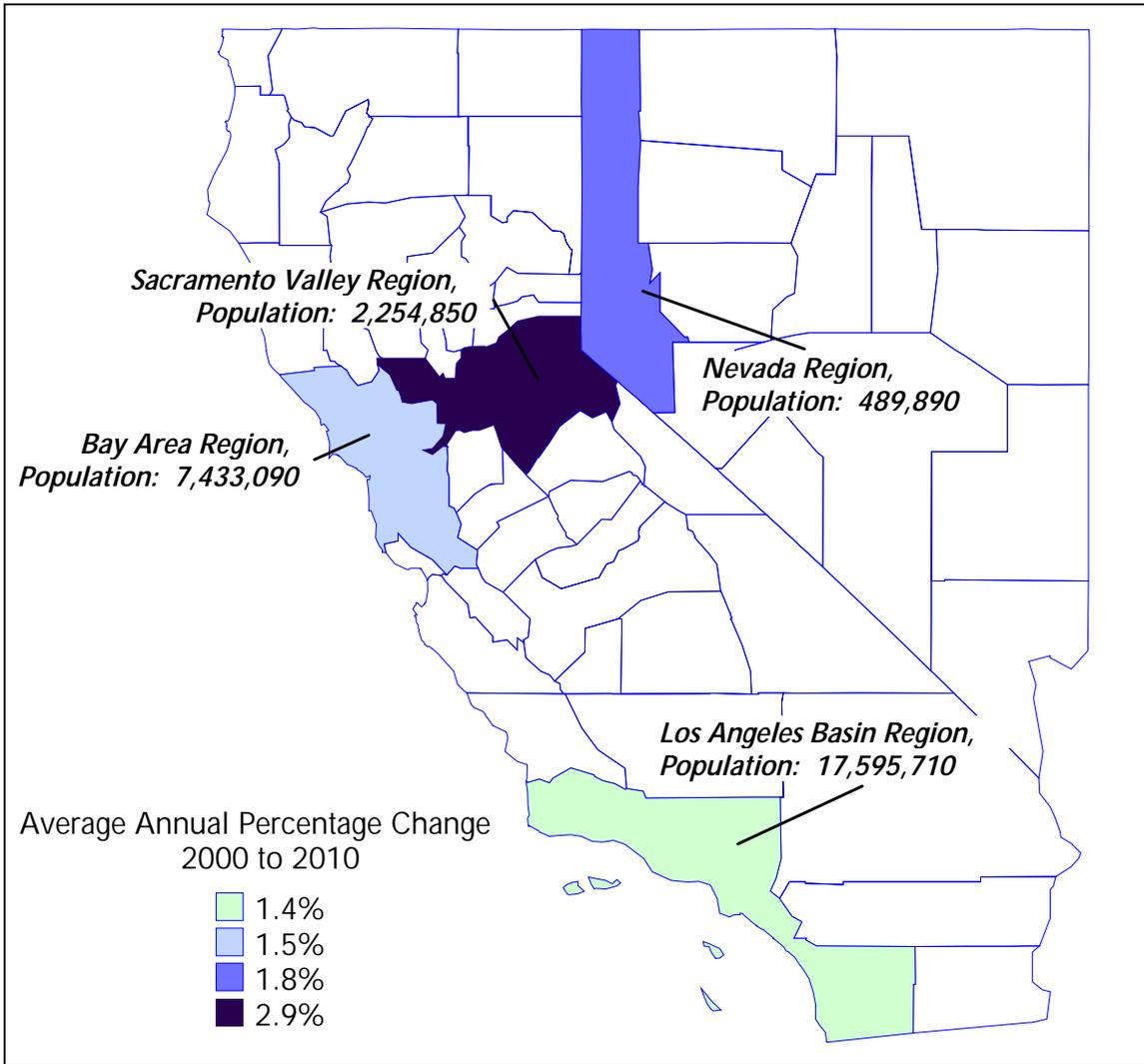
A. DEMOGRAPHIC CHARACTERISTICS AND TRENDS

1. Population

Steady population growth in the visitor regions, particularly those areas with the shorter driving times, will encourage visitation to the Lake Tahoe Region. Table 11-12 shows the projected population of each visitor region in 2010, and approximate driving time from each region to Lake Tahoe. The Los Angeles Basin contains the largest and longest traveling group of visitors to Lake Tahoe. The San Francisco Bay Area will contain a population of nearly 7.5 million within relatively close distance for overnight visits to Lake Tahoe. The population of the Sacramento Valley Region represents a primary group from which Lake Tahoe visitors are drawn, and many frequent repeat visitors will tend to live within this area. As shown in Figure 11-29, the Sacramento Valley Region is expected to grow the fastest with 2.9% average annual percent growth during the period 2000-10.

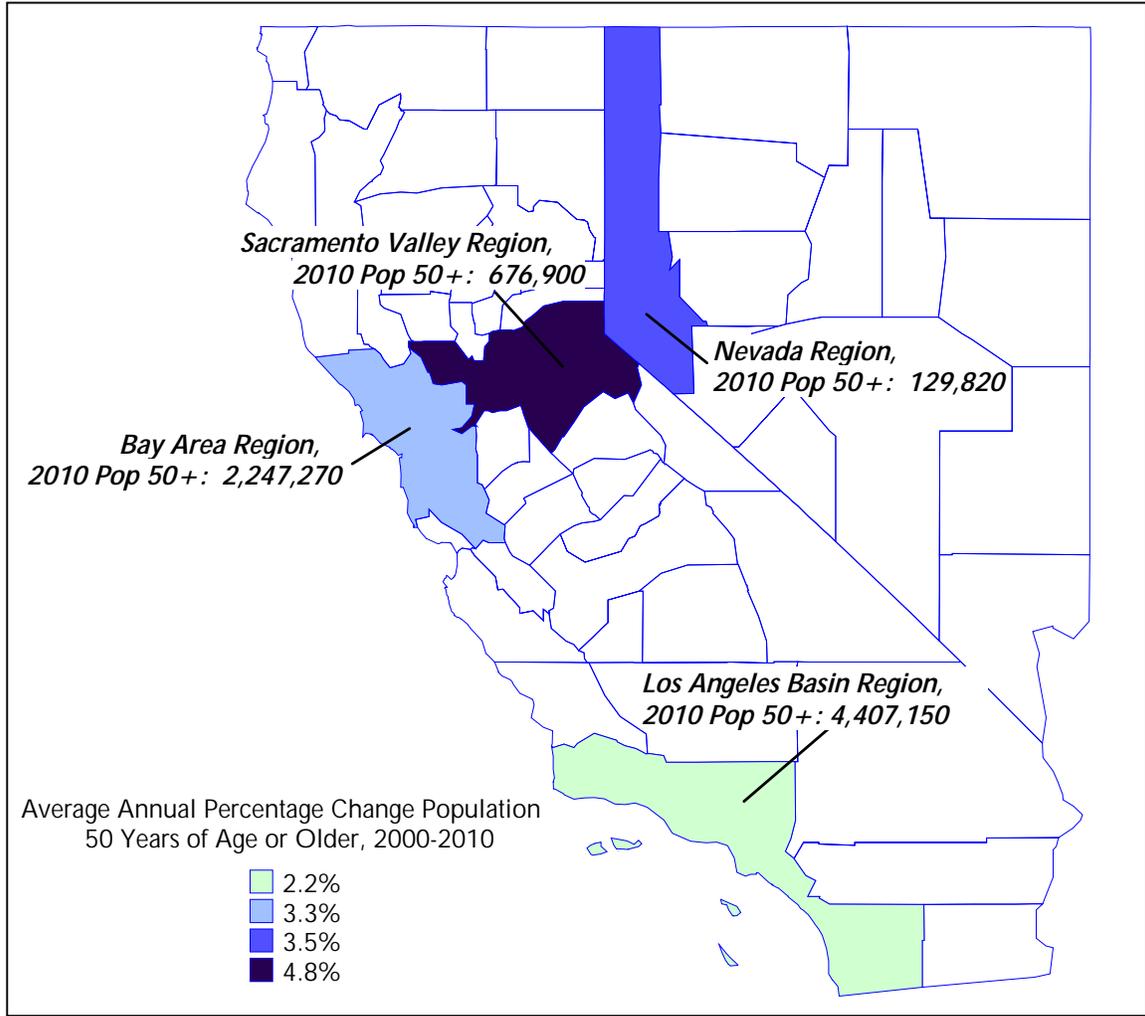
Region	Population 2010	Driving Time to Lake Tahoe
Los Angeles Basin	17,595,710	9 to 12 hours
San Francisco Bay Area	7,433,090	4 to 5 hours
Sacramento Valley	2,254,850	1 to 3 hours
Northwest Nevada	489,890	1 to 2 hours

Figure 11-29. Projected Population by Visitor Region, 2010



Source: Dean Runyan Associates and The National Planning Association

Figure 11-30. Projected Population 50 Years of Age and Older by Visitor Region, 2010

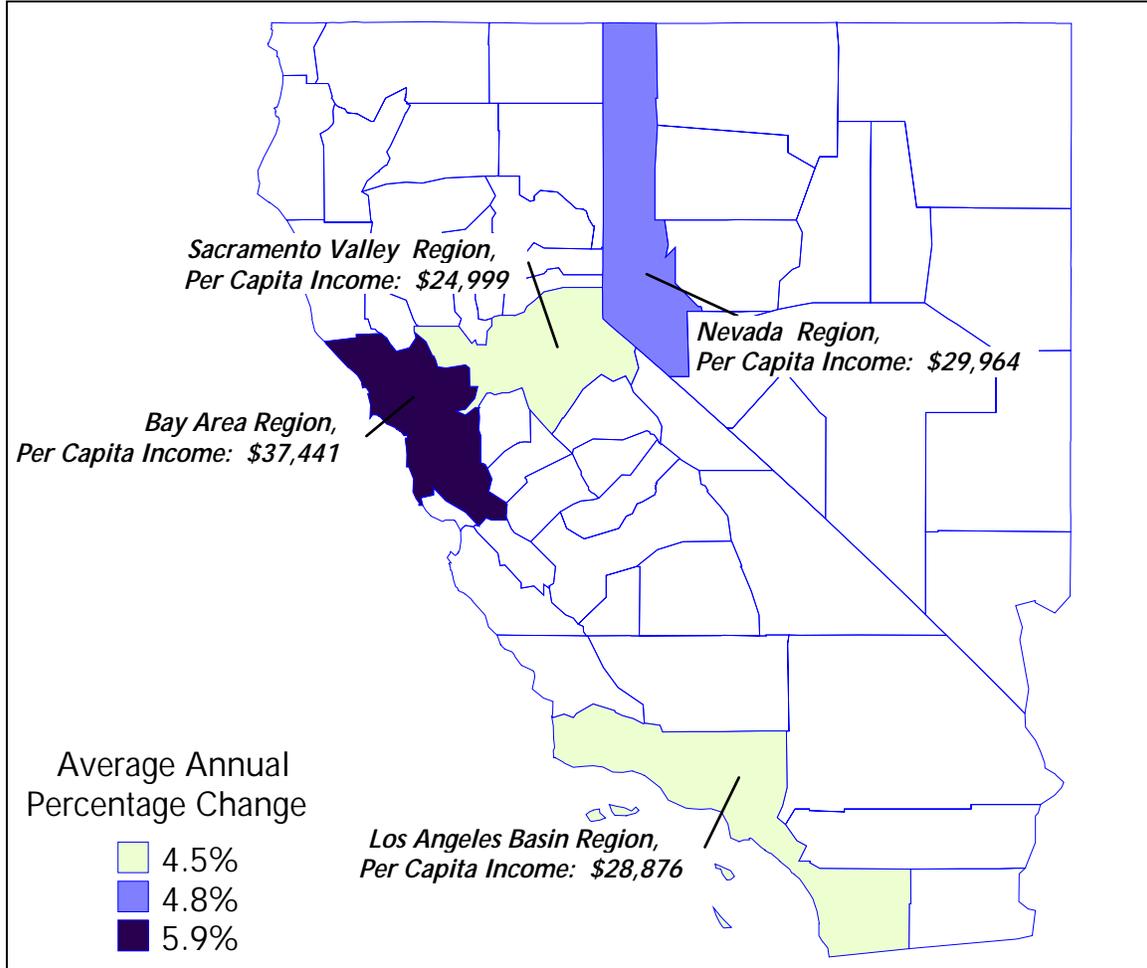


Source: Dean Runyan Associates and The National Planning Association

2. Age Distribution

Over the next decade, the age population of those over 50 will become a more prominent segment. Figure 11-30 shows the population over 50 in each of the identified visitor regions. It is interesting to note that this age group will grow the fastest in the Sacramento Valley Region, and is expected to represent nearly one-third of the area's population in 2010.

Figure 11-31. Annual per Capita Income by Visitor Region, 1998

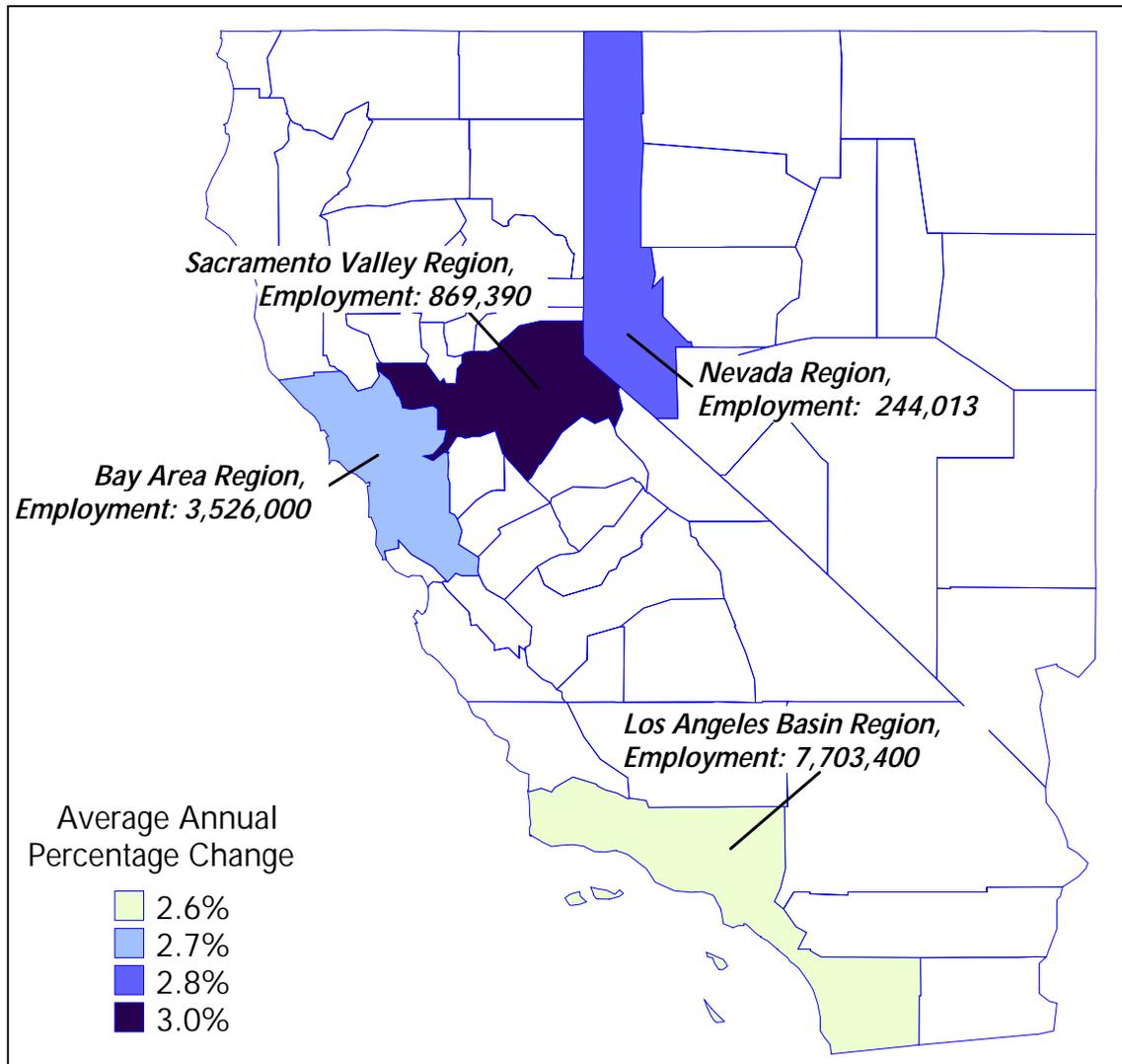


Source: Dean Runyan Associates and Bureau of Economic Analysis

3. Annual per Capita Income

Per capita income is growing in each of the primary visitor regions. Higher per capita income typically results in more resources for leisure and recreation activities. As shown above in Figure 11-31, the San Francisco Bay Area has the highest per capita income, and has also experienced the fastest rate of growth over the last several years. Much of the income growth has been fueled by the surge of high-tech industry in and around Silicon Valley. This population provides the Lake Tahoe Region with a large population of professional, educated households, with incomes able to support travel and recreation activities.

Figure 11-32. Persons Employed by Visitor Region, 1999



Source: Dean Runyan Associates and The California Employment Development Department

4. Employment

As shown in Figure 11-32, employment growth has been most rapid in the Sacramento Valley. Part of the explanation may hinge on quality of life considerations, as individuals trade-off higher income for non-financial benefits related to quality of life—in particular more convenient access to, and opportunities for, recreation offered by the Sacramento Valley. Considering this population resides within a 2-3 hour drive of Lake Tahoe, the Sacramento Valley seems likely to be the source of an increasing number of both overnight and day visitors to the Lake Tahoe Region.

B. NATIONAL TRAVEL TRENDS

A number of trends are evident in the U.S., which will affect the demand from travelers visiting the Lake Tahoe Region. The following key demographic and behavioral travel trends offer some insight into those changes most likely to influence the economy of the region.

- With more dual-earner households, it is more difficult to schedule travel, which often means taking shorter trips more frequently. Households are more likely to take long weekend and other relatively short trips; the incidence of extended, multi-destination long-distance travel is decreasing. More vacations are close to home, 2-4 days, within 150 miles, and often on weekends.
- The American population is aging, with the primary growth in the 40-50 age range. These are more likely to be “empty nesters” without children living at home; although relatively few are retired. The retired population will increase strongly after 2010.
- Travel for meetings, conferences and conventions continues to grow along with US economic activity. The relatively low cost of airfares is a contributing factor.
- Incomes of professional, educated households have been increasing, producing a segment of the population with adequate resources for travel and recreation.
- Organized group travel – by motor coach, cruise ship, or air transportation – is increasing, and is related to the aging of the North American population, as well as to increasing incomes. Much of this travel is during the summer, and is value-oriented.
- The American population is becoming increasingly educated, with nearly a quarter of American adults currently holding a bachelor or advanced degree. Educated travelers are particularly interested in informative and interesting attractions and experiences.
- The top activities participated in by U.S. travelers in 1998 were shopping, outdoor recreation, historical sites and museums, beaches, and cultural events and festivals.
- International visitation to the U.S. has increased by 28% between 1989 and 1998. The top five inbound markets for the U.S. were Canada, Mexico, Japan, the United Kingdom, and Germany.

V. VISITOR VOLUME FOR LAKE TAHOE REGION

For purposes of planning to preserve environmental and recreational attributes of the Lake Tahoe Region, it is important to consider the overall volume and composition of visitors to the region. In 2000, overnight visitors were the source of about 13.2 million visitor-days in the Lake Tahoe Region. In addition, day travelers made about 4.4 million visits, for a total of about 17.6 million visitor days in the region. Table 11-13 shows the estimated visitor days for both overnight and day trips during 1996-2000.

Visitor volume estimates are calculated from the economic findings of this report and estimates of average party size. Visitor volume is calculated as follows: 1) travel expenditures are divided by average daily expenditures per party to estimate the number of party day-visits to the region; and 2) party day-visits are divided by average party size to produce an estimate of the total number of visitor-days to the region.

Table 11-13. Lake Tahoe Region Visitor Volume, 1996-2000						
Overnight Visitor Volume, 1996-2000						
Year	Travel Spending (Million)	Average Daily Spending Per Party	Party Day Visits (Million)	Average Party Size	Person Day Visits (Million)	
96	\$1,042	\$316	3.3	3.5	11.5	
97	\$1,091	\$322	3.4	3.5	11.9	
98	\$1,164	\$329	3.5	3.5	12.4	
99	\$1,225	\$337	3.6	3.5	12.7	
2000	\$1,311	\$347	3.8	3.5	13.2	
Day Visitor Volume, 1996-2000						
Year	Travel Spending (Million)	Average Daily Spending Per Party	Party Day Visits (Million)	Average Party Size	Person Day Visits (Million)	
96	\$194	\$154	1.3	3.0	3.8	
97	\$204	\$158	1.3	3.0	3.9	
98	\$216	\$159	1.4	3.0	4.1	
99	\$229	\$164	1.4	3.0	4.2	
2000	\$253	\$173	1.5	3.0	4.4	

Source: Dean Runyan Associates

The term “visitor-days” should not be confused with “visitors,” or “visits” as a visitor will often generate multiple visitor-days on a single visit. For example, one person visiting the Lake Tahoe Region for four days would be counted as four visitor-days. Hence, the number of visitor-days will usually exceed the number of individual visitors. While knowledge of individual visitors may be useful for marketing purposes, this analysis concentrates on visitor-days as a useful measure for purposes of environmental management and planning.

VI. TRPA INFLUENCE ON LAKE TAHOE REGION ECONOMY

This section investigates and assesses the role of TRPA policies, relative to the economy of the Lake Tahoe Region. In order to support data collection and the quantitative analysis, we have gathered the perceptions of those whose businesses and projects may have been influenced to some degree by TRPA policies or programs. Accordingly, we have selected a sample representing participants in the regional economy. These included:

- Private sector recreation
- Property management, development and real estate
- General business
- Local government
- State and federal land managers

A. QUALITATIVE RESEARCH – METHODOLOGY AND OBJECTIVES

In addition to augmenting the quantitative work, the qualitative interviews provide in-depth insight into the **perceived** impact of TRPA policies and actions on the Lake Tahoe Region economy. Qualitative research of this type is conducted in order to gain a range of perspectives on policy impacts. Note that the perceptions gathered as part of this qualitative component may not directly reflect current TRPA activities or program areas, and could also represent attitudes toward policies implemented by a wide range of other local, state and federal entities.

This research approach provided several results. First, we identified those themes that were common for the selected interview group as a whole – regardless of the organization type or economic sector represented. As themes were repeated throughout the interview process, we were able to distill these patterns into findings and recommendations that may direct TRPA policy makers toward a greater understanding of their agency’s overarching impact. Second, we observed any cogent differences among perspectives by organization type, thus gaining perspectives on policy impacts for both the public and private sectors.

In addition to selecting a sample of representative organizations from each identified sector, we identified individuals within these organizations that would be most amenable to sharing their perspectives. Moreover, these individuals were typically decision makers – either for their organization or for a specific project area within an organization. The individuals contacted were informed that these were confidential one-on-one interviews, thus ensuring fully candid and honest responses. This is particularly important given the close-knit nature of the Regional community, and the likelihood that some comments, if revealed, could cause some discomfort between the agency and those interviewed—please note that this is a typical approach regardless of the audience.

The following is a list of sector representatives:

Private sector recreation: This group includes visitor-serving tourism and recreation associations or businesses. Interviews addressed issues particular to the recreation sector, with input gathered from both industry representatives and individual attractions. Since this group represents a significant proportion of economic activity in the Basin, the list was somewhat expanded in order to provide better coverage of recreation sector perspectives.

- North Lake Tahoe Resort Association
- Ponderosa Ranch
- MS Dixie/Travel Systems Ltd.,
- Tahoe Douglas Chamber of Commerce
- Spooner Lake Cabins and Skiing
- Lake Tahoe Gaming Alliance

Property management, development and real estate: This group included those who may serve seasonal and employee housing demand, as well as permanent year-round residents. These interviews also provided a private sector perspective of policy impacts on Lake Tahoe Region real estate and associated development trends.

- Incline at Tahoe Property Management and Realty
- South Tahoe Realty
- Booth Creek Ski Holdings Inc.

Local government: These include representatives of local government or local decision-making bodies who have significant ongoing contact with TRPA policies.

- South Lake Tahoe Redevelopment Agency
- Tahoe City Public Utility District
- Douglas County Parks
- Incline Village General Improvement District

Other businesses: We contacted a selection of other firms with business not directly related to tourism activity, but who may principally provide goods and services to the local community. These include, professional services and retail establishments, as well as a recent addition to the business community.

- North Lake Tahoe Business Association
- Raleys (South Shore)
- Office Depot

State and federal land managers: Given the range of land management agencies whose actions or policies may be impacted by TRPA, input provided by this sector may shed additional light on the confluence of TRPA and other agency regulations, as they might affect economy activity.

- Nevada Division of State Parks
- California Tahoe Conservancy
- USDA Forest Service

To the extent feasible, we have contacted sector representatives who have long-term experience in the region, and who could provide both sector-specific and overall perspectives of the regional economy and TRPA policy impacts. We have also intended that those interviewed are familiar with specific TRPA policies or regulations, as they may impact their own specific business or organization's operations in the Lake Tahoe Region. Finally, in order to ensure a candid yet focused interview, a discussion guide was utilized (see Appendix A).

Note that many of the opinions solicited during the interviews often were delivered as a general critique of TRPA activities. In nearly all cases, respondents were prompted to specifically focus on economic impacts or the Regional economy only. However, many of those interviewed felt that the agency's general approach to its mission was in fact impacting economics through both direct and indirect costs. These resultant costs were considered to affect the willingness of economic entities to pursue projects, even if an environmentally positive development objective might be proposed.

Consequently, it is important to keep in mind that if the information presented in this section sometimes sounds like a general management assessment, the findings are all in the context of the agency's economic influence. Moreover, we expect that many of these opinions have already been delivered to a variety of TRPA staff in one form or another. We have made every effort to focus discussion on specific policies and related economic impacts but, as can occur within wider public initiatives, citizens' overall perceptions can translate into opinions about unintended economic affects.

B. OVERVIEW OF COMMON PECEPTIONS

Very shortly after beginning the series of interviews, common perceptions or themes began to emerge. In fact, with the exception of specific individual examples, there was surprising agreement about the TRPA's mission, the importance of this mission to the region's environment, and the connection between environmental quality and the long-term well-being of the regional economy. Likewise, there were many shared perspectives about the impacts the agency's policies have on economic activity—impacts on both respondents' specific organizations, as well as other economic sectors active within the region.

1. TRPA Mission and Policy Approach

As described by more than one respondent, the TRPA's mission is to "keep the Lake blue". This, of course, included the implication that TRPA should give appropriate attention to the overall Lake Tahoe Basin environment – though, as will be discussed, not all agreed on the extent to which TRPA practices this stewardship. It is interesting to note that respondents' level of understanding about TRPA's mission varied according to private or public sector affiliation. As might be expected, those connected to public sector work were far more familiar with the specific TRPA program topics and their specific impacts. However, throughout the interviews, key terms such as "coverage", "land classification", "environmental thresholds", and Best Management Practices (BMP) and Vehicle Miles Traveled (VMT) were routinely used as part of the discussion vocabulary, thus indicating a relatively high level of familiarity with the agency's overall policy approach.

2. Impact on the Overall Region Economy

All of those interviewed, regardless of their opinions about specifics of the TRPA mission, recognized that the quality of the Lake Tahoe environment and the viability of a sustainable recreation economy are one and the same. All respondents emphasized that visitor spending was the heart of the region economy, and would remain that way into the future. Even if economic activity not directly or indirectly related to the visitor and recreation industry were to arrive in the region, respondents said that they would probably locate there for the environmental beauty first and foremost. Threats to environmental quality in general, and the health of the Lake specifically, were seen as a threat to economic vitality.

As a result, all respondents recognized that a lead organization, in this case the TRPA, is necessary to keep the region economy viable through environmental protection. Even though elements of the agency's programs and the method of mission fulfillment were met with reservations, TRPA was cited as the primary actor on environmental protection issues.

3. Impact on Individual Economic Entities

While seen as critical to the Basin's overall economic sustainability, there was considerable concern about the TRPA's delivery of its mission – particularly as it may affect specific projects or businesses. There was a perceived disconnect between the agency's overall environmental objectives and the specific applications of policies and regulations. These concerns centered on the perceived complexity of regulations, the time consuming nature of the permitting process, and the costs involved with this process.

Specifically, respondents felt that the cost of complying with policies and regulations had a "chilling" effect on project development or redevelopment. Small "mom and pop" businesses or individuals were seen as disproportionately affected in comparison to larger entities that might have the financial and professional resources to sustain a successful permit application and project review process.

4. Regulatory Approach vs. Planning Policy Areas

When pressed to discuss economic impacts by specific policy area, most respondents either had limited knowledge of policy details, or felt that the type of policy was immaterial given the overall TRPA regulatory approach and the nature of its interaction with individual projects. Specifically, respondents repeatedly voiced frustration with the number and complexity of regulations, as well as the perceived uncertainty for project approval. In addition, most respondents regarded TRPA as a regulatory agency rather than as a lead planning agency. This left several respondents questioning the agency's effectiveness as a facilitator of environmental policy for the region overall.

Note that in order to gain some perspective on various policies' relative impacts, respondents were read a list of policy areas and then asked to rate the impact on the Lake Tahoe Region economy. These findings did provide some distinction among perceived impacts per each general policy area. Listed policy areas included: erosion control, wildlife habitat protection, recreation access, scenic view protection, transportation, forestry management, and affordable housing. Specific findings for each are discussed in the next section.

5. Policy Area Assessment

In order to assess perspectives of specific policy areas, respondents were asked to rate the effect of TRPA activities on the Lake Tahoe economy. In order to gather a relative **perceived** level of impact, respondents were asked to use a rating scale from 1 to 5, where “5” means *very beneficial*, “4” means *good*, “3” means *neutral*, “2” means *poor*, “1” means *detrimental*. Note that all respondents had an opinion (there were no “don’t know” responses).

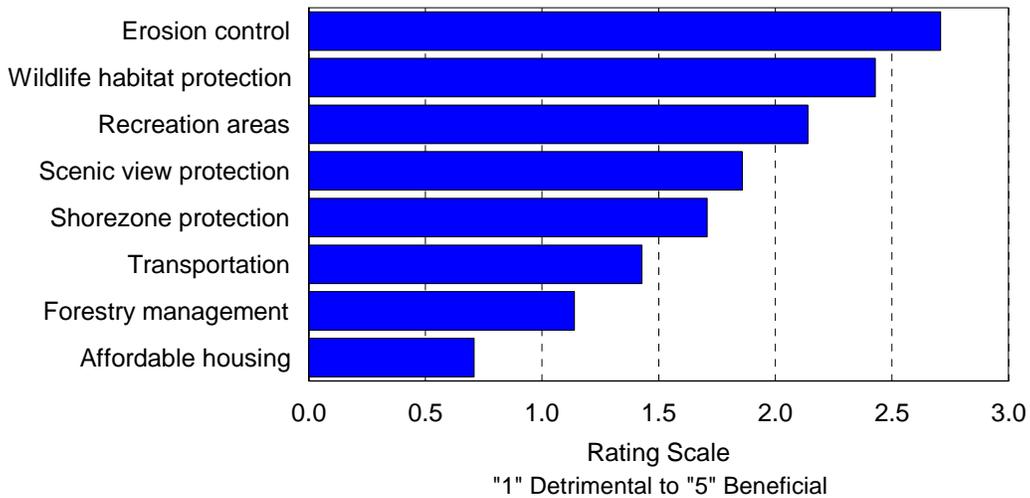
Respondents’ perceptions on the “1” to “5” scale were totaled and averaged for each policy area, as shown graphically in Figure 11-33. Those programs at the top of the scale had the most beneficial economic effect while those at the bottom of the scale were the most detrimental. Keep in mind that those interviewed received little or no prompting, and as a result, these ratings reflect a “top of mind” response to TRPA’s perceived influence within the selected policy areas:

- Erosion control (2.71 average rating). Respondents were most in agreement about the positive economic effects of erosion control. Comments were most specific to Lake clarity issues, and the importance of maintaining the integrity of Lake Tahoe for present and future recreation users. However, several respondents felt that erosion control activities could negatively impact economic viability of certain projects, depending on the time and cost associated with regulations applied to a given project.
- Wildlife habitat protection (2.43 average rating). This policy area is also considered a relative positive for the region economy. Comments generally concerned natural area enhancement, and the region’s associated image as an exemplary outdoor setting. Some respondents did make specific reference to access issues that could be impacted by habitat protection for certain species. For example, rigorous Goshawk habitat protection was seen as a potential threat to recreation access. Some respondents questioned the validity of regulations that might limit hiking access to Goshawk habitat areas.
- Recreation access (2.14 average rating). Though TRPA received relatively high marks for maintaining access, respondents nonetheless noted the possible conflict between resource protection and conflicts with access (the previously mentioned Goshawk example applies). While respondents see an exemplary environment as a key to the region’s long term economic sustainability, they nonetheless viewed access limits as potentially detrimental to recreation economics and threatening to the underlying rationale for living in the Lake Tahoe area—access to the outdoors.
- Scenic view protection (1.86 average rating). Respondents generally felt that TRPA had little impact on maintaining scenic view areas in general. Negative perceptions related to the perception that associated regulations (building and tree trimming) were subjectively applied to individual properties.
- Shorezone protection (1.71 average rating). Many of those interviewed felt that regulations in the shoreline zone were not equitably applied – specifically, those with significant financial resources were seen to have greater success passing the regulatory process. Both in terms of access to and protection of the shoreline, this policy issue was seen as compromised in zones where incomes or other financial resources were greatest. Thus, respondents perceived an unfair negative economic impact on small businesses and public entities with holdings

on the shoreline. Also note that many respondents simply felt protection was not effective, often combining Lake Tahoe clarity issues as part of their perceptions of shoreline zone policy. Media reports of declining Lake clarity were cited. Interestingly, shoreline zone protection received a relatively low rating, even though TRPA received positive responses for erosion control, an issue also related to Lake clarity.

- Transportation (1.43 average rating). Simply put, respondents felt that TRPA was not adequately implementing transportation directives, and dedicated financial resources. A perceived slow response to transportation problems was noted. The most emotive respondents called for greater immediacy in the TRPA's transportation policy implementation.
- Forestry management (1.14 average rating). Comments about TRPA forestry management policies were primarily centered on restrictions to tree trimming and thinning, and the potential related impacts of fire safety issues. Though an indirect effect, respondents considered this an economic detriment because fire danger could threaten individual property and businesses. Some mentioned the dire economic consequences of a wide spread Regional fire event. In addition, respondents also mentioned the impediment of obtaining permits for individual tree trimming and thinning projects, and the associated impacts on business and public property maintenance costs.
- Affordable housing (0.71 average rating). The lowest rated policy, affordable housing issues received fairly emotive responses. The weight of environmental regulations, both in terms of costs and process, were seen to fall heaviest on affordable housing issues. Interestingly, while not a specific TRPA program area, respondents nonetheless considered TRPA policies as detrimental to an already constrained housing market. In particular, those interested in employee housing indicated that the cost of regulation compliance, including process uncertainty, prohibited the construction of economically feasible housing alternatives. The necessity for staff to commute from outside the immediate region (i.e., from Carson City) was mentioned. As a result, employers noted the difficulty in recruiting staff, and the associated higher costs related to employment issues.

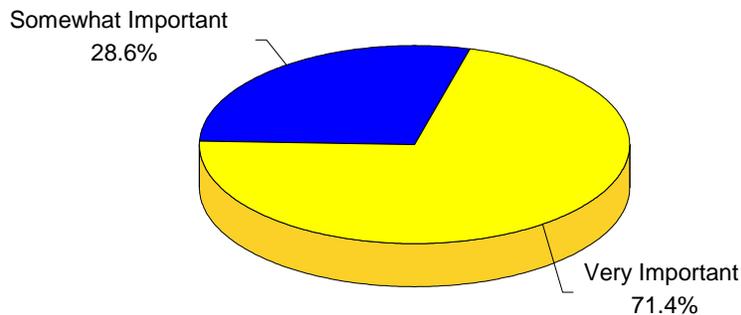
Figure 11-33. Respondent Rating of Economic Effect by TRPA Policy Area



Sources: Chuck Nozicka Consulting and Dean Runyan Associates

Finally, respondents were asked to rate the importance of all TRPA policies for *enhancing* the Lake Tahoe economy over the long run. As shown in Figure 11-34, below, TRPA programs are perceived as important to the region’s long-term economic sustainability. These findings contrast with the attitudes toward specific policy areas, indicating that while the agency’s overall mission was viewed as necessary for economic sustainability, the TRPA’s perceived implementation of specific policies was rated as needing improvement. It is important to keep in mind that these are perceptions of TRPA’s role in the region’s economy, and may also reflect impacts borne by a wide range of regulating entities.

Figure 11-34. Respondent Rating of TRPA Program Importance for Enhancing the Long Term Lake Tahoe Economy



Sources: Chuck Nozicka Consulting and Dean Runyan Associates

C. PECEIVED ECONOMIC CONSTRAINTS

It must be emphasized that any critique of the agency's policy delivery should necessarily be viewed in the positive larger impact on the Lake Tahoe economy. Overall, TRPA environmental protection objectives – as understood by respondents – were generally not questioned. The current economy of the region was considered healthy, and could be sustained to a significant degree by ongoing environmental protection efforts. Nonetheless, the following were regarded as impediments to regional economics:

1. Impacts of Added Costs

Most vehemently voiced, were the increased direct costs and time requirements – which translate into costs – imposed on projects by TRPA regulations. Some of these costs, in fact, were attributed to fees for consultants who understand and can maneuver through the TRPA permit approval process. Moreover, respondents of all types expressed frustration at the uncertainty involved in the approval process and the hidden costs this uncertainty implies, with these additional costs also carried by public sector site enhancement projects. It was reported that the demand on up-front expenditures could often drain the availability of adequate operations and maintenance funds. As a result, a detrimental effect is introduced—entities may not put projects into place or may chose not to proceed through the regulatory process. As an example, some respondents cited problems with the economic feasibility for developing employee and other affordable housing.

2. Impacts on Projects Vary by Proponent Size

Even the most supportive respondent felt that costs of the agency's regulatory permitting fell most heavily on small projects, with permitting timelines considered as one element of cost. Several large developments were cited as examples of faster approval for those with the financial resources to hire consultants and associated legal assistance.

3. Regulatory Stance vs. Proactive Mitigation

Most respondents felt that the agency erred on the side of regulatory permitting process, while proactive assistance with neighborhood wide mitigation projects was lacking. Individual parcel review was seen to be the primary agency focus, rather than greater funding of neighborhood wide mitigation strategies, such as run-off control infrastructure. Several of those interviewed suggested that the agency emphasize more neighborhood wide mitigation projects and rely less on regulatory permitting.

4. Project Specific Impacts vs. Programmatic Solutions

Most respondents discussed the agency's tendency to view each specific project, and in fact elements of a specific project, without objective programmatic guidance. Thus, the costs of compliance were primarily borne by project proponents who have to navigate thru the process with little guidance from the agency, increasing process timelines and, accordingly, adding costs. As a result, project development is seen to be limited. For example, the owner of a small lodging property interested in redevelopment may not be able to estimate likely compliance and associated development costs until well into the project approval process. As a result, a needed improvement in the lodging sector may not occur. Suggestions generally

called for regulatory actions to be driven by clear program guidelines, thus providing project applicants with greater certainty about permitting timing and the likely costs of application approval.

5. Rating Program Areas for Economic Impacts

As indicated in the above response figure, the areas of greatest economic concern were housing (availability of affordable – especially employee – housing), forestry management (tree trimming and other regulations impeding fire protection efforts), and transportation (lagging implementation of transit district improvements).

D. PERCEIVED OPPORTUNITIES FOR ECONOMIC ENHANCEMENT

It was argued that a sustainable region economy is comprised of aggregated activity among many individual projects. As a result, respondents offered suggestions for improving the agency's impact on individual project economics, and thus ensuring project development, redevelopment and site enhancement efforts. In several cases, respondents indicated that these suggestions would affect both environmental protection, as well as economic sustainability. Note that these suggestions are based on perceived conditions, and may not reflect existing programmatic activities or policies directly within the responsibilities of TRPA.

1. Bundling Projects for Review

To reduce costs, many respondents suggested a collaborative approach to project review. A collaborative approach would allow a number of smaller projects to be bundled within a wider project area application, to thereby reduce time and associated costs on certain approval hurdles. For example, one EIR/EIS document for an area would be developed with shared funds, as opposed to a separate EIR/EIS preparation costs for individual – but related – projects within an area. It was suggested that an established section of a community featuring older property in need of redevelopment, could be established as a review area, with probable compliance measures outlined prior to project planning and permitting for each property.

2. Programmatic Solutions

Also to reduce permitting timelines and costs, many respondents called for greater programmatic guidance that could be tied into the approval process. This suggestion specifically refers to a decrease in item-by-item review. In the place of an ongoing itemized review, useful development guidelines would be available to project proponents. Respondents also suggested that the TRPA regulatory review process include optional solutions to contested compliance issues, thereby reducing time and associated project development costs. This approach could more easily allow project proponents to estimate costs of a redevelopment project, including timing and permit fees.

3. Special Assistance to Small Businesses

Since smaller entities were seen as disadvantaged within the current regulatory environment, additional outreach or assistance to small business and local government projects was suggested as a way to help “level the playing field”.

4. EIP Project Implementation

With nearly a unanimous response, those interviewed perceived that TRPA's greatest influence could be felt through implementation of EIP projects. Though some projects have already been developed, there was frustration with the slow pace of implementation – particularly in regards to transportation and housing. Respondents felt that a focus on both of these policy areas could impact economic sustainability through a respective relief of congestion and employee housing constraints.

E. OVERVIEW OF FINDINGS

The following overview reflects respondents' attitudes and perceptions. Note that certain perceptions may not necessarily reflect the actual practices or impacts of TRPA, but nonetheless provide insight into perceived economic effects of TRPA management of the region.

1. TRPA is Essential to the Long Term Economic Viability of Lake Tahoe

There is general consensus as to the agency's importance for the long-term sustainability of the Lake Tahoe Region economy. A sustainable economy is clearly seen as interwoven with environmental quality issues.

2. Regulatory Delivery Can Add Costs and Time to Projects

Current regulatory practices add time, uncertainty and costs, thereby driving up risk for project development and redevelopment. These increased costs may limit the implementation of needed enhancement projects, such as environmental mitigation areas or affordable housing. The aggregation of these individual project costs may negatively impact the region's economic sustainability.

3. TRPA Perceived as a Regulator Rather than A Problem Solver

The agency is seen as primarily a reactive regulation enforcement entity, rather than a leader for environmental – and especially project specific – solutions. As a result, many respondents say costs are passed to individual entities, which are left to separately "break trail" through the regulatory process. This condition may limit project planning and redevelopment rigor. TRPA assistance with solutions to regulatory issues could greatly reduce project risks for both the region's public sector and private sector investments.

4. Private Sector Needs Additional Education

The business community, with the exception of those closest to the agency's operations, appears in need of education about not only specific TRPA policies, but also how these policies integrate with the agency's overall Regional planning mission. Education could reduce the uncertainty factor and help alleviate some of the frustration revealed in the interviews. By contrast, public sector respondents usually understood TRPA's current practices, and are, therefore, more likely to anticipate constraints, and accordingly plan projects somewhat more efficiently.

VII. ECONOMIC CRITERIA FOR EVALUATION OF CAPITAL EXPENDITURE PROJECTS

This section provides a means by which economic considerations can be included in an explicit manner during the review of grant and other capital proposals, and during discussions of TRPA policies. Because of the wide variety of circumstances during which economic considerations might arise, the procedure included here represents a framework that can be utilized under varying circumstances.

The manner and extent to which a particular investment, program or policy will affect the Tahoe Region economy is very difficult to predict. Economic benefits of a particular capital investment, for example, may accrue only over a long period of time, and perhaps for a geographic area well beyond the particular point at which the investment is focused. These benefits may need to be balanced by less desirable effects, or perhaps detriments, locally and/or in the near term.

In addition, it will often be the case that difficult-to-quantify and intangible benefits will be compared to specific costs, sometimes substantial and near-term. An example is near-term investments in shoreline mitigation that, over time, will increase scenic values, enhance wildlife habitat and improve water quality, all of which contribute to the quality and attractiveness of the region. These comparisons are made particularly difficult when a project creates adverse near-term economic impacts, such as costs for individual landowners, access limitations and/or delays in business investments.

Economic impacts rarely affect varying people and businesses equally, and the consideration of these distributive effects is an important aspect of assessing these impacts. The following is a summary of the primary groups for which economic impacts in the Tahoe Region should be discussed.

Group	Description	Example Economic Benefits	Example Economic Costs
Resident workers	Full-time residents of the Tahoe Region who work in the area.	Employment, wages, good business climate that enhances the goods and services available in the Tahoe Region.	High housing costs, expense of goods and services, limited transportation options.
Businesses	Businesses operating in the Tahoe Region, some of which are locally-owned and others owned by entities located outside the region.	Good business conditions that keep costs as manageable as possible and generate good sales. Available labor. Available and reasonably priced transportation.	Limitations on business demand due to access and congestion. Limitations on new facility development due to restrictions and/or time requirements.
Second Home owners	Individuals, and perhaps businesses, that own second homes primarily for recreational purposes	Availability of goods and services, particularly those necessary for maintenance. Good market for visitor rentals. Capital appreciation.	High costs or limitations due to congestion and high transportation costs. Limitations on renovation and/or new development due to restrictions and/or time requirements.
Non-resident workers	Workers in Tahoe Region businesses who reside outside the region.	Employment, wages, good business climate that enhances the goods and services available in the Tahoe Region.	Expense of goods and services, high cost of transportation.

A guideline matrix for discussing economic impacts in the context of considering TRPA project approvals, funding applications and/or policy changes appears below in Table 11-14. This matrix can be used in two ways. It can serve as a checklist of impacts to be considered, and accordingly, to identify section headings and topics to be covered in an economic assessment review. Topics that do not pertain to a particular circumstance can be simply omitted. The matrix can also serve as an economic impact summary, with the cells filled with scores. An example scoring system would rate a proposed item from -5 (very adverse effect) to +5 (highly beneficial effect) within each cell. A "0" would indicate no impact.

Table 11-14 Guideline Matrix				
	<u>Immediate/Local Area</u>		<u>Lake Tahoe Region</u>	
	Near-term	Long-term	Near-term	Long-term
Residents				
Employment/wages				
Goods/ services				
Housing costs				
Transportation costs				
Recreation access				
Businesses				
New business opportunities				
Sales				
Transportation costs				
Real estate appreciation				
Second Home Owners				
Goods/ services				
Real estate appreciation				
Transportation costs				
Non-resident workers				
Employment/wages				
Goods/services				
Transportation costs				

VIII. POLICY IMPLICATIONS AND RECOMMENDATIONS

This section presents a general overview of the findings and implications for TRPA. In addition, this section reviews each of the 1996 Evaluation Report recommendations along with progress-to-date; and considering new identified needs, presents new recommendations for 2001.

POLICY IMPLICATIONS

Visitors traveling to the Lake Tahoe Region provide nearly three-fourths of all jobs and over two-thirds of total earnings both directly through visitor spending and indirectly through the spending of the businesses and employees serving the visitors. Both visitors and residents are attracted to the Lake Tahoe Region for scenic beauty, recreation opportunities, and the unique crystalline blue water of Lake Tahoe. Adherence to the TRPA threshold standards will help protect these important environmental and scenic qualities and maintain the unique comparative advantage of the region's economy.

Maintaining a high standard for the environmental quality of the Lake Tahoe Region is essential for ensuring economic vitality and livability throughout the region. While this section identified some perceived barriers to redevelopment and disincentives to private investment, there appears to be general support for the environmental protection policies administered by TRPA. TRPA environmental thresholds are a vital component to protect the high quality natural and scenic resources that play a fundamental role in the region's economy.

A summary of the major findings follows:

Population Growth

Over the next decade, the population of the Lake Tahoe Region is expected to grow at a much slower rate as compared to the relatively fast rate of growth projected in Placer, El Dorado, Washoe, and Douglas counties. Population growth in these counties will influence the Lake Tahoe Region through the volume and composition of visitors.

- In 2000, the Lake Tahoe Region had a population of about 56,000 persons and is expected to grow to about 58,500 by 2010, an average rate of 0.4% per year.
- Over the next decade, the combined population of the Placer, El Dorado, Washoe, and Douglas counties is expected to grow from 780,000 in 2000 to over 1 million persons, an average growth rate of 2.5% per year.

Economic Conditions and Trends

- In 2000, there were approximately 49,500 full and part-time jobs in the Lake Tahoe Region with over \$1.3 billion in earnings.
- Between 1995-2000, the unemployment rate in the Lake Tahoe Region fell from 7.8% to 3.5% of the labor force.
- The Lake Tahoe Region depends more on investment and retirement income and outside earnings (42 percent of personal income) as compared to the states of California and Nevada as a whole.

- Lodging, gaming, recreation, retail, and eating & drinking establishments play a substantial role in the region's economy, generating more the half of all employment.
- Gaming revenue (i.e., casino revenue) in the Lake Tahoe Region has held steady over the last decade amounting to about \$378 million per year.
- Alpine skier days in the Lake Tahoe Basin (includes resorts located outside the Lake Tahoe Region) totaled about 3.2 million during the 1999-2000 season.

Housing

Demand for housing has been strong in the Lake Tahoe Region with home prices rising at a steady pace along steady demand for building permit applications.

- Over the last decade, the median sales price of single-family homes in the Lake Tahoe Region rose steadily from \$119,000 in 1990 to \$285,000 in 2000, an average increase of 7% per year.
- In 1999, TRPA received nearly 200 permit applications for residential construction and modification and about 100 permit applications for commercial retail or lodging accommodations.

Transportation

A private auto is the primary means of transportation to the Lake Tahoe Region. Highway traffic into the Lake Tahoe Region has grown rapidly contributing to vehicle congestion throughout the region.

- Highway traffic shows a consistent seasonal pattern with a peak period during the summer months (Jun-Sept).
- Between 1997-99, highway traffic along CA State Highway 89 (south of Truckee) and US Highway 50 (at Sly Park) has grown by about 20 percent.
- Primary vehicle access routes into the Lake Tahoe Region Two parallel routes off I-80 -- CA State Highways 89 and 267 -- account for nearly two-thirds of the volume of traffic into the Lake Tahoe Region.
- About 24% of Lake Tahoe Region employees choose to live outside the region in locations including: Truckee, Reno, Sparks, Carson City, Minden, and Gardnerville.
- During 1999, the Reno-International Airport received over 3 million passenger arrivals with 17% reporting Lake Tahoe as their primary destination and mostly traveling by rental car.

Economic Impact of Visitor Spending

Visitor spending generates a primary source of earnings and employment in the Lake Tahoe Region. The economic contribution of visitors has grown over the last five years.

- Visitor spending in the Lake Tahoe Region has grown at a steady pace from \$1.2 billion in 1996 to over \$1.5 billion in 2000.
- Visitor spending in the Lake Tahoe Region directly supported 22,100 jobs (both full- and part-time with total earnings of \$435 million).

- Through indirect impacts (purchases made by businesses and employees), visitor spending generated an additional 14,000 jobs and \$452 million in earnings.
- Total (direct and indirect) visitor generated impacts represent 74% of total employment and 68% of total earnings in the Lake Tahoe Region.

1996 RECOMMENDATIONS AND PROGRESS-TO-DATE

Below is a list of recommendations made in the 1996 Threshold Evaluation. Following, in italics, is a summary of the status of that recommendation.

1. TRPA should continue to work with the Tahoe Truckee Regional Economic Coalition (TTREC) to coordinate the initiation of a regional economic data collection effort and help identify key economic indicators. *TTREC is no longer a viable group; however, TRPA has developed effective working relationships with community groups representing the economic interests of the region, including North Lake Tahoe Resort Association, Strategic Marketing Group, Lake Tahoe Gaming Alliance, League to Save Lake Tahoe, and local area chambers of commerce, as well as representatives of state and local governments. TRPA has developed effective working relationships with these various organizations to help identify key issues related to TRPA policies and economic conditions in the region. Many of these organizations contributed valuable insight, information, and guidance to the research and analysis described in this Economics Chapter.*
2. Allocations of additional residential development should be continued to allow for some residential development opportunities, which would have positive economic benefits in terms of stability, assessed valuation, and – to a limited degree – housing supply and availability. *TRPA has continued to approve additional residential development at 300 allocations per year – a benchmark established in 1987. Future research could help determine a new level of allocations, given the needs of the region and availability of land appropriate for residential development.*
3. TRPA should initiate a study of the local economy to determine key business relationships and the impacts of development guidelines, including environmental mitigation programs, on new business development. *Section VI of this report describes a recent investigation of the impact of TRPA policies and regulations, which includes development guidelines and environmental mitigation programs, as related to the economy of the Lake Tahoe Region. This investigation and analysis provides an overview of common perceptions as well as an assessment of TRPA programs in which respondents were asked to rate the effect of TRPA programs on the economy. These findings identify key program areas of success, as well as where additional TRPA efforts may allow the residents and business of the region achieve additional economic benefits. Additional research within each program area is necessary to identify specific actions that can achieve the desired level of environmental protection and enhance other economic and social benefits for the region.*

4. TRPA should monitor the rate of absorption of commercial allocations by business type and location to establish the need for additional commercial allocations in the future. *Each year, TRPA monitors the rate of absorption of commercial allocations; however, a study of commercial needs has not been completed. The Regional Plan limits the total build-out of commercial floor area to 150,000 square feet over a five-year period, and the actual allocations are tracked to ensure that the limit is not exceeded.*
5. TRPA should develop a model of the local economy to determine significant contributors to local economic growth. This model should estimate total economic activity, economic multiplier rates, and assess the impact and extent of economic leakage. *An overall assessment of sources for employment and earnings identified the large economic contribution of industries that provide goods and services to visitors, and the need for additional detail describing the economic impact of visitors to the Lake Tahoe Region. Using local economic data and a Regional Travel Impact Model developed by Dean Runyan Associates, TRPA has completed an analysis of total economic impacts (both direct and indirect) including total earnings, employment, and tax receipts generated by visitors to the Tahoe Region.*

In addition, the Lake Tahoe Watershed Assessment provides estimates of total jobs and earnings at a community level for five community regions within the formal TRPA boundaries.

5. TRPA should study the recreational nature of the economy to determine how this relates to the commercial needs of the region. *Research described in this chapter identified the extent to which the economy of the region is supported by the recreation activities of visitors. Recent research by Chuck Nozicka Consulting – Recreation User Preference Survey and Focus Group Research – investigated a range of recreation-related issues, including the attitudes towards public investment and recreation facilities for both visitors and residents of the region. This research identified the need for pedestrian development, including village-type redevelopments at resort areas and town sites, as well as the need to improve recreation access and conditions, particularly related to traffic, congestion and recreation site maintenance.*

RECOMMENDATIONS FOR 2001

[See Appendix B for the revised 2001 Threshold Evaluation Recommendation List.](#)

~~A. — Visitor generated economic impacts~~

~~Responsible Entity: — TRPA~~

~~Funding/Cost: — TRPA, Other/\$25,000~~

~~Completion Date: — Annual~~

~~**Recommendation:** Annually update and monitor total economic impacts generated by visitors to the region in terms of earnings, employment and tax revenue. Compare these findings to changes in the region's total employment.~~

~~**Product:** Monitoring the trends and various segments of these vital visitor-generated economic impacts will enable TRPA to gauge the economic health of the region and provide a measure of success for environmental protection efforts.~~

B. Monitor recreation use patterns

Responsible Entity: TRPA
Funding/Cost: TCORP/\$45,000
Completion Date: October 2003

Recommendation: Periodically update and monitor year-around resident and visitor recreation use patterns in light of economic trends. Compare use pattern findings to changes in the region's total employment and other associated economic measures.

Product: Tracking a range of activity and attitudinal trends could provide policy makers with the tools necessary to maintain a proactive approach to policy development.

C. Programmatic regulatory review process

Responsible Entity: TRPA
Funding/Cost: TRPA Staff time
Completion Date: December 2002

Recommendation: To the extent feasible, TRPA will develop programmatic guidelines or project area templates to guide individual developments through the TRPA regulatory review processes. They will emphasize a more proactive stance regarding project review and development. In particular, small businesses need guidance or help with creative solutions in order to meet pertinent regulatory requirements.

Product: Programmatic guidelines to provide proponents with a better estimate of project approval requirements prior to entering the review process. Special assistance for small businesses would be a major focus.

D. Accelerated EIP implementation

Responsible Entity: TRPA/EIP Partners
Funding/Cost: TRPA Staff time
Completion Date: December 2007

Recommendation: Through partnerships, coordination, and planning efforts, accelerate the pace of implementation for EIP projects, particularly those projects related to the transportation needs of the region.

Product: Publicly funded investments in infrastructure and facilities will help spur additional private investment and generate additional economic benefits, such as job creation, in the region, and provide an opportunity to shift the Agency's image toward one of a proactive Regional planning partner.

E. Economic Vision for 2007+

Responsible Entity: TRPA/Business Community
Funding/Cost: \$50,000
Completion Date: December 2004

Recommendation: There is an undeniable link between the economy and the environment. The concept can be advanced by describing and planning for an economy that is consistent with threshold attainment. Such a vision or desired future condition then provides the basis for development or revision of an economic model and analysis of regulations.

~~**Product:** The communities of the Region and TRPA will develop an economic vision for Basin that is sustainable and consistent with threshold attainment~~

~~**F. Regional transportation system**~~

~~Responsible Entity: TRPA/
Funding/Cost: TRPA Staff time
Completion Date: October 2003~~

~~**Recommendation:** Provide greater oversight for and support to the regional transportation system and accelerate or increased investment of EIP funds in public transportation infrastructure.~~

~~**Product:** For residents and visitors, comprehensive improvements to the regional system may reduce the number and/or length of automobile trips within the region thus addressing many Air Quality/Transportation threshold indicators.~~

~~**G. Regional employee commuter patterns survey**~~

~~Responsible Entity: TRPA/
Funding/Cost: TRPA/Local Jurisdictions/\$60,000
Completion Date: October 2003~~

~~**Recommendation:** Update the 1992 transportation survey to identify the location of residence for Lake Tahoe Region employees. Understanding the commuting patterns in the region is essential for effective management of air quality, traffic congestion and crowding. Traffic congestion has been identified as a significant concern of both residents and visitors.~~

~~**Product:** Commuting patterns help establish, and foster an understanding of, the degree to which the region is integrated and influenced by conditions outside of TRPA management.~~

~~**H. Residential regulations**~~

~~Responsible Entity: TRPA
Funding/Cost: TRPA Staff time
Completion Date: October 2004~~

~~**Recommendation:** Review TRPA policies and regulations that may impact housing affordability. To the extent feasible, revise associated TRPA processes or actions to mitigate negative impacts on housing. While housing is not a direct part of TRPA's programmatic mission or eligible for EIP funding, the issue nonetheless impacts the region's economy and environment.~~

~~**Product:** To the degree that TRPA regulatory process may hinder affordable housing development, revisions could provide some needed assistance for this issue.~~

IX. SUPPLEMENTAL INFORMATION

- Appendix 1. - Zip Codes Of Economic Areas
- Appendix 2. - Monthly Traffic Data
- Appendix 3. - Regional Travel Impact Model
- Appendix 4. - IMPLAN Modeling System
- Appendix 5. - Discussion Guide

Appendix 1. LAKE TAHOE REGION ZIP CODES

Greater Tahoe Area Zip Codes			
Zip	County	State	City
89402	Washoe	NV	Incline Village
89410	Douglas	NV	Gardnerville
89413	Douglas	NV	Glenbrook
89423	Douglas	NV	Minden
89431	Washoe	NV	Sparks
89432	Washoe	NV	Sparks
89433	Washoe	NV	Sun Valley
89434	Washoe	NV	Sparks
89435	Washoe	NV	Sparks
89436	Washoe	NV	Sparks
89448	Douglas	NV	Zephyr Cove
89449	Douglas	NV	Stateline
89450	Washoe	NV	Incline Village
89451	Washoe	NV	Glenbrook
89452	Washoe	NV	Incline Village
89494	Washoe	NV	Sparks
89501	Washoe	NV	Reno
89502	Washoe	NV	Reno
89503	Washoe	NV	Reno
89504	Washoe	NV	Reno
89505	Washoe	NV	Reno
89506	Washoe	NV	Reno
89507	Washoe	NV	Reno
89509	Washoe	NV	Reno
89510	Washoe	NV	Reno
89511	Washoe	NV	Reno
89512	Washoe	NV	Reno
89513	Washoe	NV	Reno
89515	Washoe	NV	Reno
89520	Washoe	NV	Reno
89523	Washoe	NV	Reno
89533	Washoe	NV	Reno
89557	Washoe	NV	Reno
89570	Washoe	NV	Reno
89595	Washoe	NV	Reno
89599	Washoe	NV	Reno
89701	Carson City	NV	Carson City
89702	Carson City	NV	Carson City
89703	Carson City	NV	Carson City
89704	Carson City	NV	Carson City
89705	Carson City	NV	Carson City
89706	Carson City	NV	Carson City
89711	Carson City	NV	Carson City

Greater Tahoe Area Zip Codes			
Zip	County	State	City
89712	Carson City	NV	Carson City
89713	Carson City	NV	Carson City
89714	Carson City	NV	Carson City
89721	Carson City	NV	Carson City
95646	Alpine	CA	Kirkwood
95720	El Dorado	CA	Kyburz
95721	El Dorado	CA	Twin Bridges
95735	El Dorado	CA	Twin Bridges
96140	Placer	CA	Carnelian Bay
96141	Placer	CA	Homewood
96142	Placer	CA	Tahoma
96143	Placer	CA	Kings Beach
96145	Placer	CA	Sunnyside-Tahoe City
96146	Placer	CA	Sunnyside-Tahoe City
96148	Placer	CA	Kings Beach
96150	El Dorado	CA	South Lake Tahoe
96151	El Dorado	CA	South Lake Tahoe
96152	El Dorado	CA	South Lake Tahoe
96153	El Dorado	CA	South Lake Tahoe
96154	El Dorado	CA	South Lake Tahoe
96155	El Dorado	CA	South Lake Tahoe
96156	El Dorado	CA	South Lake Tahoe
96157	El Dorado	CA	South Lake Tahoe
96158	El Dorado	CA	South Lake Tahoe
96160	Nevada	CA	Truckee
96161	Nevada	CA	Truckee
96162	Nevada	CA	Truckee

Appendix 2. MONTHLY AVERAGE DAILY TRAFFIC

Table 2a. Average and Seasonal ADT, State Highway 89 South from Truckee – California, 1999		
MONTH	89 – from Truckee	Increment Above Seasonal Low
Jan	21,599	(1,989)
Feb	22,987	(601)
Mar	28,094	4,506
Apr	27,885	4,297
May	26,589	3,001
Jun	32,751	9,163
Jul	35,929	12,341
Aug	37,602	14,014
Sep	31,301	7,713
Oct	30,651	7,063
Nov	27,352	3,764
Dec	26,177	2,589
Annual Average	29,076	5,489
Average Seasonal Low	23,588	NA

Source: California Dept. of Trans. & Dean Runyan Associates

Table 2b. Average and Seasonal ADT, Highway 267 – Jct. 80– California, 1999		
Month	267 – from Truckee	Increment Above Seasonal Low
Jan	19,054	(618)
Feb	20,017	345
Mar	20,822	1,150
Apr	18,760	(912)
May	17,645	(2,027)
Jun	21,804	2,132
Jul	24,527	4,855
Aug	24,484	4,812
Sep	21,384	1,712
Oct	19,174	(498)
Nov	17,637	(2,035)
Dec	19,944	272
Annual Average	20,438	766
Average Seasonal Low	19,672	NA

Source: California Dept. of Trans. & Dean Runyan Associates

Table 2c. Average and Seasonal ADT, Highway 50 – at Sly Park – California, 1999

Month	US 50 – at Sly Park	Increment Above Seasonal Low
Jan	8,437	(230)
Feb	8,530	(137)
Mar	10,411	1,744
Apr	10,031	1,364
May	12,680	4,013
Jun	12,805	4,138
Jul	15,579	6,912
Aug	15,000	6,333
Sep	11,627	2,960
Oct	10,855	2,188
Nov	9,152	485
Dec	9,034	367
Annual Average	11,178	2,511
Average Seasonal Low	8,667	NA

Source: California Dept. of Trans. & Dean Runyan Associates

Table 2d. Average and Seasonal ADT, Highway 50 – West of 395 – Nevada, 1999

Month	US 50 – West of 395	Increment Above Seasonal Low
Jan	8,336	(594)
Feb	8,677	(253)
Mar	9,918	988
Apr	9,468	538
May	11,025	2,095
Jun	12,853	3,923
Jul	14,368	5,438
Aug	14,497	5,567
Sep	12,887	3,957
Oct	11,642	2,712
Nov	9,709	779
Dec	9,777	847
Average Annual	11,103	2,173
Average Seasonal Low	8,930	NA

Source: Nevada Dept. of Trans. & Dean Runyan Associates

**Table 2e. Average and Seasonal ADT, State Road 431 (Mt. Rose Hwy.)
– West of 395 – Nevada, 1999**

Month	SR 431 – West of 395	Increment Above Seasonal Low
Jan	7,881	(40)
Feb	8,081	160
Mar	8,817	896
Apr	7,656	(265)
May	8,317	396
Jun	9,436	1,515
Jul	10,466	2,545
Aug	10,784	2,863
Sep	9,283	1,362
Oct	8,557	636
Nov	7,566	(355)
Dec	7,802	(119)
Annual Average	8,757	836
Average Seasonal Low	7,921	NA

Source: Nevada Dept. of Trans. & Dean Runyan Associates

Appendix 3. REGIONAL TRAVEL IMPACT MODEL (RTIM)

TRAVEL SPENDING

Paid Accommodations. Spending on paid accommodations is estimated from Transient Lodging Tax collections at the city/county jurisdictional level. Spending by hotel and rented home/condo guests on other visitor activities, such as eating and drinking, and recreation activities is estimated using spending distributions reported in available visitor survey data. Spending distributions show how travelers divide their spending between lodging and other purchases. Spending by campground visitors is estimated from the number of available campsites and the average occupancy of these campsites. Spending by campers in other business categories is estimated in the same way as for hotel and rented home guests.

Unpaid Accommodations. Estimated spending by friends, family and owners staying in vacation home property is estimated based on housing data from the U.S. Bureau of the Census, information gathered from real estate and property management firms, and visitor survey data estimating the number of visitors staying as guests and applying these rates to the resident population.

Day Travel. The share of day visits as a percentage of total travel is estimated from visitor survey data and applied to average daily spending estimates to produce day visitor spending.

RELATED TRAVEL IMPACTS

Total Earnings generated directly from traveler expenditures are estimated from the payroll-to-receipts ratio obtained from the U.S. Census Bureau, and earnings estimates from the Bureau of Economic Analysis.

Employment in each business category is calculated from average wage data derived from data supplied by the California Employment and Development Department; and Nevada Department of Employment, Training, and Rehabilitation.

Local Taxes consist of transient lodging taxes as well as local sales taxes applicable to visitor purchases retail and eating and drinking establishments.

State Taxes consist of California and Nevada state sales taxes applied to visitor spending on retail expenditures, restaurant meals, and gasoline as well as gaming taxes (Nevada only), and corporate and personal income taxes (California only). Personal income taxes are estimated by applying the average state personal income tax rate to payrolls resulting from visitor spending. Corporate income taxes are estimated by applying the applicable corporate tax rate to the business receipts, or sales, generated from visitor spending.

Appendix 4. IMPLAN MODELING SYSTEM

IMPLAN is a widely used, nationally recognized economic impact model, first developed by the U.S. Forest Service. IMPLAN provides estimates of the additional economic activity associated with an. This methodology has been packaged, along with the necessary data files, as IMPLAN Pro by the Minnesota IMPLAN Group, Inc. (MIG) of Stillwater, Minnesota, and provides the basis for the indirect analysis in this report.

The following are some of the conventions used by IMPLAN.

Database Components

The IMPLAN databases consist of two major parts: 1) national-level matrices and tables and 2) economic and physical data at the county and/or state level. The national matrices are combined with regional data to create a regional model, which can be edited to reflect local conditions.

The IMPLAN data is divided into four main categories:

1. Industry Output
2. Employment
3. Value Added (includes employee compensation)
4. Final Demands

Industry output represents the dollar value (producer price of goods and services) of an industry's total production. The data is derived from a number of sources including Bureau of Census economic censuses and the BLS employment projections.

Employment is listed as a single number of jobs for each industry. The data is derived from ES202 employment security data supplemented by county business patterns and Regional Economic Information System (REIS) data. All IMPLAN databases, after 1985, include both full-time and part-time workers in employment estimates.

Value Added includes employee compensation, proprietor income, other property type income, and indirect business taxes. Employee compensation includes the total payroll costs (including benefits) of each industry in the region. Proprietary income consists of payments received by self-employed individuals (includes private business owners, doctors, and lawyers). Other property type income consists of payments from rents, royalties, dividends, and interest. Indirect business taxes consist primarily of excise and sales taxes paid by individuals to businesses.

Final Demands are the dollar value of goods and services purchased by consumers and institutions (federal, state, and local government). Personal consumption expenditures are the largest component of final demand. It consists of payments by individuals/households to industries for goods and services used for personal consumption.

Trade Flows

Trade flows describe the movement of goods and services between a defined region and the outside world (imports and exports into and out of the study region). Regional Purchase Coefficients (RPC's) were used to estimate how much of the local production of a commodity will supply local demand and how much will be exported from the region. RPC's represent the portion of local demand purchased from local producers for each commodity. IMPLAN software automatically generates RPC's for each commodity with a set of econometrically based equations.

Indirect Impacts

Input-output models are driven by final consumption (or final demand). Industries respond to meet demands directly or indirectly (by supplying goods and services to industries responding directly). Each industry that produces goods and services generates demands for other goods and services. These other producers, in turn, purchase goods and services. These indirect purchases (indirect effects) continue until "leakage" from the region (imports, wages, profits, etc.) stop the cycle.

Appendix 5. DISCUSSION GUIDE FOR TRPA ASSESSMENT SECTION

DISCUSSION GUIDE QUESTIONS:

Organization type: _____

Contact title: _____

Telephone ? On-site ? _____

1. In your view, what is TRPA's mission in the Tahoe Basin? (If necessary probe knowledge of the relationship between TRPA and local and state regulators) What aspects of your business/activities need to be considered with respect to TRPA?
2. From an economic perspective (costs, business growth, project development, hiring employees, etc.), has conducting your business or organization been specifically influenced or affected in some manner by TRPA policies, regulations or programs? Explain how – please provide an example. (Specify project type and issue – to be categorized into by policy area such as coverage, habitat, view shed etc.)
3. For each project and issue mentioned: Was this influence beneficial to you? Explain how. Detrimental? Explain how.
4. How beneficial do you consider TRPA's role to be in the Tahoe Basin overall, particularly with respect to the basin economy? To the visitor industry? To community development?
5. What aspects of TRPA actions are most beneficial to the basin economy? Most detrimental to the economy? (Categorize by action type such as TRPA mission, staff and personnel, policy and regulation interpretation, regulation implementation, process timing, etc.)
6. How could the TRPA improve its impact on basin economics: (If necessary probe: administration and decision-making processes, relationships with the business community, relationships with the resident community, public information about TRPA role and responsibilities, etc.)
7. In addition to this interview, we will hand out a brief rating questionnaire to obtain your opinions about TRPA's role in Lake Tahoe economy. This is a rating of TPRA activities with specific attention to the economic aspects of the agency's programs.

Thinking about your knowledge of or personal experience with TRPA, what is **the effect of the following TRPA programs on the Lake Tahoe economy** for each of the following factors, please rate the following on a scale from 1 to 6, where “1” means *very beneficial*, “2” means *good*, “3” means *neutral*, “4” means *poor*, “5” means *detrimental*, and “6” means *don’t know*. (Please circle one number for each item)

	<u>Very Beneficial</u>	<u>Good</u>	<u>Neutral</u>	<u>Poor</u>	<u>Very Detrimental</u>	<u>Don't Know</u>
Recreation access	1	2	3	4	5	6
Wildlife habitat protection	1	2	3	4	5	6
Shoreline zone protection	1	2	3	4	5	6
Protection of scenic views	1	2	3	4	5	6
Affordable housing	1	2	3	4	5	6
Transportation	1	2	3	4	5	6
Erosion control	1	2	3	4	5	6

1. How important are TRPA programs to enhancing the Lake Tahoe economy over the long run?

Very important

Somewhat important

Not important

2. How might TRPA programs be improved with respect to their influence on the Lake Tahoe economy?

Appendix A

MASTER LIST OF COMPLIANCE MEASURES

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
WATER QUALITY/SEZ – MEASURES IN PLACE											
1	1	BMP requirements, new development: Chapter 25	X	X							
2	2	BMP implementation program -- existing streets and highways: Chapter 25	X	X	T						
3	3	BMP implementation program -- existing urban development: Chapter 25	X	X							
4	4	BMP implementation program -- existing urban drainage systems: Chapter 25	X	X	T						
5	5	Capital Improvements Program for Erosion and Runoff Control	X	X	T						
6	6	Excess coverage mitigation program: Chapter 25	X	X							
7	7	Effluent limitations: California (SWRCB, Lahontan Board) and Nevada (NDEP): Chapter 9	X	X							
8	8	Limitations on new subdivisions: (See the Goals and Policies, p. 113.)	X	X						X	X
9	9	Land use planning and controls: See the Goals and Policies (pp. II-2 through 5), and Chapters 13, 14, 15, 16, and 18 of the Code of Ordinances.	X	X	T						X
10	10	Residential development priorities, The Individual Parcel Evaluation System (IPES): Goals and Policies (pp. VII-3 through 7) and Chapter 37 of the Code.	X	X							
11	11	Limits on land coverage for new development: Goals and Policies (pp. II-12 through 15) and Chapter 20.	X	X							X
12	12	Transfer of development: Goals and Policies, pp. II-14 and VII-14.	X	X							
13	13	Restrictions on SEZ encroachment and vegetation alteration: Chapter 20	X	X		X	X	X		X	X
14	14	SEZ restoration program: Volume III of the 208 Plan and Volume's I-IV of the updated Environmental Improvement Program.	X	X		X	X	X			X
15	15	SEZ setbacks: Chapter 37	X	X		X	X	X			
16	16	Fertilizer reporting requirements: Chapter 81	X	X						X	
17	17	Water quality mitigation: Chapter 82	X	X							
18	18	Restrictions on rate and/or amount of additional development	X	X							X
19	19	Improved BMP implementation/enforcement program	X	X							
22	20	Increased funding for CIP for erosion and runoff control: CIP Volume IV of the 208 plan.	X	X							

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
23	21	Artificial wetlands/runoff treatment program	X	X							
24	22	Transfer of development from SEZs	X	X							X
25	23	Improved mass transportation	X		T						
26	24	Redevelopment and redirection of land use: Goals and Policies, pp. II-2, II-4, and II-12, and Chapter 15	X	X							X
27	25	Combustion heater rules, stationary source controls, and related rules: Chapter 91	X		AQ						
29	26	Elimination of accidental sewage releases: Goals and Policies, pp. II-41 and 43	X	X							
30	27	Reduction of sewer line exfiltration: Goals and Policies, p. II-44	X	X							
31	28	Effluent limitations	X	X							
32	29	Regulation of wastewater disposal at sites not connected to sewers: Chapter 81	X	X							
33	30	Prohibition on solid waste disposal: Goals and Policies p. II-45	X	X							
34	31	Mandatory garbage pick-up: Goals and Policies p. VI-3.	X	X			X				
35	32	Hazardous material/wastes programs: Goals and Policies pp. II-44 and 45 and Chapter 81	X	X							
36	33	BMP implementation program, Snow and ice control practices: Chapter 81, Chapter 25.	X	X	AQ						
37	34	Reporting requirements, highway abrasives and deicers: Goals and Policies, p. II-44 and Chapter 81	X	X							
38	35	BMP implementation program--roads, trails, skidding, logging practices: Chapter 71, Chapter 25	X	X				X			
39	36	BMP implementation program--outdoor recreation: Chapter 25	X	X						X	
40	37	BMP implementation program--livestock confinement and grazing: Chapter 18, Chapter 73, Chapter 25	X	X		X	X	X			
41	38	BMP implementation program--pesticides	X	X							
42	39	Land use planning and controls -- timber harvesting: Chapter 18	X	X	AQ		X	X			X
43	40	Land use planning and controls - outdoor recreation: Chapter 18	X	X					X	X	X
44	41	Land use planning and controls--OHV use: Goals and Policies, p. V-3	X	X	AQ		X	X	X	X	X
46	42	Control of encroachment and coverage in sensitive areas	X	X			X			X	X
48	43	Control on shorezone encroachment and vegetation alteration: Chapter 53	X	X							X

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
49	44	BMP implementation program--shorezone areas: Chapter 25	X	X							
50	45	BMP implementation program--dredging and construction in Lake Tahoe: Chapter 25	X	X							
51	46	Restrictions and conditions on filling and dredging: Chapter 54	X	X				X			
52	47	Protection of stream deltas	X	X			X	X			X
53	48	Marina master plans: Chapter 16	X								X
54	49	Additional pump-out facilities: Chapter 25	X	X							
55	50	Controls on anti-fouling coatings: Chapter 25	X	X							
supp. 4	51	Modifications to list of exempt activities	X	X							
WATER QUALITY/SEZ – SUPPLEMENTAL MEASURES											
new	52	More stringent SEZ encroachment rules	X	X			X	X			
1	53	More stringent coverage transfer requirements	X	X							
5	54	Modifications to IPES	X	X							
6	55	Increased idling restrictions	X	X	AQ						
7	56	Control of upwind pollutants	X	X	AQ						
8	57	Additional controls on combustion heaters	X	X	AQ						
9	58	Improved exfiltration control program	X	X							
10	59	Improved infiltration control program	X	X							
11	60	Water conservation/flow reduction program	X	X							
12	61	Additional land use controls	X	X							
AIR QUALITY/TRANSPORTATION – MEASURES IN PLACE											
1	62	Fixed Route Transit - South Shore: STAGE			T						X
2	63	Fixed Route Transit - North Shore: TART			T						X
3	64	Demand Responsive Transit - South Shore: Bus Plus, STAGE			T						
4	65	Seasonal Trolley Services - North and South Shores: South Shore TMA and Truckee-North Tahoe TMA			T						X
5	66	Social Service Transportation			T						
6	67	Shuttle programs			T						
7	68	Ski shuttle services			T						X

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
8	69	Intercity bus services			T						
10	70	Passenger Transit Facilities: South Y Transit Center			T						
11	71	Bikeways			T					X	X
12	72	Pedestrian facilities			T					X	X
13	73	Wood heater controls: Chapter 91	X		AQ						
14	74	Gas heater controls: Chapter 91	X		AQ						
15	75	Stationary source controls: Chapter 91	X		AQ						
16	76	U.S. Postal Service Mail Delivery			T						
17	77	Indirect source review/air quality mitigation: Chapter 93	X		AQ						
18	78	Idling Restrictions: Chapter 91	X		AQ						
19	79	Vehicle Emission Limitations(State/Federal)	X		AQ						
20	80	Open Burning Controls: Chapters 72 and 91	X		AQ						X
21	81	BMP and Revegetation Practices	X		AQ						
23	82	Employer-based Trip Reduction Programs: Chapter 97			T						
24	83	Vehicle rental programs: Chapter 95.			T						
25	84	Parking Standards			T						
26	85	Parking Management Areas			T						
27	86	Parking Fees			T						
28	87	Parking Facilities			T						
30	89	US 50 Traffic Signal Synchronization - South Shore			T						
31	90	General Aviation, The Lake Tahoe Airport			T				X		
32	91	Waterborne excursions	X		T					X	
33	92	Waterborne transit services	X		T					X	
new	93	Air Quality Studies and Monitoring	X		AQ						
new	94	Alternate Fueled Vehicle - Public/Private Fleets & Infrastructure Improvements			T						
new	95	Demand Responsive Transit - North Shore			T						
supp. 5	96	Tahoe Area Regional Transit Maintenance Facility			T						
supp. 10	97	Heavenly Ski Resort Gondola			T						
AIR QUALITY/TRANSPORTATION – SUPPLEMENTAL MEASURES											
AQ/T 1	98	Demand Responsive Transit - North Shore			T						

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
Supp. 2	99	Coordinated Transit System - South Shore			T						
3	100	Transit Passenger Facilities			T						
new	101	South Shore Transit Maintenance Facility - South Shore			T						
7	102	Transit Service - Fallen Leaf Lake	X		T						
8	103	Transit Institutional Improvements			T						
9	104	Transit Capital and Operations Funding Acquisition			T						
11	105	Transit/Fixed Guideway Easements - South Shore			T						
12	106	Visitor Capture Program			T						
13	107	Pedestrian and Bicycle Facilities--South Shore			T					X	
14	108	Pedestrian and Bicycle Facilities--North Shore			T					X	
18	109	Parking Inventories and Studies Standards			T						
19	110	Parking Management Areas			T						
20	111	Parking Fees			T						
21	112	Establishment of Parking Task Force			T						
22	113	Construct parking facilities			T						
23	114	Intersection improvements--South Shore			T						X
24	115	Intersection improvements--North Shore			T						X
25	116	Roadway Improvements - South Shore			T						X
26	117	Roadway Improvements - North Shore			T						X
27	118	Loop Road - South Shore			T						X
28	119	Montreal Road Extension			T						
29	120	Kingsbury Connector			T						
30	121	Commercial Air Service: Part 132 commercial air service			T						
31	122	Commercial Air Service: commercial air service that does not require Part 132 certifications			T						
32	123	Expansion of waterborne excursion service	X		T						
in place 22	124	Re-instate the oxygenated fuel program	X		AQ						
new	125	Management Programs			T						
in place 9	126	Around the Lake Transit			T						

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
VEGETATION - MEASURES IN PLACE											
1	127	Vegetation Protection During Construction: Chapter 64	X		AQ	X					X
2	128	Tree Removal: Chapter 71				X	X				X
3	129	Prescribed Burning: Chapter 72	X		AQ	X	X				X
5	130	Remedial Vegetation Management: Chapter 74	X			X					
6	131	Sensitive and Uncommon Plant Protection and Fire Hazard Reduction: Chapter 75				X					
7	132	Revegetation: Chapter 77	X			X					X
8	133	Remedial Action Plans: Chapter 9	X			X					
10	134	Handbook of Best Management Practices: Volume II of the 208 Plan	X			X					
12	135	Shorezone protection	X			X					
14	136	Project Review				X					
15	137	Compliance inspections				X					
16	138	Development Standards in the Backshore	X	X		X					X
17	139	Land Coverage Standards: Chapter 20	X			X					X
18	140	Grass Lake, Research Natural Area	X			X	X	X			
19	141	Conservation Element, Vegetation Subelement: Goals and Policies				X	X	X			
supp. 1	142	Late Successional Old Growth (LSOG): Chapter 71				X	X	X			
supp. 2	143	Stream Environment Zone Vegetation: Chapter 76	X			X	X	X			
supp. 7	145	Tahoe Yellow Cress Conservation Strategy				X					
VEGETATION – SUPPLEMENTAL MEASURES											
3	146	Control and/or Eliminate Noxious Weeds				X	X				
5	147	Deepwater Plant Protection	X			X					
6	148	Freel Peak Cushion Plant Community Protection				X					

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
WILDLIFE - MEASURES IN PLACE											
WDLF 1	149	Wildlife Resources: Chapter 78					X		X		
5	150	Stream Restoration Program	X				X				
6	151	BMP and revegetation practices	X			X	X				
7	152	OHV limitations	X		AQ		X		X	X	
9	153	Remedial Action Plans: Chapter 9					X				
10	154	Project Review					X				
FISHERIES - MEASURES IN PLACE											
1	155	Fish Resources: Chapter 79	X					X			
2	156	Tree Removal: Chapter 71					X	X			
3	157	Shorezone BMPs	X					X			
4	158	Filling and Dredging: Chapter 54	X					X			
5	159	Location standards for structures in the shorezone: Chapter 54	X					X			
6	160	Restrictions on SEZ encroachment and vegetation alteration	X	X				X			
7	161	SEZ Restoration Program: Volume III of the 208 plan	X	X				X			
8	162	Stream restoration program	X	X				X			
9	163	Riparian restoration	X	X				X			
10	164	Livestock: Chapter 73	X	X				X			
11	165	BMP and revegetation practices	X					X			
12	166	Fish habitat study						X			
13	167	Remedial Action Plans: Chapter 9						X			
14	168	Mitigation Fee Requirements: Chapter 56						X			
15	169	Compliance inspection						X			
16	170	Public Education Program					X	X			
NOISE - MEASURES IN PLACE											
Noise 1	174	Airport noise enforcement program					X		X		
2	175	Boat noise enforcement program					X		X	X	
3	176	Motor vehicle/motorcycle noise enforcement program: Chapters 8, 9, and 23					X		X		

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
4	177	ORV restrictions			AQ		X		X	X	
5	178	Snowmobile Restrictions	X				X		X	X	
6	179	Land use planning and controls							X		
7	180	Vehicle trip reduction programs			T				X		
8	181	Transportation corridor design criteria			T				X		
9	182	Airport Master Plan South Lake Tahoe			T				X		
10	183	Loudspeaker restrictions							X		
11	184	Project Review							X		
12	185	Complaint system: Chapters 8, 9 and 23							X		
13	186	Transportation corridor compliance program			T				X		
14	187	Exemptions to noise limitations							X		
supp. 1	188	TRPA's Environmental Improvement Program (EIP)							X		
supp. 2	189	Personal watercraft noise controls							X		
NOISE - SUPPLEMENTAL MEASURES											
3	190	Create an interagency noise enforcement MOU for the Tahoe Region.							X		
RECREATION - MEASURES IN PLACE											
Rec. 1	191	Allocation of Development: Chapter 33								X	
4	192	Master Plan Guidelines: Chapter 16								X	X
5	193	Permissible recreation uses in the shorezone and lake zone: Chapter 51	X						X	X	
6	194	Public Outdoor recreation facilities in sensitive lands	X							X	X
10	195	Hiking and riding facilities								X	
12	196	Scenic quality of recreation facilities								X	X
13	197	Density standards								X	
14	198	Bonus incentive program								X	
16	199	Required Findings: Chapter 6								X	
new	200	Lake Tahoe Recreation Sign Guidelines								X	X
supp. 1	201	Annual user surveys								X	

1996 Measure #	2001 Tracking #	2001 Compliance Measure Wording	WQ	Soils/SEZ	Trans/AQ	Veg	Wildlife	Fish	Noise	Rec	Scenic
RECREATION - MEASURES SUPPLEMENTAL											
Supp. 2	202	Regional recreational plan								X	
3	203	Establish fairshare resource capacity estimates								X	
4	204	Reserve additional resource capacity								X	
new	205	Economic Modeling								X	
SCENIC - MEASURES IN PLACE											
SC 1	206	Project Review and Exempt Activities: Chapter 4									X
2	207	Land Coverage Limitations: Chapter 20	X								X
3	208	Height Standards: Chapter 22									X
4	209	Driveway and Parking Standards: Chapter 24			T						X
5	210	Signs: Chapter 26									X
6	211	Historic Resources: Chapter 29									X
7	212	Design Standards: Chapter 30									X
8	213	Shorezone Tolerance Districts and Development Standards: Chapter 53									X
9	214	Development Standards Lakeward of Highwater: Chapter 54	X								X
10	215	Grading Standards: Chapter 64	X								X
11	216	Vegetation Protection during Construction: Chapter 65			AQ	X					X
12	217	Revegetation: Chapter 77									X
14	218	Design Review Guidelines									X
15	219	Scenic Quality Improvement Program(SQIP)									X
16	220	Project Review Information Packet									X
17	221	Scenic Quality Ratings, Features Visible from Bike Paths and Outdoor Recreation Areas Open to the General Public			T						X
supp. 1	222	Nevada-side Utility Line Undergrounding Program									X
SCENIC - MEASURES SUPPLEMENTAL											
2	227	Real Time Monitoring Program									X
3	228	Integrate projects identified in the SQIP									X

Appendix C

CUMULATIVE ACCOUNTING

APPENDIX A Information and Analysis Pursuant to Chapter 32, TRPA Code of Ordinances

The TRPA Code of Ordinances, in Subsection 32.7 B, Cumulative Accounting, requires TRPA to maintain a current cumulative account for the purpose of assessing cumulative impacts on interim targets established pursuant to subsection 32.4.E of the Code, for projects approved after the effective date of the Regional Plan, July 1, 1987.

The Code states that the cumulative account shall include at least the following items:

1. Units of Use: residential, commercial, tourist and recreational allocations.
2. Resource Utilization: additional vehicle miles traveled (VMT), vehicle trip ends (VTE), impervious coverage, water demand, sewer demand, sewage disposal capacity and area of SEZ disturbance.
3. Threshold Attainment and Maintenance: value of investments in water quality, air quality, transportation and coverage mitigation programs, area of SEZ restoration.

I. UNITS OF USE

Table 1. RESIDENTIAL ALLOCATIONS									
COUNTY	1996	1997		1998		1999		2000	
Douglas	23	23	(2)	23	(5)	23	(8)	23	(1)
Washoe	59	59	(6)	59	(22)	59	(39)	59	(24)
El Dorado	130	130	(4)	130	(4)	130	(7)	130	(3)
Placer	88	88	(1)	88	(39)	88	(33)	88	(29)
Total	300	300	(85)	300	(71)	300	(87)	300	(57)

The number in parenthesis indicates the number of residential allocations that were unused in the identified year. Beginning in 1997, the unused allocations are rolled into the allocation pool.

Allocations can be assigned from the allocation pool provided the recipient retires a sensitive lot in the basin. The allocation numbers represent allocations returned to TRPA from the local jurisdiction.

Table 2. RESIDENTIAL ALLOCATION TRANSFERS

COUNTY	1996	1997	1998	1999	2000
Douglas	0	0	0	0	0
Washoe	2	0	0	0	0
El Dorado	11	2	3	0	0
Placer	0	0	0	0	0
Total	13	2	3	0	0

Table 3. RESIDENTIAL ALLOCATION ASSIGNMENTS FROM POOL

COUNTY	1996	1997	1998	1999	2000
Douglas	0	0	0	0	0
Washoe	0	0	0	0	0
El Dorado	0	0	0	1	5
Placer	0	0	0	0	0
Total	0	0	0	1	5*

* Note: In 2001 at least 13 allocations were assigned from the allocation pool.

Table 4. NUMBER OF RESIDENTIAL ALLOCATIONS IN POOL

	1997	1998	1999	2000
Allocations in Pool	100*	100 (85)**	156 (71)**	242 (87)**
Number of Allocations Assigned	0	0	1	5
Remaining	100	100	155	237

*Allocation pool was initially stocked with 100 allocations that were required to be replaced with allocations rolled-over from previous year starting in 1998.

**Rollover from previous year.

Table 5. COMMERCIAL FLOOR AREA ALLOCATIONS

COUNTY	1996	1997	1998	1999	2000
Douglas	1,738	0	3,000	36,767	0
Washoe	5,446	19,015	16,000	0	19,306
El Dorado	5,127	0	4,190	10,038	87,634
Placer	5,080	17,125	15,432	13,049	7,064
Total	17,391	36,140	38,622	59,854	114,004

Table 6. TOURIST ACCOMMODATION UNIT ALLOCATIONS

COUNTY	1996	1997	1998	1999	2000
Douglas	0	0	0	0	0
Washoe	0	0	0	0	0
El Dorado	0	0	0	0	0
Placer	0	0	0	0	0
Total	0	0	0	0	0

Table 7. RECREATIONAL ALLOCATIONS

Plan Area Statements / CPs	'92 RTP Summer Day-use	Existing Summer Day-use	Corrected Summer Day-use	Existing Winter Day-use	Corrected Winter Day-use	Existing Overnight Uses	Corrected Overnight Uses
001A - Tahoe City CP	600	600	600	0	0	0	0
004 - Burton Creek	0	0	0	0	0	600	600
008 - Lake Forest	110	0	110	0	0	0	0
013 - Watson Creek	0	0	0	0	0	400	400
015 - North Star	0	0	0	1000	1000	0	0
016B - Carnelian Bay Subdivision	200	0	200	4000	0	280	280
017 - Carnelian Bay CP	40	40	40	0	0	0	0
019 - Martis Peak	0	0	0	0	0	124	124
022 - Tahoe Vista CP	100	0	100	0	0	0	0
024A - North Tahoe Recreation Area	0	0	0	0	0	200	200
024B - Snow Creek	285	0	285	0	0	0	0
029 - Kings Beach Commercial CP	300	750	750	0	0	0	0
048 - Incline Village Tourist CP	500	0	500	0	0	0	0
052 - Incline Ski	0	0	0	900	900	0	0
053 - Incline lake	100	0	100	0	0	0	0
057 - Spooner Lake	160	0	160	0	0	390	390
066 - Zephyr Cove	180	0	180	0	0	200	200
070B - Rabe	0	0	0	0	0	500	500
071 - Round Hill CP	25	25	25	0	0	0	0
072 - Round Hill/Tahoe Dempsey	0	0	0	0	0	500	500
086 - Heavenly Valley Nevada	0	0	0	350	350	0	0
087 - Heavenly Valley California	0	0	300	5050	5550	0	0
098 - Bijou/Al Tahoe CP	0	0	0	0	0	64	60
101 - Bijou Meadow	25	0	25	0	0	0	0
119 - Country Club Meadow	160	0	160	0	0	0	0
125 - Meyers CP	150	0	150	0	0	0	0
129 - Fallen Leaf North	80	0	80	0	0	1020	1020
153 - Sugar Pine Point	0	0	0	4000	0	280	280
157 - Homewood/Tahoe Ski Bowl	0	0	0	4000	4000	280	280
166 - Upper Ward Valley	0	0	0	4000	600	280	280
174 - 64 Acre Tract	400	0	400	0	0	0	0
Subtotal	3415	1415	4165	23300	12400	5118	5114
Summer Day-use Reserved Pool	2000	2000	2000				
Overnight Use Reserved Pool						1000	1000
PAS Allocations with Reserve Pools	5415	3415	6165	23300	12400	6118	6114
Total PAOT Code Allocations	6761	6761	6761	12400	12400	6114	6114
Discrepancy	-1346	-3346	-596	10900	0	4	0

Plan Area Statements Requiring Amendment

Per TRPA Code of Ordinances, Subsection 33.6: Summer Day-use PAOTs MAY be assigned to a PAS for future allocation; Winter Day-use PAOTs SHALL be distributed in the plan area statements; Overnight PAOTs SHALL be distributed in the plan area statements

II. RESOURCE UTILIZATION

Table 8. ADDITIONAL DAILY VEHICLE TRIP ENDS (DVTE) AND VEHICLE MILES TRAVELED (VMT) *						
County	1996	1997	1998	1999	2000	Total
Washoe						
DVTE	271	1,754	3,531	728	360	6,644
VMT	974	6,314	12,710	2,622	1,297	23,917
Douglas						
DVTE	99	83	1,048	1,548	2,034	4,812
VMT	358	299	3,772	5,574	7,322	17,325
El Dorado						
DVTE	6,852	2,589	8,537	2,147	6,274	26,399
VMT	24,668	9,319	30,732	7,731	22,587	95,037
Placer						
DVTE	323	197	2,427	1,554	727	5,228
VMT	1,192	709	8,737	5,594	2,619	18,851
TOTAL:						
DVTE	7,545	4,623	15,542	5,978	9,396	43,084
VMT	27,162	16,641	55,950	21,520	33,825	155,098

*Note: The increase in daily vehicle trip ends (DVTE) is based on air quality mitigation fees collected for approved single family dwellings and new or expanded commercial uses. Vehicle miles of travel (VMT) are calculated assuming an average trip length per vehicle trip.

Table 9. APPROVED NEW COVERAGE						
County	1987-1991		1992-1995		1996-2000	
	Square Feet	Acres	Square Feet	Acres	Square Feet	Acres
Douglas	993,436	22.80	306,396	7.03	264,116	6.06
Washoe	2,165,109	49.70	1,295,005	29.73	739,791	16.98
El Dorado	1,916,872	44.00	1,399,704	32.13	1,758,560	40.37
Placer	1,375,059	31.57	1,109,462	25.47	1,250,049	28.70
TOTAL	6,450,476	148.07	4,110,567	94.36	4,002,017	91.87

Table 10. Water Demand

A Draft Policy for Water Allocation, based on the 208 Plan, was published in 1984, and identified zones on the California side, which are roughly the boundaries of the current Public Utility districts. The TRPA Compact states a limit of 23,000 acre-feet including public and private lands. The intent of the water demand is that current and future allocations do not exceed the 23,000 acre-feet. The data presented in Table 10 was derived using the residential allocations for the five-year evaluation period that were actually built (see Table 1). An additional 572 acre-feet per year will not violate the Compact. The 1998 EIS for the Truckee River Operating Agreement states that Nevada's annual demand in Lake Tahoe is 9,330-acre-feet, and California's is 15,000. (*Draft EIS, Truckee River Operating Agreement, Bureau of Reclamation, February, 1998*).

Table 10. WATER DEMAND			
County	Residential Allocations	Per Unit Multiplier*	New Use Per Allocation, Acre Ft./Year
Douglas	99	.45 Acre Ft./Year	50
Washoe	204	.48 Acre Ft./Year	98
El Dorado	634	.47 Acre Ft./Year	298
Placer	268	.47 Acre Ft./Year	126
TOTAL	1205		572
* Estimate based on 1989 STPUD Wastewater Treatment Facility Expansion			

Table 11. Sewage Disposal Capacity

The contributions to Table 11 were supplied by the respective utilities responsible for wastewater export from the Tahoe Basin. Residential allocations are grouped by the district and multiplied by a general per household gallons per day estimate. The increase in usage is shown along with current daily capacity, indicating how much increase each district will handle.

Table 11. SEWAGE DISPOSAL CAPACITY				
District	Per Unit Multiplier*	New usage, Ac/Ft per day	Current Capacity in Acre Ft.	Total new usage, Ac/Ft
TTSA	.34 Acre Ft./Year	0.25	3.68 per day	3.93 per day
STPUD	.34 Acre Ft./Year	0.59	13.8 per day	14.4 per day
IVGID	.34 Acre Ft./Year	0.19	4.09 per day	4.28 per day
Douglas GID	.34 Acre Ft./Year	0.09	7.06 per day	7.15 per day
* Estimate based on 100 gal/day per person, 3 person single family unit= 300 gal/day= .34 acre feet per year				

Table 12. AREA OF SEZ DISTURBANCE						
	Pre-1981		1981-1995		1996-2000	
			Disturbance	Restored	Disturbance	Restored
		4,400ac		321.15ac		153.55ac
TOTAL		4,400ac		4078.85ac		3925.30ac
Note: This table does not include the newly created disturbance as a result of approved projects. Utility access is quite difficult to ascertain, as this disturbance is not provided on project plans.						

III. THRESHOLD ATTAINMENT AND MAINTENANCE

Table 13. Erosion & Runoff Control Projects Constructed Since 1988			
Jurisdiction	Project Name	Completed	Project Cost*
Placer	Dollar Point	1989	630,000
County	Tamarack Drive	1989	269,900
	Agate Bay	1990	156,000
	Carnelian Woods	1990	300,000
	Carnelian Drive	1990	437,760
	Regency Way	1990	350,000
	Trout Street	1990	76,500
	Alpine Peaks (I)	1990	360,000
	Alpine Peaks (II)	1991	400,000
	Estates Drive	1991	590,000
	Kahula Park	1991	305,475
	McKinney Estates	1991	457,663
	Skyland Phase I and II	1991	569,000
	Holly Road	1992	80,000
	Kingswood West II	1992	100,000
	Nightingale	1992	130,000
	Ridgewood	1993	421,904
	Fox Street	1993	250,000
	Chambers Lodge	1995/96	404,000
	Forest Road	1995/96	640,000
	Agate Road Phase I	1995/96	630,000
	McKinney Rubicon Springs Phase I	1995	52,901
	Fir Avenue	1995	45,000
	Tahoe Swiss Village	1996	543,000
	Tahoe Park Heights	1996	107,020
	Speckled/Pine Overlay	1996/97	340,000
	McKinney Rubicon Springs Phase II	1997	324,176
	Blackwood Creek Debris Removal	1997	4,684
	Ward Creek Debris Removal	1997	153,357
	Tahoe City Phase I	1997	4,503,000
	Agate Road Phase II	1997	43,906
	Homewood Canyon	1998	208,821
	Agate Road Phase III	2000	174,652
	Tahoe City Urban Improvement	2000	4,898,938
	Carnelian Area Drainage System	2000	500,000
	Lake Vista Dr. Stabilization Project	2000	91,560
	National Ave. Water Quality Project	2001	To Be Determined
		TOTAL	19,549,217

Table 13. Erosion & Runoff Control Projects Constructed Since 1988

Jurisdiction	Project Name	Completed	Project Cost*
El Dorado County	(Includes phases of several projects, Rubicon, Tahoma, Montgomery Estates, Country Club, & Echo View)	1988	1,509,600
	Marshall Trail	1989	125,000
	Santa Fe	1989	37,000
	Tahoe Paradise #60	1989	10,000
	Tahoe Mountain	1989	322,000
	Montgomery Estates	1989	12,000
	Country Club	1989	842,000
	Rubicon	1989	200,000
	Pioneer Trail	1989	1,800,000
	Upper Truckee	1989	175,000
	1989 CCC	1990	200,000
	Arapahoe	1990	6,500
	North Upper Truckee	1991	760,000
	Golden Bear	1992	50,000
	Victoria Drive	1992	785,000
	Pat Lowe Bike Trail/ECP	1992	500,000
	Valley View	1993	220,000
	Del Norte	1993	83,000
	Apache I	1993	1,000,000
	North Upper Truckee	1993	1,200,000
	Black Bart Phase I	1996/96	342,951
	Black Bart Phase II	1995/96	984,211
	Angora/Bike Lane Phase I	1997	429,804
	Mountain Drive	1997	941,245
	Angora Creek ECP II- portion of Mountain View	1998	1,795,017
	Hepka Erosion Control Project	1998	790,422
	Pioneer Trail III	2001	2,942,283
		TOTAL	18,063,033
City of	Bijou/Wildwood	1988	3,361,440
South Lake	Lake Christopher	1990	229,500
Tahoe	Bijou	1990	272,000
	Ski Run I	1990	750,000
	Tahoe Valley	1991	350,000
	Gardner Mountain	1992	410,000
	Al Tahoe Pioneer Trail	1992	900,000
	Lakeview Avenue	1993	15,000
	Gardner Mountain	1993	48,000
	Lake Christopher	1994	600,000
	12th & 13 th Streets	1994	900,000
	Clement Street Erosion Control Project	1996	270,000
	Stateline Erosion Control Project	1996	2,121,080
	Al Tahoe/Pioneer Trail/Bijou Creek	1999	1,797,900
	Beecher/Lodi portion of Sierra Tract Residential	1999	1,025,990
	Ski Run Blvd. Improvement	2000	338,172
	Park Avenue Project Phase I	2000	244,572
	Regina Road BMP	2001	9,000
	Ski Run Marina Drainage Retrofit	2001	253,000
		TOTAL	13,895,654

Table 13. Erosion & Runoff Control Projects Constructed Since 1988

Jurisdiction	Project Name	Completed	Project Cost*
Washoe County	Crystal Bay	1989	1,412,579
	Steven Parking Lot & Preston Field	1990	321,000
	Ski Way/R-2-1 & R-2-2	1990	522,000
	Ski Incline Parking	1990	257,000
	Incline Village II	1991	1,568,076
	Incline Village IV, Phase I	1993	670,000
	1st, 2nd, 3rd, & Woods Creek Water Quality Imprvmnt. Project	1995	772,000
	2 nd Creek & Country Club Drive	1997	19,625
	Goshute Road Crystal Bay	1997	68,435
	Ski Way portion of Mill Creek Water Quality	1998	576,892
	Incline Village Unit #1 BMP- includes Upper Jennifer	1999	1,317,070
	Incline Village Commercial and Lower Wood Creek	2000	1,525,000
	Fairview Country Club Water Quality Project	2001	2,600,000
		TOTAL	11,629,677
Douglas County	Elk Point	1988	42,623
	Chimney Rock	1989	108,000
	Hubbard Road	1990	127,000
	Kingsbury Highlands	1991	339,183
	Cave Rock	1991	1,062,394
	North Martin Street	1991	61,394
	Zephyr Knolls	1991	672,136
	Kingsbury Summit	1991	1,712,663
	Kahle Drive/Burke Creek	1992	532,635
	Lower Kingsbury	1992	1,471,196
	Kingsbury Summit	1992	1,337,192
	Kingsbury Village	1993	1,380,530
	Glenbrook Slope Stabilization	1995	320,472
	Skyland	1995	292,549
	Elk Point/Round Hill GID	1997	130,983
	Marla Bay	2000	406,100
	Kingsbury Estates/Tahoe Village Phase I & II	2000	1,513,473
	Round Hill GID, McFaul Way	2000	48,323
	Kingsbury Village	2001	1,071,324
	Cave Rock Estates GID	2001	1,999,157
		TOTAL	14,629,327
NDOT	Nevada 28-Crystal Bay to NV 431	1991	296,211
	Incline Village Highway 431 to Lakeshore Drive	1995	1,800,000
	SR 28 from WA mile post 3.19 to 4.98	1996	2,486,035
	Kingsbury/Hwy 50 Drainage: Edgewood System	1999	511,918
	SR 28 from DG mile post 0.00 to 1.23, CC 0.77	1999	2,750,000
	US 50 Kingsbury to Kahle	1999	2,659,907
	South Shore Casino Core Urban Runoff Treatment	2000	2,500,000
		TOTAL	13,004,071

Table 13. Erosion & Runoff Control Projects Constructed Since 1988

Jurisdiction	Project Name	Completed	Project Cost*
Caltrans	Highway 28-mile post 8.4	1988	28,000
	Highway 89-mile post 4.42	1988	19,000
	Highway 89-mile post 7.6	1988	26,000
	Highway 50-mile post 71.5-73.5	1988	40,000
	0.02 miles west of Pioneer Trail on Highway 50	1989	10,000
	Highway 28-mile post 9.57	1989	31,000
	1.4 miles east of Highway 89 on 28	1990	10,000
	Highway 89 (Rubicon)-mile post 21.8-22.9	1990	500,000
	Emerald Bay	1991	2,460,000
	Highway 50 at the Airport	1991	250,000
	Elizabeth Drive	1991	188,000
	Cherry Street/Grimsel Pass	1992	188,000
	Tahoe Swiss Village/Trout Street	1992	40,281
	Airport	1992	250,000
	Taylor Creek Bridge	1994	690,000
	Cascade Creek Bridge	1994	690,000
	Rubicon Glen Drive to Silver Tip Drive	1994	1,128,000
	Dollar Grade Erosion Control	1995	725,000
	Brockway Summit Erosion Control	1998	2,715,000
	Burton Creek Culvert Replacement	1999	375,000
	Snow Creek Water Quality/Culvert	1999	752,000
		TOTAL	11,115,281
GRAND TOTAL			88,882,189
*Costs are provided by jurisdiction, subject to update			

Table 14. INVESTMENTS IN AIR QUALITY MITIGATION PROGRAMS

Year	Amount Invested	Project
Placer County		
1988	\$ 26,400	Coordinated Shuttle Service Study
1990	\$ 16,385	TART
1991	\$ 123,000	Grant Match- Buses
1991	\$ 40,000	Tahoe City Circulation Improvement
1991	\$ 27,000	Transit Purchase
1992	\$ 25,825	Transit Vehicle
1992	\$ 30,000	Transit Vehicle
1992	\$ 45,000	Bus Turnouts
1993	\$ 25,000	Bike Trail Sweeper
1993	\$ 15,000	Transit Center Design
1994	\$ 25,000	Maintenance Vehicle
1994	\$ 39,000	TART Facility
1995	\$ 40,000	Bike Trail Design
1997	\$ 346,000	TART Maintenance Facility
1997	\$ 26,000	North Shore Trolley Program
1998	\$ 300,000	64-Acre Transit Center- Tahoe City and TART Maintenance Facility
1999	\$ 125,055	Lakeside and Rocky Point Bike Trails and North Shore Trolley Program
1999	\$ 15,000	Kings Beach Commercial Core
2000	\$ 300,000	Grant Match- TART Buses
El Dorado County		
1991	\$ 284,000	Bike Lanes
1994	\$ 100,000	Bicycle Trail
1995	\$ 110,000	Trolley Purchase
1995	\$ 103,000	5-Yr Project List
1998	\$ 536,232	Bike and Transit Projects
2000	\$ 150,000	New Street Sweepers
2000	\$ 76,540	Angora Erosion Control and Bike Lane Projects
City of South Lake Tahoe		
1988	\$ 10,000	Coordinated Shuttle Service Study
1988	\$ 1,200	Coordinated Shuttle Service Study
1988	\$ 2,000	Coordinated Shuttle Service Study
1991	\$ 18,000	Methanol Fuel Vehicles
1991	\$ 9,000	STAGE
1991	\$ 9,000	Methanol Fuel Vehicles
1991	\$ 18,000	Alternative Fuel Vehicles
1994	\$ 148,995	Bus Purchase
1996	\$ 62,000	Purchase of Street Sweeper
1996	\$ 60,000	South Y Transit Center Facility
1999	\$ 140,477	Transit buses, STAGE Operating Assistance and Caltrans Bus Shelter.

Table 14. INVESTMENTS IN AIR QUALITY MITIGATION PROGRAMS		
Year	Amount Invested	Project
Douglas County		
1992	\$ 30,000	Bus Service
1993	\$ 45,000	Bicycle Trail
1994	\$ 30,000	Extension of Stage
1995	\$ 100,000	Trolley Purchase
1996	\$ 30,000	STAGE Service in Douglas County
1999	\$ 10,000	Purchase of Street Sweeper
Washoe County		
1993	\$ 70,541	Pedestrian/Bike Path
1995	\$ 549,400	Bike and Pedestrian Facility
1997	\$ 140,000	TART Maintenance Facility
1997	\$ 25,000	Highway 28 Shuttle
1998	\$ 125,000	North Stateline Urban Design Project

Table 15. COMPLETED LAND COVERAGE REDUCTION PROJECTS (1996-2000)	
USFS – North Shore Ecosystem Mgmt. Project	55.27 Acres
USFS – East Shore Land Coverage Restoration	27.2 Acres
USFS – Heavenly CWE Implementation – Phase 2	40.6 Acres
USFS – Heavenly CWE Implementation – Phase 3	5.24 Acres
Redevelopment Project No. 1 (Embassy Vacation Resort/Ski Run)	9.95 Acres
TOTAL	138.26 Acres

Table 16. COMPLETED SEZ RESTORATION PROJECTS 1996 - 2000

Jurisdiction	Project	Completed	Cost	Acres	Lead Agency
Placer	Carnelian Bay Access - Phase II & III	2000	\$1,666,650	4	CTC
Placer	Snow Creek	2000	\$3,429,189	6	Placer County/ CTC
Placer	Tahoe Vista Beach	2000	\$20,000	1	NTPUD
Placer	Carnelian Creek – Phase III	2000	\$2,458,490	8	CTC
Placer	Tahoe City Urban Improvements	2000	\$4,714,000	3	Placer County
Placer	Snow Creek Wildlife Habitat Restoration	2000	\$750,000	4	CTC
CSLT*	Trout Creek – Pioneer to Black Bart – Phase I & II & III	2001	\$2,175,808	99	CSLT
CSLT*	Wildwood (Between Ski Run and Pine Grove)	1998	\$500,000	1	CSLT
CSLT*	Osgood Avenue	1998	\$150,000	0.5	CSLT
CSLT*	Redevelopment Project No. 1 (Embassy Vacation Resort)	1998	Not available	2.39	CSLT
El Dorado	Angora Creek	1997	\$350,000	10	C-Parks
El Dorado	Sky Meadows Stream Bank Stabilization	1998	\$25,000	0.15	USFS
El Dorado	Arapahoe	1996	\$27,468	.5	
El Dorado	Heavenly CWE Phase 2	1999	\$230,000	5.77	USFS
El Dorado	Heavenly CWE Phase 3	2000	\$205,000	5.24	USFS
Washoe	Incline Creek (Hyatt)	1999	\$939,098	1.5	IVGID
Washoe	Lake Country Estates	1997	Not available	1.5	Private
TOTAL (1996 to 2000)				153.55 Acres	
TOTAL (1981 to 1995)				321.15 Acres	
GRAND TOTAL (1981 to 2000)				474.7 Acres	
* City of South Lake Tahoe					

Appendix D

CUMULATIVE EFFECTS

Appendix C lists the cumulative accounts for allocations. TRPA Code Chapter 32.8.A(2) requires TRPA to report on the cumulative impacts on each threshold for projects approved after the effective date of the Regional Plan, and since the last threshold evaluation. The following sections evaluate the cumulative impacts on each threshold.

AIR QUALITY

Cumulative effects of projects approved by TRPA on the Air Quality threshold indicators.

AQ-1: Carbon Monoxide (CO)

CO concentrations have significantly dropped since 1987, and no exceedances have occurred since 1995. This is primarily due to technological improvements in vehicle emissions. The development that has occurred over the past 15 years and the resulting cumulative effects on the indicator are negligible due to the cleaner fleet.

AQ-2: Ozone

Since 1987, average ozone concentrations during June-August have been slightly reduced. The number of exceedances of the federal and state standards have been significantly reduced. Technological improvements in vehicle emissions are likely the primary reason for this reduction. Allocations have had little or no impact on this indicator.

AQ-3: Particulate Matter (PM10)

Exceedances of the PM standards have been significantly reduced since 1987. Likely causes include the use of BMPs in the Basin to reduce the transmission of particulates into the atmosphere, the reduction in PM emissions from both stationary (i.e. wood stoves, power generators, etc.) and mobile (automobile) sources, and the reduction in wood smoke emissions resulting from TRPA's Wood Heater Retrofit Program and the popularity of gas stoves. Since PM trends have been downward, development in the Basin may have had a positive effect on this indicator as all new and remodeled units are required to install new cleaner wood stoves (EPA certified) and heating appliances (TRPA Code of Ordinances, Chapter 91). This has resulted in a continuous phase-out of older appliances that emit more pollutants. There may be impacts from the increase in vehicle miles traveled (AQ-7), due to the re-entrainment of dust from cars traveling over roadways, although impacts have not been measured as this indicator is in attainment.

AQ-4: Visibility

Since 1987 there have been significant improvements in both Sub-Regional (local urban areas) and Regional (Basin-wide) visibility standards. Currently, the two Sub-Regional standards (which address visibility for 50% and 90% of the year) are being met, indicating that local sources of visibility-reducing constituents have been significantly reduced; thus, past projects in the Basin have not resulted in negative impacts to this indicator. As discussed with AQ-3, EPA-certified wood stoves and other, cleaner heating appliances are installed in any new or remodeled unit. This cumulative reduction in emissions has likely contributed to the decline in particulate matter; thus, projects may have resulted in positive impacts to this indicator. For the Regional standards, out-of-Basin sources may be partially responsible for the non-attainment status.

AQ-5: Traffic Volume

This indicator addresses traffic volumes at the Park Avenue and US 50 intersection during the winter months. The official indicator is the traffic volume at this intersection, averaged from November through February, from 4:00 pm to 12:00 midnight. Although data are not available to evaluate this indicator from 1997-present, counts at the specified intersection indicate that the threshold was in attainment during the winter of 1996-1997. Another measurement that is used for evaluation is traffic volumes on the Saturday of President's Weekend, during the same evening hours. The trends for this indicate that after increasing from 1981 to 1987, the volumes have steadily decreased through 1997. The volume from 1997 (22,384) was approximately eleven percent lower than 1981 (25,173), and approximately 21.7 percent lower than 1987 (28,605). These volumes are shown in Table 2-1 of the 2001 Threshold Evaluation.

It is likely that a decline in traffic volumes is partially due to improvements generated by projects in the Basin (many which used Air Quality Mitigation Funds). Each project that generates additional vehicle trips is required to mitigate its traffic impacts and/or contribute to a regional air quality mitigation fund. These funds are used for projects that will improve air quality in the Region, including purchasing transit vehicles, providing for transit infrastructure (e.g., transit shelters), and bicycle and pedestrian projects.

AQ-6: Wood Smoke

Although no base level data are available from 1981 to evaluate the status of this indicator, aerosol data collected by TRPA indicates significant reductions in wood smoke levels from 1991 to 1999. This is likely due to the implementation of TRPA's Wood Heater Retrofit Program, general improvements in the emissions of all new wood heaters, and the increased popularity of gas heaters. Since wood smoke concentrations have dropped, it appears that permitted projects have had a positive impact, as permits require the installation of EPA-approved wood heaters and do not allow new open-burning fireplaces (which emit a significant amount of wood smoke).

AQ-7: Vehicle Miles Traveled (VMT)

In 1987 the modeled VMT for the Basin was 1,813,748 miles (average peak summer day). The estimated VMT for 1995 was 1,735,000 miles. However, the 1995 VMT was developed from a significantly different database, using more accurate spatial socioeconomic data. As a result, the VMT values for the 1995 base year are not directly comparable to the 1987 estimated values. Therefore, TRPA recommends analyzing trends from 1995 to 1999 to analyze the impacts of allocations on this indicator. In doing so, estimates show an increase in VMT of 3.2 percent, or 55,602 miles, between 1995 and 1999. Both local residents and non-resident visitors contribute to VMT. Unfortunately, the relative contributions from each population are unknown and difficult to quantify. However, using the assumptions for increased VMT per allocation (see the Environmental Assessment for the 2001 Threshold Evaluation), a portion of this increase has likely resulted from allocations permitted since 1987.

AQ-8: Atmospheric Deposition

Since 1987 the peak hourly concentrations of nitrogen dioxide have dropped. Also, the annual mean nitrate concentrations have dropped from 1989 to the present (data not available for 1987-88). Vehicle emissions contribute to atmospheric nitrogen concentrations, and technological improvements have resulted in a significant reduction in nitrogen emissions. The positive impacts of these reductions have far outweighed any negative impacts associated with development over the past 15 years.

WATER QUALITY

Cumulative effects of projects approved by TRPA on Water Quality threshold indicators.

Appendix C lists the cumulative accounts for allocations and water quality projects implemented, in part, from Water Quality Mitigation Funds. According to Code Chapter 32.8.A(2), TRPA is required to report on the cumulative impacts on each threshold for projects approved after the effective date of the Regional Plan, and since the last threshold evaluation. While the required BMPs and water quality mitigation fees included on permits are intended to mitigate the onsite and offsite impacts of development, this section is intended to evaluate the cumulative impacts on the seven water quality threshold indicators.

WQ-1: Turbidity, Shallow Waters of Lake Tahoe

Since 1987, all turbidity data taken has been less than the indicator standards of 1 Nephelometric Turbidity Units (NTU) or 3 NTU for stream discharge effected littoral zone. Since this threshold has been in attainment for the 1991, 1996, and 2001 Threshold Evaluations, there appears to be no direct cumulative impact of projects since the 1987 Regional Plan. Recent studies have indicated potential localized impacts in nearshore areas adjacent to urban development, but for the most part turbidity in these areas has been below the indicator standard. Further investigations on the higher turbidity nearshore areas will occur during 2002, with test to evaluate the source and nature of the turbidity in those areas (e.g. fine inorganic sediments, or organic particles and phytoplankton growth).

WQ-2: Clarity, Winter Pelagic Lake Tahoe (Secchi depth)

Since 1987, the Winter Average Secchi has continued to decline with considerable variation from year to year. Due to the decades long response time of the lake, it is difficult to determine if there has been cumulative effects of projects on this threshold indicator. Of the two major mitigation measures for this indicator, \$88.9 million has been spent on Erosion & Runoff Control projects since 1988. Many of these projects would include mitigation of offsite impacts of development. Since BMP requirements in these permits were intended to mitigate onsite (within design limits), there should be no cumulative impacts to that extent. If these project BMPs have not been maintained there could be impacts such as increased runoff, and sediment loading due to increased flows in right-of-ways (particularly those that have not had erosion and runoff treatment projects). The location of projects in the watershed would be related to their potential for direct impact on lake clarity.

WQ-3: Phytoplankton Primary Productivity (PPr)

Since 1987, Phytoplankton Primary Productivity has continued to increase in the deep waters of the lake. It is now known that PPr is predominantly Phosphorus limited in the lake. The increase in VMT, due to projects since 1987 and visitor trips may have contributed to Nitrogen loading of the lake in addition to atmospheric loading from distant sources. However, reductions in atmospheric nitrogen dioxide from improved emissions standards for engines may have decreased these impacts since 1987. Direct impact of the projects since 1987 on Phosphorus loading to the lake would be difficult to determine in the absence of data on landscape maintenance and use of phosphorus fertilizers. The trends and focus for road sanding have been to reduce the use of road sand, but increased sanding or use of asphalt sealing in some areas with phosphorus containing abrasives or slurry sealers may have resulted from projects implemented since 1987.

Water quality and source control projects on road right-of-ways would be expected to reduce the amount of phosphorus loading to the lake. In addition road and SEZ restoration, and revegetation projects should have resulted in a net reduction of loading to the lake as well.

WQ-4: Tributary Water Quality

Since 1987, tributary water quality annual averages for Nitrogen have exceeded standards for many years, and Phosphorus standards have been exceeded in most years with the exception of a few monitored tributaries. Iron standards are typically exceeded, however TRPA and the Lahontan Regional Water Quality Control Board have recognized that iron standards do not reflect natural background levels in these watersheds. Suspended sediment standards are exceeded less often and in fewer tributary watersheds than the nutrient standards. A recently completed analysis of the Lake Tahoe Interagency Monitoring Program for tributaries showed decreasing trends in Nitrogen, Phosphorus, and suspended sediment concentrations for many watersheds. Increasing trends for suspended sediment and iron were only detected in three west shore tributaries (General, Blackwood, and Ward Creeks). The General Creek watershed is relatively undeveloped, but has had past disturbance from logging roads, recreation such as the 1960 Olympics cross country skiing course and off-highway vehicle use. There is a general understanding that increased coverage from past projects (if concentrated in subwatersheds or entire watersheds) will tend to increase runoff and thus stream flows, which can lead to down cutting of those streams and bank erosion. However, there have been few projects since 1987 in the General Creek watershed, or on the main stem of Blackwood Creek, which may suggest the need for general restoration on those streams and impacts from disturbance other than development. There is no evidence from tributary data on the other monitored tributaries to indicate impact of projects since 1987 in decreasing tributary water quality. The trends for nutrient loading from tributaries suggest a cumulative benefit from water quality and restoration projects, and other BMP retrofit.

WQ-5: Stormwater Runoff Quality, Discharge to Surface Water

Since 1987, monitoring of untreated stormwater runoff discharges to surface water had demonstrated that such runoff in most cases does not meet runoff standards. There has been a shift in emphasis since the 1996 to focus monitoring efforts on treatment sites and projects built to treat stormwater runoff in order to meet those discharge standards. While all such sites are not monitored, the majority that are monitored are meeting soluble Nitrogen, Phosphorus, and suspended sediment discharge standards. Areas that have had concentrated project development since 1987, particularly those that have not had erosion and runoff control projects implemented on the right-of-ways in those areas (e.g. Cascade Properties, where the right-of-way project is out to bid this year), would be likely to have impacted stormwater runoff water quality for events which have exceeded the one inch an hour design guidelines. Those impacts would be expected to be eliminated once the right-of-way water quality projects are implemented (now Water Quality EIP). Monitoring of stormwater runoff has been largely focused on completed projects such as El Dorado County's Angora Creek II Erosion Control Project.

WQ-6: Stormwater Runoff Quality, Discharge or Infiltration to Groundwater

Since 1987, monitoring data of untreated stormwater runoff discharges to infiltration or treatment sites (particularly if no pretreatment such as sediment catch is involved) has been more limited than surface discharge data. Since 1996, there has been a shift in emphasis to focus monitoring efforts on treatment sites and the majority of those inlets to

basins, etc., did meet total Nitrogen, Phosphorus, and Iron treatment standards. There was no turbidity data available for these sites, but older data suggests that discharges to such sites occasionally exceed discharge standards for turbidity. Since 1987, project BMP requirements would have included pretreatment for larger commercial projects that might be expected to exceed discharge standards to treatment areas. Data from limited residential BMP monitoring completed in 1996 suggested that infiltration standards for stormwater runoff were not being exceeded for total Nitrogen, or Phosphorus or likely turbidity (data was for suspended sediment but relatively low concentrations). Thus projects built since 1987 with well maintained BMPs should not be impacting this threshold indicator onsite within the design standards. Implementation of water quality EIP projects for general areas such as Incline Village #1, the Upper Kingsbury, and Pioneer Trail III projects; and right-of-ways such as Brockway Summit, State Route 28, and U.S. 50 projects should be reducing any offsite impacts.

WQ-7: California-Nevada Other Lakes Water Quality

Since 1987, there have been few if any development projects that would impact other lakes water quality with the exception of Fallen Leaf Lake. While there have been rebuilds and some new development around Fallen Leaf lake in recent years, BMP requirements on these projects should have mitigated any impacts (with the possible exception of excess coverage removal on rebuilds if the original footprint was retained). Installation of BMPs where none existed previously should provide a net water quality benefit. Data from sampling prior to 1996 demonstrated Nitrogen, Phosphorus, and biologically available Iron below specific state standards or tributary standards. In 1998, Fallen Leaf, Lower Echo, and Angora Lakes met standards for Nitrogen, soluble Iron, and dissolved Oxygen. Data from Fallen Leaf Lake suggests that Secchi depth there is improving. Thus there is no evidence at this time that projects since 1987 have impacted the other lakes water quality threshold.

SOIL CONSERVATION/SEZ

Cumulative effects of projects approved by TRPA on Soil Conservation/Stream Environment Zone Threshold Indicators

Between 1987 and 2001, new residential and commercial development has accounted for 334.3 acres of impervious coverage. This level of development represents 1.5% of the land area within the urban boundary and 0.2% of the total land area within the basin. While in the same timeframe 273.7 acres of impervious coverage has been rehabilitated and an additional 16.9 acres of potential coverage has been mitigated by fee. Since 1987, on average, about 24 acres of new coverage per year has been approved.

SC-1: Impervious Coverage

Since 1987 all TRPA-approved projects have met the Bailey Coefficients and are in attainment with the Soil Conservation threshold. Also, in 1987 TRPA adopted the Excess Coverage Mitigation Program (ECMP), which strives to gradually bring all pre-1972 coverage into compliance with the Bailey Coefficients through the following options:

1. Reduce Coverage Onsite,
2. Reduce Coverage Offsite,
3. Coverage Mitigation Fee,
4. Parcel Consolidation or Parcel Line Adjustment

The program is functioning as intended, though more attention to the retirement of hard coverage is recommended. Land banks in California and Nevada are receiving disbursements from TRPA and retiring potential coverage with fees from this program.

Overall, the cumulative effect of Regional Plan approved development in the Tahoe Basin on the Soil Conservation SC-1 Impervious Coverage threshold has been a 43.7 acre net increase in impervious coverage. All of this coverage has been approved by TRPA and is in compliance with Bailey coefficients and therefore in attainment with the SC-1 threshold.

SC-2: Naturally Functioning Stream Environment Zones

The Naturally Functioning SEZ Threshold has two main components: protection and restoration. Since 1987 no new disturbance in SEZ's has been allowed except in circumstances where SEZ disturbance was unavoidable. In these cases a 1.5-restored to 1-disturbed mitigation is required. The SEZ restoration portion of the threshold was set at restoring 1,100 acres of disturbed, developed and subdivided SEZ by 2006. The restoration component of this threshold is in non-attainment and at the current rate of remedial activities will not be in attainment until 2023. Since 1987, restoration efforts have not moved at a pace to allow attainment by 2006. These issues are being addressed and the trend of acres of SEZ restored has been steadily increasing since 1987. The period from 1992–1995 saw a 44% increase in acres restored as compared with the period between 1987-1991. Furthermore, the period between 1996-2001 showed a 16% increase compared to 1992-1995. Examples of the types of projects that have contributed to this positive SEZ restoration trend since 1996 are listed in Table D-1.

Jurisdiction	Project	Completed	Cost	Acres	Lead Agency
Placer	Carnelian Bay Access Phases II & III	2000	\$1,666,650	4	CTC
Placer	Snow Creek	2000	\$3,429,189	6	Placer County/ CTC
Placer	Tahoe Vista Beach	2000	\$20,000	1	NTPUD
Placer	Carnelian Creek – Phase III	2000	\$2,458,490	8	CTC
Placer	Tahoe City Urban Improvements	2000	\$4,714,000	3	Placer County
Placer	Snow Creek Wildlife Habitat Restoration	2000	\$750,000	4	CTC
CSLT*	Trout Creek – Pioneer to Black Bart – Phases I & II & III	2001	\$2,175,808	99	CSLT
CSLT*	Wildwood (Between Ski Run and Pine Grove)	1998	\$500,000	1	CSLT
CSLT*	Osgood Avenue	1998	\$150,000	0.5	CSLT
CSLT*	Redevelopment Project No. 1 (Embassy Vacation Resort)	1998	N/A	2.39	CSLT
El Dorado	Angora Creek	1997	\$350,000	10	C-Parks
El Dorado	Sky Meadows Stream Bank Stabilization	1998	\$25,000	0.15	USFS
El Dorado	Arapahoe	1996	\$27,468	.5	
El Dorado	Heavenly CWE Phase 2	1999	\$230,000	5.77	USFS
El Dorado	Heavenly CWE Phase 3	2000	\$205,000	5.24	USFS
Washoe	Incline Creek (Hyatt)	1999	\$939,098	1.5	IVGID
Washoe	Lake Country Estates	1997	N/A	1.5	Private
				<i>TOTAL (1996 to 2000)</i>	<i>153.55 Acres</i>
				<i>TOTAL (1981 to 1995)</i>	<i>321.15 Acres</i>
				GRAND TOTAL (1981 to 2000)	474.7 Acres

* City of South Lake Tahoe

With more effort being placed on integrating EIP projects into the SEZ threshold the trend of increasing acres restored per year should continue. Even though the threshold will not likely be met by 2006, the results of past SEZ restoration and the increasing trend of SEZ acres restored is encouraging. Overall, since 1987 the cumulative effect on SEZ's has been positive.

VEGETATION

Cumulative effects of projects approved by TRPA on Vegetation Threshold Indicators.

While the vegetation conditions and patterns in the Lake Tahoe Region of today are a reflection of past and current human activities, there is a cumulative impact to the vegetation thresholds as a result of the allowed activity under the regional plan. The cumulative impacts that have occurred since the adoption 1987 of the regional plan are detailed below. These impacts are listed by threshold standard.

V-1: Common Vegetation

The resulting second growth forest that has grown in the past century has, until recently, received little active management, except fire suppression. As such, today's forest is even-aged and crowded, with many trees suppressed by the density of the surrounding forest. A drought, which started in the late 1980s, stressed the overstocked trees, making them susceptible to insects. In 1991 the United States Forest Service (USFS) estimated that 300 million board feet of timber were dying or dead (USDA 2000). This condition has increased the threat of large catastrophic fire and is indicative of a forest where many natural processes have been excluded. The increase in houses, residents and visitors increases the likelihood fire ignition, and the need to further suppress fires. This continues the overstocking problems and makes the forest susceptible future insect outbreak.

Housing, commercial and infrastructure construction have also influenced today's vegetation patterns. Not only have large and small trees been removed for these projects, forest structure and composition are also manipulated around the urban area as a defensible space for fire protection. In addition, road salts and soil compaction can stress remaining trees to the point where the tree is later removed as a hazard. The impacts of construction and hazard tree removal are not known; however, the impacts have not been evenly distributed within the watershed. Indeed, roughly 95 percent of the urban area is within the montane major vegetation zone (below 7,000 feet). Roughly 27 percent of the montane zone is urbanized and, if a large fuel defensible profile zone is included around the urban areas, roughly 55 percent of the montane zone forest is manipulated both in structure and composition. New impacts as a result of construction will continue in the montane zone as most of the remaining buildable lots in the Basin are within the montane zone. Lost urban trees are not replaced quickly, nor are there mechanisms to ensure lost trees are replaced. An average tree planted in an average location within the montane zone will only grow between 15-25 feet within 20 years. It is estimated that 60,000 trees have been removed since 1987 within the urban area as a result of allowed projects.

Since 1987 TRPA has approved 334 acres of new coverage. This new coverage is assumed to be mostly a conversion of vacant lands within the urban boundary. Within this same time, 274 acres of hard and soft coverage has been removed by public agencies within the conservation and recreation lands. This removal of coverage includes road closures and reduction of roads to trails. It is assumed that complete restoration of this land to a pre-disturbance condition has not occurred in terms of vegetation and wildlife needs, however the rehabilitation is effective for water quality and soil needs. In many regards it is not appropriate to equate the conversion of land and the rehabilitation of land for vegetation and wildlife on an acre for acre basis.

There has been a negative impact on the total amount of native vegetation by the creation of new structures within the urban areas (334 acres). Likewise, there is a positive impact by removing coverage within the conservation and recreation lands (274 acres).

V-2: Uncommon Plant Communities

All four of the uncommon plant communities are located within public land, and are therefore protected from planned and large-scale impacts. However, Grass Lake, Osgood Swamp, and Freel Peak are impacted by recreation activity. The total increase in residents and visitors, as a result of allowed development has increased the recreation impacts on these communities. Difficulty in quantifying the impacts makes it difficult to understand the significance of these impacts. In addition, the indicator for this threshold standard makes the assessment of visitor impacts difficult.

V-3: Rare Plants

Most of the rare plants are located on public land, and are therefore protected from planned and large-scale impacts. However, Tahoe yellow cress is found on public and private lands along the shoreline of Tahoe. The total increase in residents' and visitors' use of beaches has increased the impacts to Tahoe yellow cress. This impact is part of the reason this threshold standard is not in attainment.

V-4: Late Seral/Old Growth Ecosystems

This threshold standard and associated changes to the regional plan was adopted in 2001, and prior to this TRPA had only focused on late seral/old growth (LS/OG) since 1997.

There has been little additional increase in the total amount of late seral/old growth forest stands from 1987 or 1997. The time required for a stand of trees to develop old growth conditions is on the order of 160 to 250 years. The Comstock logging boom was during the 1880's and not enough time has passed for the development of late seral forests.

FISHERIES

Cumulative effects of projects approved by TRPA on Fisheries Threshold Indicators.

F-1: Lake Habitat

According to the 1996 Threshold Evaluation, non-compliance with existing regulations by shorezone property owners that have manipulated lakebed habitat in order to improve sandy 'beach-like' conditions has hampered TRPA ability to achieve the Lake Habitat Threshold Standard. In total, it was estimated that 1,670 acres of lake habitat has been disturbed since the adoption of the 1987 Regional Plan. These impacts are not a function of TRPA permitting but more likely the result of ineffective TRPA regulation enforcement.

F-2: Stream Habitat

Inappropriate stream crossing design at road intersections render large section stream unavailable to migrating fish and hamper TRPA ability to achieve the threshold standard for Stream Habitat. However, impacts attributed to poor stream crossing design occurred **prior** to the adoption of the TRPA Regional Plan.

Stream habitat restoration project approved will likely improve stream habitat conditions for fish. Below are some examples of progress made towards improving TRPA's ability to attain the Stream Habitat Threshold Standard.

- Trout Creek Restoration project between Pioneer Trail and Martin Blvd will improve 3 miles of riparian habitat.
- Snow Creek Marsh Restoration Project in North Lake Tahoe.
- Cove East Marsh Restoration Project will reclaim 13 acres of marsh habitat, which will provide nursery habitat for fish.
- USFS-LTBMU removal of grazing pressure in Upper Truckee watershed.

F-3: Stream Flow:

The region is in attainment with this threshold standard.

F-4: Lahontan Cutthroat Trout Reintroduction

The region is in attainment with this threshold standard.

WILDLIFE

Cumulative effects of projects approved by TRPA on Wildlife threshold indicators.

This section is intended to evaluate the cumulative impacts on the two wildlife threshold standards and wildlife habitat in general. In addition to cumulative impacts, 'cumulative benefits' to wildlife thresholds and wildlife habitat in general are identified below.

TRPA does not have a monitoring system in place to determine, with quantitative certainty, the relationship of wildlife habitat quality and development. However, some conclusions may be drawn based amount of development in the basin and the preponderance of peer-reviewed literature assessing the effects of fragmentation on wildlife communities (summarized by Meffe and Carroll 1994). According to Meffe and Carroll (1994) and others, effects of urban development (i.e., habitat fragmentation) occur at many temporal (short- and long-term) and spatial scales (local to eco-region) and could include the following:

- 1) Increased predation rates and harassment from domestic pets,
- 2) Increased simplification of habitat structure,
- 3) Increased wildlife mortality rates associated with road kill,
- 4) Increased abundance of non-native nest parasites and predators, and invasive plants species.
- 5) Increased availability of non-native foods (e.g., garbage, bird seed)
- 6) Decreased habitat quality associated with human activity (increased noise, harassment, recreation, depredation, etc.).
- 7) Changes in species composition (insect, plant and wildlife) and abundance.
- 8) Changes in hydrologic conditions.
- 9) Decreased access to movement corridors.

In addition, the urbanization of forested landscapes necessitates the need to suppress and artificially manipulate natural forest processes, such as fire. Excessive fuel loading as a result of fire suppression could increase the probability of large-scale wildlife habitat loss through catastrophic wildfire.

In total, it was estimated that 6,526 acres (3.2% of land surface covered) of hard coverage existed in the basin prior to the adoption of the 1987 TRPA Regional Plan according to TRPA (1983). Since 1987, new development permitted by TRPA has additionally covered 334 (additional 0.2% of land surface covered) acres of land within the TRPA defined urban boundary (i.e., coverage attributed to residential and commercial development). These coverage values do not include 'soft' coverage development attributed to trails, dirt roads, parking pads (typical not permitted) and other man-modified areas such a ball fields. The USFS-LTBMU has estimated that a minimum additional 700 to 900 miles of 'soft' coverage (approximately 1,020 to 1,310 acres) exists in the form of roads and trails on lands they manage (G. Villanueva, USFS-LTBMU, pers. comm., 2001). Both hard and soft coverage creation represents potential cumulative degradation to the quality of wildlife habitats as some species are negatively affected by man-induced habitat fragmentation.

According to TRPA's land capability program, 274 acres of hard and soft coverage has been rehabilitated to a condition suitable for allowing water to infiltrate rather than run-off at locations within Conservation and Recreation Plan Areas. The rehabilitated land includes road to trail conversions and road closures. It was assumed that complete restoration of this rehabilitated land has not entirely occurred to the extent that wildlife would benefit because disruptive human activities typically still occur at rehabilitated sites. However, the rehabilitation of these lands has likely been effective for mitigating water quality and soil impacts. Consequently, it was assumed that the land capability program does not always mitigate impacts to wildlife habitat quality and therefore new coverage cumulatively contributes to a decrease in the availability of potential wildlife habitat.

Based on 'hard' coverage calculations, a minimum of 30.9% of the land area within the urban boundary has been developed. On average, 22.3 acres of new coverage is created each year within the urban boundary. If it is assumed that 180 trees of varying size class occur per acre (1 tree per 15 ft) within the urban boundary, then over the last fifteen years 60,120 trees (or 4,014/year) have been removed to accommodate new development. It should be assumed that a larger area of wildlife habitat has been affected by additional residential and commercial development due to human associated disturbance. Some evidence suggests that TRPA has unknowingly approved projects that have reduced the suitability of some wildlife habitat and consequently made attaining wildlife threshold standards more challenging. Conversely, TRPA has permitted projects and adopted actions that will likely improve conditions for wildlife and thus TRPA ability to achieve wildlife threshold standards.

W-1: Special Interest Species

Below are some example actions that have improved conditions for Special Interest Species.

- The USFS-LTBMU has decommissioned nearly 20% of Forest Service road network. The fraction of the USFS road decommissioning that has completely restored the road prism, will presumably improve wildlife habitat connectivity through reduce human impacts.
- TRPA adopted Late Seral/Old Growth Ecosystem threshold standard that will assist with improving habitat condition for species that are associated with old growth communities. This threshold standard moves 55% of forested habitat towards and old growth condition.
- TRPA adopted ordinance that require a minimum stocking level of decadent forest materials that will benefit multiple forest taxa including species list by TRPA and other agencies as Special Status Species.

Listed below are some examples of projects that TRPA permitted that have potentially impacted TRPA ability to achieve Special Interest Species Threshold Standards:

Northern Goshawk:

- A bike trail between Elks Point Drive and Kahle Park at Roundhill, NV bisected a Northern Goshawk nesting territory. Subsequent to this project, Northern Goshawk nesting activity has not been documented in the area.
- The upper section of North Canyon on Nevada Spooner Lake State Park lands was identified by TRPA as a Northern Goshawk population site (TRPA maps

1987). This area was identified as such presumably because historic Northern Goshawk nest activities were documented in that area prior to 1982. Several actions over time have likely cumulatively reduced habitat suitability for nesting Northern Goshawk of North Canyon; not all were permitted by TRPA. The TRPA permitted a cross-country ski area (circa 1990) and several overnight cabins (1997) at North Canyon. Additionally, a historic flume was removed (not permitted by TRPA) to develop a mountain bike trail. This bike trail today is nationally known serves thousands of mountain bike enthusiasts. Since the establishment of these activities, Northern Goshawk nest activity has not been documented in North Canyon and may be attributed to increased recreational activity permitted in part by TRPA.

Waterfowl

- Lake Baron is mapped by TRPA as a waterfowl disturbance (free) zone. TRPA permitted a water-ski school at Lake Baron that likely has reduced the habitat quality of the lake for nesting and loafing waterfowl. According to the TRPA Goals and Policies (1986), "...Special Interest Species shall be protected and buffered against conflicting land uses." Permit actions such as this make it difficult for TRPA to provide undisturbed (human) habitat conditions for this group of Special Interest Species.

W-2: Habitat of Special Significance

Listed below are examples of projects that TRPA permitted that have likely improved TRPA ability to achieve the Habitat of Special Significance Threshold Standards:

- Trout Creek Restoration project between Pioneer Trail and Martin Blvd will improve 3 miles of riparian habitat.
- Snow Creek Marsh Restoration Project in North Lake Tahoe.
- Cove East Marsh Restoration Project will reclaim 13 acres of marsh habitat.
- Nevada Tahoe Resource Team's Aspen Restoration Project will improve multiple acres of this riparian community.
- Although TRPA has not kept pace with restoration goals for SEZ, TRPA has been successful at not permitted further degradation to SEZ.

SCENIC RESOURCES

Cumulative effects of projects approved by TRPA on the Scenic Resources threshold indicators.

Although the single impact of one allocation on scenic resource indicators is not possible to assess, overall trend analysis can be used to analyze these impacts. For the four scenic resource threshold indicators, the cumulative impacts of approved allocations are discussed below.

SR-1: Travel Route Ratings

Since 1987, extensive fieldwork have been completed for the threshold evaluations, along with that completed during the Shorezone Ordinance development and assessment process identified several clear trends related to scenic threshold issues. The following paragraphs discuss trends important for the travel route and scenic quality rating systems.

Improvements in Commercial Districts

Beginning with the adoption of the 1987 Regional Plan, substantial public and private investment in the community plan areas of the region has occurred. Almost without exception, this investment has improved the scenic quality of the associated roadway units. Ten of the sixteen roadway units with improved scores fall partially or wholly within community plan areas; improvement in the newly separated units increases this to sixteen units in community plan areas with improved scores. The most dramatic of these improvements is the South Lake Tahoe Redevelopment Area. Removal of degraded structures, improvement in architectural quality of new and remodeled structures, increased landscaping and landscaped open space, decreases in highway curb cuts, and improved signage have all contributed to a remarkable transformation. This improvement affects both travel route and scenic quality ratings. Current plans for continued improvement in this unit are expected to produce threshold attainment.

While the redevelopment area of South Lake Tahoe produces the improvement with the highest visibility, upgrades in many other areas have also occurred. Since 1996, major improvements in Douglas County around the US 50/Kahle Drive intersection, Tahoe City, and Carnelian Bay have resulted in bringing three roadway units into travel route rating threshold attainment. In Washoe County, implementation of the North Stateline Beautification Project has resulted in improvements to the built environment and enhances scenic quality in the area. In most of these areas, publicly funded projects that produce scenic improvement occurred and were matched by privately funded upgrades to existing development. In the last five years throughout the region, publicly funded projects (or public-private partnerships such as redevelopment) improved roadway travel route ratings by approximately 15 points; public investment since 1991 has created approximately 19.5 points improvement. Private property upgrade that followed these projects occurred in Tahoe City, Kings Beach, Kingsbury Grade, South Lake Tahoe, and Meyers. This confirms a fundamental principle of community redevelopment and provides encouragement for continued public leadership in planning and funding improvement projects.

Increase in Visibility of Residential Structures.

The release of allocations since 1987 has resulted in impacts to scenic quality to the basin, and increases in visibility of residential structures along the threshold travel

routes. However, based on previous evaluations and reconfirmed in the 2001 Evaluation, it is important to note that the majority of impacts is the direct result of the redevelopment process that does not require an allocation. First noted in 1991 and raised as a serious concern in 1996, this redevelopment is adversely affecting both shoreline and roadway units. It is particularly noteworthy that the continued drop in both travel route and scenic quality scores is occurring as a result of new projects approved by TRPA in apparent compliance with regulations intended to prevent this drop. This reduction in scenic quality, concentrated outside of the urban roadways, is occurring at a time that the developed commercial centers are improving as discussed above, and appears to be accelerating in recent years. Although the release of allocations in conjunction with a project has been shown to impact scenic quality when they are visible from threshold travel routes, the majority of allocations has resulted in infill development within residential plan areas that do not directly impact the travel route rating threshold.

Dramatic increase in the scale and mass of residential structures. As land values increase, property owners are proposing residential structures very much larger than existing on-site structures. While staying within maximum coverage and height allowances, new projects very often replace several small, one- or two-story cabins with large two-, three-, or four-story houses. These structures often block lake views from the roadway and are rarely adequately screened or sited to reduce visual dominance as seen from the lake.

Reduction in structure setback. Residential rebuilds on littoral parcels are placing larger structures at the shorezone setback line, often noticeably decreasing the structure setback from the previous condition. These reduced setbacks can limit the area for effective landscape screening and sometimes force removal of existing important shoreline vegetation.

Although this trend is affecting several north and west shore roadway units, it has the most pressing impact on shoreline units. Nearly every north and west shore shoreline unit with areas of residential development is already out of travel route rating threshold attainment or is seriously threatened by the current trends in residential rebuilds. Increasingly, this trend is also threatening residentially developed shoreline units on the east and south shores. It is clear that existing regulatory requirements are not sufficient to avoid further degradation, let alone create threshold attainment.

Residential structures in the upland and forest backdrop areas are also increasingly visible. This results from use of light colored exterior building materials, metal roofs and large window area that reflect light, and reduction in tree screening. The increased visibility reduces the continuity of the natural forest landscape and is visible from great distances, often impacting several travel routes and scenic resources. This effect is most apparent in the slopes above Incline Village. This may be the result of residential remodels that increase visibility, yet the most likely cause is recent forest health projects that decrease the amount of mature tree screening.

Incremental Loss of Lake Views

Roadway units along the north and west shores are experiencing incremental loss of lake views. Very often this loss results from residential rebuilds that increase the scale of lakeside residences. This loss also occurs, however, through construction of accessory structures such as solid fences or two story garages. The loss of small lake views can be hard to define as a significant impact when considering any individual project, yet the

cumulative effect is important. Brief glimpses of lake views, interspersed with more open and dramatic longer lake views, define the notable character of most of the scenic corridor along the north and west shores. Loss of these brief lake views creates stretches of highway that are undistinguished from many other forested roadways. This has negative implications for both travel route and scenic quality thresholds.

Increasing Visual Impact of Shorezone Structures

Due to the prohibition on new pier development in prime fish habitat, this trend has not yet caused widespread visual impacts; however, it is clear from recent applications, pier improvements that have been permitted, and discussion with representatives of littoral property owners, substantial visual change in the shorezone is likely. Without careful management of the unique shoreline landscape, the cumulative effect of new and larger piers, boat lifts, and associated structures could dramatically affect the scenic character of the Lake.

SR-2: Scenic Quality Ratings

Trends affecting the scenic quality rating indicator are the same as those described above for the travel route rating indicator.

SR-3: Public Recreation and Bicycle Trails

Public Investment in Maintenance and Upgrade Produces Widespread Improvements

Since threshold adoption in 1993, important improvements to recreation areas and bike trails have been funded, resulting in upgraded and new facilities available to the general public. Nearly all the recreation areas assessed displayed good or improving maintenance conditions, and several areas offered dramatically improved facilities. The lake access projects funded by the California Tahoe Conservancy offer the best example of use of public funds to both create and improve the scenic quality of public recreation areas. Redeveloped beach parcels in Kings Beach and Carnelian Bay restore important landscape characteristics and offer built features completely in harmony with the natural landscape and high expectations of the recreational visitor. The City of South Lake Tahoe (El Dorado Beach), Nevada State Parks (Memorial Point), California State Parks (Vikingsholm parking area), and the Incline Village General Improvement District (Incline Beach) are other examples of organizations making improvements.

As with other redevelopment projects noted throughout this report, some new recreation facilities produce both positive and negative change. At Burnt Cedar Beach and Sand Harbor in the festival area, new facilities offer improved visitor services and display pleasing design characteristics, yet are too large for their settings and include design elements out of character with the natural environment.

Impacts From Changing Off site Conditions

The primary concern related to recreation areas and bike trails are changing scenic conditions occurring off site. The primary off site feature creating concern is shoreline and littoral parcel development. Trends related to construction of large shoreline residences are discussed in detail above. Increased length of piers and spread of use of boat lifts also decrease view of the natural landscape and increase shoreline clutter. In fact, shorezone development (i.e. piers, buoys and boatlifts) impacts views from the recreation areas as much or more than views from any other rated resource or travel route.

Changes in the forest backdrop are visible from many recreation areas, although scores for the affected views rarely decline. View of the new gondola cut for Heavenly Valley, of the new Embassy Suites structure at Ski Run Blvd., and increased view of residential development above Incline Village are examples. While these changes are distinct, often from many viewpoints, they are usually part of a large panorama and do not alter the score for the entire view.

SR-4: Community Design

Increased Use of Regionally Appropriate Architectural Elements and Other Design Changes

Allocation of Commercial Floor Area (CFA) since 1987 has resulted in substantial public and private investment in redevelopment has and is occurring in the Lake Tahoe Region. Almost without exception, new projects introduce high quality materials and involve superior design elements. Both commercial and residential redeveloped properties often include design characteristics commonly called “Tahoe rustic” or “Old Tahoe” or “National Park”. This includes use of peeled logs, natural wood and stone exterior siding, and steeply pitched roofs with dormer windows. Many projects also include paned glass for windows and richly detailed garden areas. These design elements often create regionally appropriate architectural improvements compared to the structures they replace.

Not all of the features of these redeveloped structures produce positive effects on the scenic quality or community design thresholds, however. As noted in other sections of this report, decreased setbacks, substantially larger and more massive structures, use of large window area and other reflective materials such as metal roofs, and the use of lighter exterior siding materials all combine to increase the visual dominance and visibility of man-made elements. Thus, while each new structure may have many pleasing and interesting elements, very often they combine to create negative effects on appreciation of the area’s natural character.

Public/Private Projects Making Substantial Improvements

Throughout the region, public and joint public/private investments have produced substantial improvements to community character. These projects include several sidewalk/landscaping projects, erosion control and water quality improvement projects, land buy-out by public agencies that involves removal of decrepit structures, and the numerous projects involved in the South Lake Tahoe redevelopment area. Without exception, investment made in these projects has resulted in improving the sense of place and the functionality of core community areas. As noted in other sections of this chapter, public leadership in these projects has often encouraged private investment on nearby properties, expanding the benefits beyond the public project area boundaries.

Another benefit of these public projects is the degree of public involvement in their planning and design. Even in communities that lack strong statements of desired community character, the public nature of the design process often, though not always, produced projects that reflect such character. For example, design of the amenity package for the sidewalk project in Tahoe City was the result of years of community meetings and community fundraising to produce a specific desired result. On the other hand, community interest in the design for the pedestrian connection between Kingsbury Grade and the South Stateline Casino Core failed to secure a design that reflected a specific desired character.

Development Patterns

Throughout the evaluation report, the negative scenic effects of removing small structures and replacing them with very much larger structures has been identified. Another feature of that development trend is the loss of historical structures and historical development patterns. Together these resources create community and landscape characters distinct in different parts of the region, but also unique to Tahoe. Structures constructed at different times in the region's history display changing technologies, resident and visitor interests, and environmental values. Changing economic and social trends over time brought about development patterns, including size of parcel, structure setbacks, and landscape treatment, which create the story of the built environment in Tahoe. This story includes transition from summer estate retreats, to small summer cabin tracts, and to the modern year-round mixed community we have today. The resulting landscape constitutes a scenic tourist draw and provides continuity with the past and a strong emotional attachment to repeat visitors. However, it should be noted that redevelopment of existing structures generally do not require an allocation unless it is an expansion of a commercial or tourist accommodations use. Existing residential structures have vested rights and do not require an allocation from TRPA.

As noted previously, not all past development practices or "old" structures produce

Improvement to the region's signage has been considered a key feature in creating desirable commercial districts and attaining threshold standards. Since adoption of the TRPA sign ordinance (Chapter 26) in 1989, the quality, size and placement of signs has steadily improved. However, this evaluation concludes that signage continues to contribute to scenic problems. Specifically, signage continues to produce levels of clutter that is inconsistent with appreciation of the area's natural values. This includes signs that are too large, too close to the road, too high, and with colors and materials that compete to such an extent as to cause confusion.

Loss of Native Landscape Material and Use of Non-native Plants

An important element in creating communities that respect the natural values of the Tahoe Region is maintaining the character of the native vegetation community. Increasingly, new projects throughout the region are introducing larger areas of non-native vegetation. This is particularly noticeable along the shoreline where areas of native underbrush are replaced by lawn bordered with flowers and introduced shrub species. It also occurs, however, with the increased use of frontage lawn strips and bedding plant type flower borders in commercial areas and associated with residential areas along transitional roadways. In some cases, the change in vegetation type greatly decreases vegetative screening for structures. In most cases, the loss of undeveloped open space and the increase in specialty plantings begins a transformation from a native mountain landscape to more of a suburban landscape that could exist nearly anywhere.

NOISE

Cumulative effects of projects approved by TRPA on the Noise threshold indicators.

N-1: Single Event Noise- South Lake Tahoe Airport

Since 1987, few exceedances have occurred of Airport noise standards relative to the total number of operations. Permitted projects do not appear to have significantly impacted the noise standards set for the airport. Most exceedances in the past five years were due to military operations, for which the airport has no enforcement authority.

N-2: Single Event Noise- Other

The unit of sound level measurements is the decibel (dB), sometimes expressed as dBA. Since decibel levels are expressed in a logarithmic relationship, sound levels can not be added or subtracted. The doubling of a noise source will result in about a 3 dBA increase, which is barely perceptible to the human ear. A 10-fold increase in noise will result in about a 10 dBA increase, which is like a doubling of loudness. Since 1987, TRPA has continued to receive a significant number of noise complaints regarding the operation of jet skis and similar water craft on Lake Tahoe, and the operation of off-highway vehicles, particularly motorcycles. However, monitoring for single events has been extremely limited, and therefore the actual impacts associated with permitted projects are unknown. Although the data which are available have not indicated significant impacts on noise resulting from the projects permitted over the past 15 years, it is expected that noise generated from single events has been and will likely continue to increase as the local and non-local populations of Lake Tahoe have increased, and will continue to do so (though local population growth is limited by TRPA).

N-3: Community Noise Equivalent Level (CNEL)

The unit of sound level measurements is the decibel (dB), sometimes expressed as dBA. Since decibel levels are expressed in a logarithmic relationship, sound levels can not be added or subtracted. The doubling of a noise source will result in about a 3 dBA increase, which is barely perceptible to the human ear. A 10-fold increase in noise will result in about a 10 dBA increase, which is like a doubling of loudness. Since 1987, CNEL measurements have been taken only three times. Therefore, the actual impacts of permitted projects on Basin noise levels are unknown. Within the limited data set, measurements indicate that in 1991, approximately 15% of the Plan Areas measured exceeded the CNEL. In 1996, approximately 18% of monitoring Plan Areas were above the standard. In 2000, 19% of CNEL measurements exceeded the applicable standard. However, most exceedances were caused or contributed to by local construction activities (which are exempt from noise standards during certain hours) and traffic. Aside from the construction and traffic generated noise, it would likely require a significant increase in residential development to generate a significant increase in the CNEL values for each Plan Area (since a doubling of the source results in only a 3 dBA increase). Since TRPA has and will continue to limit development, impacts to the CNEL generated by local activities (excluding construction) will likely remain minimal, especially since the CNEL values are the average noise levels over a 24 hour period (with weighting to account for evening and nighttime hours) and not for single events. However, noise levels associated with traffic corridors appear to have increased since 1987, which is expected given the increase in VMT in the Basin. Therefore, It is safe to assume that as the local and non-local populations of Lake Tahoe have increased, and will continue to do so (though local population growth is limited by TRPA), noise events will also increase.

RECREATION

Cumulative effects of projects approved by TRPA on the Recreation threshold indicators.

All projects approved by the Agency are found to be consistent with the threshold standards, or the project possess elements of mitigation that render potential negative impacts to a level of less than significant.

R1: High Quality Experience/Additional Access

The development of residential, commercial and tourist projects has not hindered the ability of TRPA to meet the threshold standards as measured by the interim targets established in the 1996 Threshold Evaluation. Concerning additional access to public recreation areas, not all urbanizing activities have resulted in a loss of access. However, changes in the use of lakefront property, especially a tourist accommodation use changed to residential use, has resulted in the loss of access to the shoreline of Lake Tahoe.

The utilization and consumption of resources do not directly effect the attainment of the threshold standards, unless the utilization leads to environmental degradation; a circumstance that should not occur given the findings necessary for project approval.

The programs in place for the restoration and mitigation of past development activities only contribute positively toward the attainment of the recreation threshold standards. As was described in the Summer 2000 User Preference Survey, some of the leading attributes that contribute to a high-quality experience are the same attributes of a healthy environment: clean air, clear water, scenic beauty, and green vegetation. Cumulatively, these programs and the resulting projects contribute positively toward the attainment of the recreation threshold standards.

The cumulative effects of projects has not lead to the attainment of the R1 threshold standards.

R2: Fair Share of Resource Capacity Available to the General Public

The interim targets for PAOT allocations (R2 standard) were not realized within the five year timeframe, nor will they be disposed during the next five year interval. This is not, however, due to the residential, commercial and tourist development projects. In the future, this may not be the case, as consumptive resources are used for non-recreation development.

The resources of concern for the recreation threshold standards are linked to transportation capacities and the consumptive resources of potable water and available sewer treatment capacity. Projects approved in the basin in advance of recreation projects do have the potential to preclude recreation facility development should VMT and DVTE capacities expire prior to recreation facility development. At this juncture, water and sewer capacity appear not to be the limiting factor to recreation facility development for many of the local jurisdictions. However, the smaller water and sewer purveyors do have real capacity limitations that may preclude the development of recreation facilities that require substantial amounts of water, such as golf courses and turf play fields. A quick review of these smaller purveyors in relation to the existing land use patterns associated with their service boundary indicates that major recreation facility development that uses substantial water supplies should not be significantly

impacted. Those areas where large water consuming recreation facilities are likely to occur do not coincide with the smaller water purveyors.

The programs in place for the restoration and mitigation of past development activities generally are not long term consumers of resources, therefore, cumulatively these are positive contributors to threshold attainment. Moreover, these types of project present the opportunity to gain additional resources that may be used for recreation or other types of facility development.

The cumulative effects of projects has contributed to the attainment of the R2 threshold standard.

