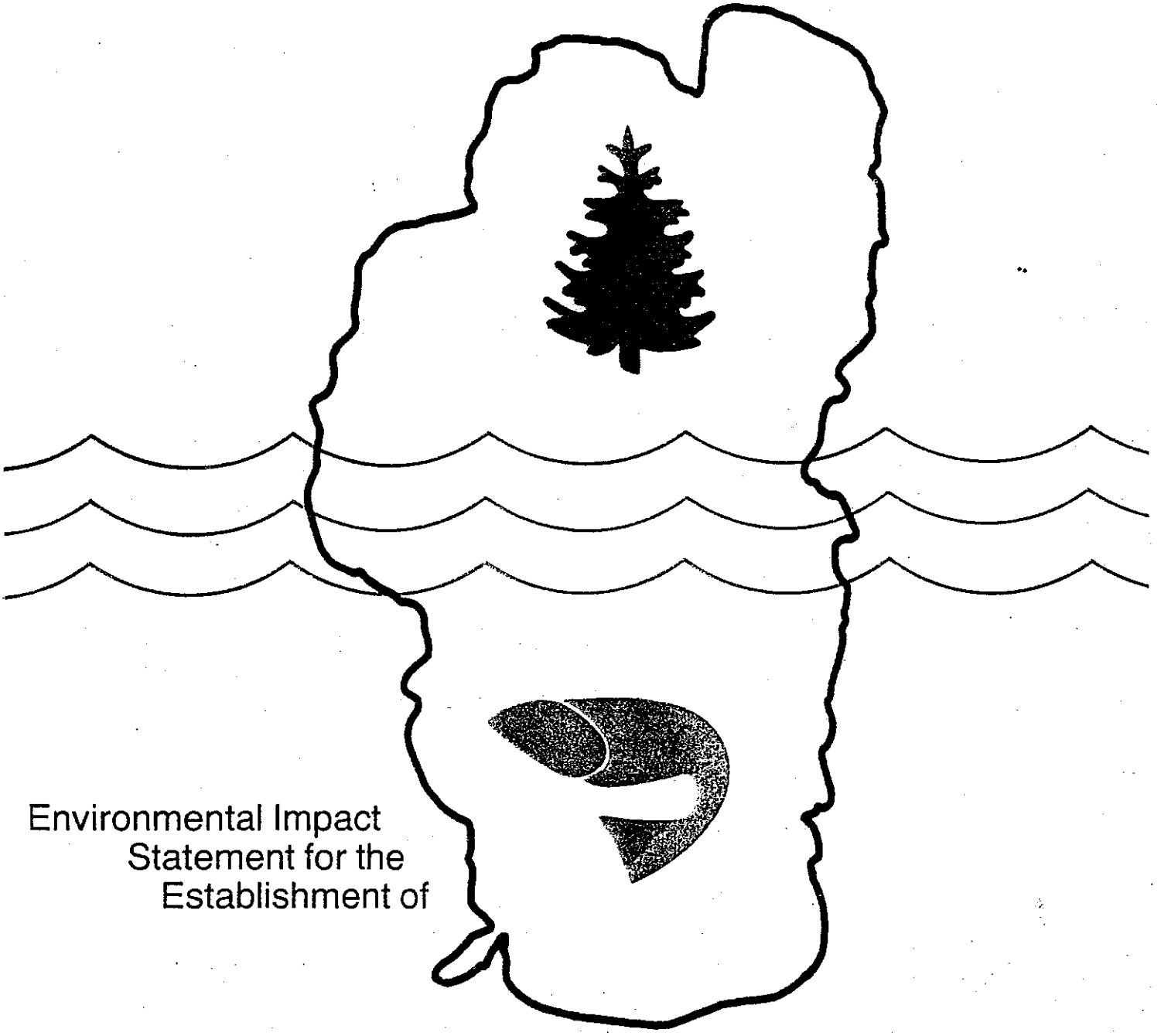

Environmental Impact
Statement for the
Establishment of

Environmental Threshold Carrying Capacities

Tahoe Regional Planning Agency
May, 1982

PLAINTIFF'S
EXHIBIT
Ziegler
5/4/92

ENVIRONMENTAL IMPACT STATEMENT
FOR THE ESTABLISHMENT OF
ENVIRONMENTAL THRESHOLD CARRYING CAPACITIES

Responsible Agency:	Tahoe Regional Planning Agency 2155 South Avenue P. O. Box 8896 South Lake Tahoe, California 95731
Information Contact:	Randall C. Sheffield Tahoe Regional Planning Agency P. O. Box 8896 South Lake Tahoe, California 95731 (916) 541-0249
Abstract:	This environmental impact statement describes a proposed action and alternatives to it for the establishment of environmental threshold carrying capacities. The proposed action is a staff and consultant team recommendation for specific threshold standards that will maintain significant scenic, recreational, educational, scientific, and natural values of the Lake Tahoe Basin. The alternatives provide for different levels of maintaining environmental quality. The environmental consequences of implementing the proposed action and alternatives to it are displayed.
Date of Availability:	This environmental impact statement was made available for a 60 day public review period beginning May 19, 1982.
Comment Period End:	Comment upon this impact statement must be received by July 17, 1982 to be considered.

ENVIRONMENTAL IMPACT STATEMENT
ENVIRONMENTAL THRESHOLD CARRYING CAPACITIES

- 02495

Page

SUMMARY OF THE
ENVIRONMENTAL IMPACT STATEMENT
FOR THE ESTABLISHMENT OF
ENVIRONMENTAL THRESHOLD CARRYING CAPACITIES

Purpose and Need: The Tahoe Regional Planning Compact, Public Law 96-551, reorganized the Tahoe Regional Planning Agency and gave it the power to establish environmental threshold carrying capacities (environmental thresholds or thresholds). Subsequent to the adoption of thresholds, the Agency is to adopt and enforce a regional plan that will achieve and maintain the thresholds. This environmental impact statement describes a proposed action and alternatives to it and the environmental consequences anticipated for the adoption of environmental thresholds.

Environmental threshold carrying capacity means 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. Establishment of thresholds ultimately is adoption of environmental standards.

This summary of the EIS is designed to provide most reviewers with sufficient information to comment on environmental thresholds. If you find more data is required, the complete environmental impact statement is available for purchase at the Tahoe Regional Planning Agency. A 60 day review period, expiring July 16, 1982, provides the public an opportunity to comment in writing and/or at public hearings noticed by the Agency. Response to the comments will be a part of the EIS process. The Governing Body will certify the environmental impact statement before taking final action to adopt thresholds at their July meeting.

Affected Environment: The environment to be affected by the adoption of environmental thresholds is the Lake Tahoe Basin. The Basin includes about 501 square miles of which the Lake itself covers 191 square miles. The Basin includes the City of South Lake Tahoe, portions of El Dorado and Placer Counties of California, and portions of Washoe, Douglas and Carson City Counties of Nevada.

The Basin offers a unique experience created by a combination of an exceptionally clear, high elevation lake surrounded by spectacular mountain peaks. The natural scenic beauty of the Basin attracts visitors and residents to the area for enjoyment of the "Tahoe Experience."

The various components that comprise the Tahoe Basin are described in the body of the environmental impact statement. Emphasis is placed on those components for which thresholds are recommended. This includes water quality, water quantity, soil, air quality, noise, vegetation, wildlife, fisheries, recreation, and scenic resources. Each component, current standards, and an historical description of quality trends are described.

Alternative Including the Proposed Action: The proposed action is a staff and consultant team recommendation for specific environmental thresholds for each environmental component area. It was found early in the process that the components had to be subdivided to be both understandable and measurable. The remainder of this section of the Summary describes the subcomponents and displays the recommended threshold and alternatives to it.

WATER QUALITY

Pelagic Lake Tahoe: The recommended threshold for the pelagic or deep water zone of Lake Tahoe is to achieve ambient clarity at 28.7 meters annual average and 32.4 meters average winter Secchi depth. Ambient primary algal productivity measured in carbon uptake is recommended at 52 grams carbon per square meter of Lake surface per year ($gC/m^2/yr$). A nitrate nitrogen loading rate reduction of 40 percent from the estimated 1982 value of 10 metric tons per year is recommended. The recommended ambient thresholds are the same as the currently established standards. Alternatives considered include maintenance of clarity at the current condition of 26.2 meters annual average and 26.8 meters winter average Secchi depth. The alternative threshold would also set ambient primary productivity at the current level of 86 $gC/m^2/yr$ and would reduce nitrate nitrogen loads by either 20 or 60 percent.

Littoral Lake Tahoe: The recommended threshold for the littoral or near-shore zone of Lake Tahoe is to insure that ambient primary productivity will not exceed average values observed in the period 1968 to 1971. In addition, the periphyton or attached algae biomass is recommended not to exceed values observed in the littoral zone from 1968 to 1971. The recommended threshold is more stringent than current standards. Averaged over four years, current standards have not been violated.

Tributaries: The recommended threshold for the tributaries within the Lake Tahoe Basin is to adopt existing state standards for concentrations of nitrogen, phosphorus, iron, and suspended sediment on an interim basis pending further study and evaluation of the relationship of tributary flow to the Lake's nutrient budget. The recommended threshold also calls for protection, preservation, and enhancement of stream environment zones. There are no alternatives to the recommended threshold developed.

Surface Runoff: The recommended threshold for surface runoff is adoption of existing regional runoff standards on an interim basis pending further study of this subcomponents impact on Lake water quality. No feasible alternatives were identified.

Groundwater: The recommended threshold for groundwater is to 1) protect drinking water supplies, 2) maintain groundwater elevations in sensitive areas, 3) prevent biostimulation of surface waters, and 4) increase monitoring of groundwater. The threshold study has not identified any feasible alternatives to the recommended threshold.

Other Lakes: The recommended threshold for the other lakes within the Basin is to protect their existing water quality and increase monitoring and study of the lakes to identify their role pertaining to Lake Tahoe's water quality. There are no alternatives identified.

WATER QUANTITY

Water Use: The recommended threshold reiterates current California-Nevada allocations for total water use. There are no alternatives to the limitations established by the Interstate Water Compact.

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Instream Flow: The recommended threshold is to maintain natural instream flows to prevent changes in total volume of runoff. Instream flows are also discussed under the FISHERIES component. No alternatives have been developed for this threshold.

SOIL CONSERVATION

Impervious Coverage: The recommended threshold is to adopt limits on impervious coverage as envisioned in the Land Capability Classification System prepared by Bailey in 1974. No alternative systems to control impervious coverage have been developed.

Soil Productivity: The recommended threshold is to adopt "T" factors developed by the Soil Conservation Service that identify permitted soil loss while retaining soil productivity. Alternative systems for monitoring soil productivity have not been developed.

Surface Disturbance: The recommended threshold is to minimize disturbance in order to protect natural surface conditions within the Basin's watersheds. Alternatives would set various limits for the amount of disturbance permitted.

Stream Environment Zones: The recommended threshold is to prohibit or regulate development within stream environment zones and restore the zones to their natural character whenever and wherever possible. Alternatives are simple variations of the recommended thresholds that would not change the intent of the recommended threshold.

AIR QUALITY

Carbon Monoxide: The recommended threshold for carbon monoxide is 6 parts per million (ppm) averaged over an 8 hour period. This is the same as current California and Nevada standards. Alternatives more restrictive are not necessary for they would have no additional health related benefits. Alternatives higher than 6 ppm would not meet the existing standards. Adoption of this threshold is based on a commitment from California and Nevada to review the current standard by December 1, 1982.

Ozone: The recommended threshold for ozone is 0.08 ppm averaged over one hour. Current state standards are 0.10 ppm and the federal standard is 0.12 ppm. Alternatives higher than 0.08 ppm are available but would not reduce damage to vegetation as would the recommended threshold. Lower thresholds are not required from the standpoint of vegetative damage.

Acid Deposition: The recommended threshold is to reduce the transport of nitrates into the Basin and reduce oxides of nitrogen produced in the Basin in an attempt to reduce nitrate loading to the Lake. There are no alternatives to this recommended threshold at this time.

Regional Visibility: The recommended threshold for regional visibility is 171 kilometers or 103 miles to be achieved 50% of the time and a minimal threshold of 97 kilometers to be achieved 90 percent of the time. Current visibility is 166 kilometers or 100 miles with a frequency rate of 50% of the time. Current standards in California are set at 30 miles visibility. Higher or lower thresholds are available.

Subregional Visibility: The recommended threshold for subregional visibility, a problem inherent to the South Shore and sometimes Incline Village, is 87 kilometers or 54 miles to be achieved 50 percent of the time and 26 kilometers or 16 miles 90 percent of the time. Current visibility is 70 kilometers or 43 miles 50 percent of the time. There are no existing standards. Higher or lower thresholds are available.

Odor: The recommended threshold for odor is to reduce the impact of fumes from diesel buses to the extent feasible. There are no alternatives described.

NOISE

Single Noise Events: The recommended threshold is to limit noise produced by specific sources to the level of current, adopted standards. This would restrict noise by aircraft, boats, and motorized vehicles to adopted levels. Alternatives would be lower than the current standards.

Cumulative Noise Events: The recommended threshold is to limit community noise equivalent levels permitted in specific land use categories to the upper limit of the clearly acceptable range. Alternatives can be higher or lower within the range of minimal standards.

VEGETATION

Common Vegetation: The recommended threshold is threefold. The first is to increase the structural and plant diversity of forest communities through appropriate management practices. The second is to increase the total amount of meadow, wetland, and other riparian vegetation. The third threshold proposes the limitation of vegetation disturbance to areas authorized for impervious coverage and by forestry practices. The objective and ultimate goal of revegetation shall be to reestablish native vegetation.

Uncommon Plant Communities: The recommended threshold is to provide for the conservation/management of any plant community that is uncommon or of exceptional scientific or aesthetic value. This threshold shall apply but not be limited to Grass Lake, Osgood Swamp, and the Freel Peak Cushion Plant Community. Alternatives are limited but options remain open to include additional or fewer communities.

Sensitive Plant Species: The recommended threshold maintains a minimum number of population sites for plant species considered vulnerable to extinction. Limited alternatives provide protection and seek recovery of the species.

WILDLIFE

Special Interest Species: The recommended threshold is to protect a minimum number of population sites and disturbance zones for goshawk, osprey, bald eagle, golden eagle, peregrine falcon, waterfowl, and deer. Alternatives are related to increasing or decreasing the number of species, population sites, and disturbance zones.

Habitats of Special Significance: The recommended threshold is to maintain the existing amount of riparian vegetation, the best quality habitat for a majority of the wildlife, and increase the total acreage whenever possible. Alternatives are limited but generally seek to increase the habitat type by acquiring structures and removing them from the meadows, wetlands, and deciduous vegetation stands.

FISHERIES

Stream Habitat: The recommended threshold is to retain specific miles of streams in one of three quality categories. Various alternatives exist ranging all the way from the recommended threshold to maintenance of streams in their current condition.

Instream Flows: The recommended threshold is to establish insteam flow standards for streams susceptible to extreme low flow conditions as part of the regional planning process. Alternatives are based on the number of streams for which future standards would be established.

Lahontan Cutthroat Trout: The recommended threshold is to support, in response to justifiable evidence, state and federal efforts to reintroduce the native Lahontan cutthroat trout. The only alternative is not to support their effort.

Lake Habitat: The recommended threshold is to retain specific acreages of Lake fisheries habitat in one of three quality categories. Alternatives range between existing and natural acreage values.

OUTDOOR RECREATION

Undeveloped Land: The recommended threshold is to preserve high quality areas in their natural state and reserve them for low density use. Alternatives range from developing all undeveloped areas to maintaining all in their natural state.

Shorezone: The recommended threshold for the shorezone is to preserve the high quality areas in their present natural state. Again the alternatives range from total development to total preservation of the Shorezone.

Access: The recommended threshold is to provide access to the high quality areas and to provide public access to the Lake-front. Alternatives would be to provide no access other than existing.

Developed Recreation: The recommended threshold is to maintain the capacity of existing developed recreation facilities, maintain the rural setting of the facility, and encourage expansion when consistent with other thresholds. Alternatives include reducing or phasing out facilities and prohibiting further expansion.

SCENIC

Roadway Units: The recommended threshold is to maintain current high quality scenic ratings and visually improve units at lower levels. Alternatives would provide more protection on the one hand and would permit further degradation of the scenic resource on the other.

Shoreline Units: The recommended threshold is to again maintain current scenic ratings and improve units with lower ratings. Alternatives are the same as provided with roadway units.

Environmental Consequences: The establishment of environmental thresholds is the culmination of a planning process designed to achieve and maintain a high quality environment within the Lake Tahoe Basin. As such, the thresholds have positive, beneficial consequences upon the physical and biological environment.

They will also produce positive social benefits as they provide an enjoyable environment in which to live and recreate. They may also carry negative social consequences since certain activities, development, or future use within the Basin could be restricted. There likewise, may be both positive and negative economic consequences with the adoption of environmental thresholds.

The social and economic consequences can not now be identified other than from a rather broad, generic sense for the thresholds per se do not determine population densities or permitted use levels. These determinations can only be made in the regional planning phase as various land use alternatives, each meeting the adopted thresholds, are explored. Many techniques are available for meeting thresholds dependent upon willingness to mitigate, restrict development, or alter the type and intensity of development. An overall assessment of consequences is made in the following table with positive (+), negative (-), and both positive and negative (=) impacts.

THRESHOLDS	ENVIRONMENTAL CONSEQUENCES			
	Physical	Biological	Social	Economic
Water Quality	+	+	=	-
Water Quantity	+	+	+	=
Soil Conservation	+	+	=	-
Air Quality	+	+	=	-
Noise	+	+	+	=
Vegetation	+	+	=	=
Wildlife	+	+	+	=
Fisheries	+	+	+	=
Recreation	=	=	+	+
Visual	+	+	+	-

Consultation With Others: Publication of this environmental impact statement is the culmination of a planning effort involving Agency staff assisted by a team of consultants. Throughout the process, numerous individuals representing local, state, and federal agencies along with the general public have been involved in review and assistance in development of environmental thresholds. The remaining task is one of Agency review of the comment received on the EIS and ultimately adoption of thresholds.

An opportunity to provide input to the Governing Board is made available through a 60 day review period ending July 17, 1982. In addition, the Governing Board will conduct public hearings on May 28 and June 23 prior to taking action at the July 28 meeting. The Advisory Planning Commission will also conduct public hearings at their regular June 9 and July 14 meetings. The Governing Board will utilize the environmental disclosure contained in the impact statement, written comments, input from the public hearings, and a technical study report to help in the decision making process. Additional information may be obtained by contacting the Tahoe Regional Planning Agency.

I. Purpose and Need

A. Requirements of Law: The Tahoe Regional Planning Compact was adopted by the State Legislatures of California and Nevada in 1980, ratified by the United States Congress, and then approved by President Carter on December 19, 1980. The Compact reorganized the Tahoe Regional Planning Agency (TRPA) and gave it new duties. Within 18 months from the date the Compact was approved, the Governing Body of the Agency must adopt environmental threshold carrying capacities that are necessary to maintain certain values specified in the Compact. One year after that, the Governing Body must adopt a plan for the Lake Tahoe region that both achieves and maintains environmental threshold carrying capacities.

"Environmental threshold carrying capacity means 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" (Article II(i), Tahoe Regional Planning Compact). The Compact further states the standards are to include but not be limited to air quality, water quality, soil conservation, vegetation preservation, and noise. This document will use the term environmental threshold or thresholds to describe the standards that are required to be adopted by the Agency. Environmental thresholds will be subject to review and revision as necessary to achieve the purpose and policies of the Compact.

Acting pursuant to Article VII of the Compact, the Governing Body of the Agency adopted, by ordinance, regulations for the environmental analysis of matters before the Agency. The regulations, consistent with the Compact, require the preparation of an environmental impact statement (EIS) on any matter to be approved or carried out by the Agency that may have a significant effect on the environment.

The Governing Body has determined that both the development of environmental thresholds and the regional plan will have a significant effect on the environment. This environmental impact statement has therefore been prepared by the Agency, as required by law and regulation, to disclose the environmental consequences of adopting thresholds. A subsequent environmental impact statement will be prepared in conjunction with amending the regional plan.

Pursuant to Article VII of the Compact, the Agency will circulate this environmental impact statement to the public and other agencies for comment during a 60 day review period. The cover sheet to this document specifies the inclusive dates. Comment by the public and other agencies will be received in writing and/or at public hearings to be noticed by the Agency. Response to the comments will be made a part of this environmental impact statement process. The EIS will be certified and adopted by the Governing Body prior to the Board adopting environmental thresholds.

The action addressed by this environmental impact statement is a set of staff and consultant team recommendations for adoption of environmental threhsolds by the Governing Body as required by Article V(b) of the Compact. Pursuant to Agency regulations, the EIS contains a discussion of 1) the environment to be affected, 2) alternative environmental thresholds, including the recommended set, for each component area for which thresholds will be adopted, and 3) the environmental consequences of each alternative, including mitigation measures, adverse consequences that cannot be avoided, short and long term effects, irreversible and irretrievable commitments of resources, and growth inducing impacts.

An environmental impact statement has as its principal function, the analysis of significant environmental effects of a project. Significant effects are normally defined as substantial effects on the physical environment, including air, water, vegetation, and similar matters. (See, for example, 15 California Administrative Code, Guidelines for Implementation of the California Environmental Quality Act, Section 15040.) However, since Article II(i) of the Compact requires that thresholds adopted by the Governing Board maintain specified values, this environmental impact statement considers and is based in part upon certain "goal" or "value" statements developed as part of its threshold establishment process. The statements, their purposes and uses are explained more fully in Chapter I, Section D. of this document.

The environmental consequences of adopting thresholds for each component area are described later in this document. The emphasis is primarily on the physical and biological impacts as they are the consequences most directly related to the threshold establishment process being evaluated at this time. Broad social and economic impacts are described but not as precisely as those dealing with the natural components of the environment. The Compact, in separating the threshold establishment process from updating of the regional plan, recognized population levels and permitted uses, two primary socio-economic components, would be a part of the regional plan (Article V(c)(1) of the Compact). Absent full development of alternative plan elements that would attain the thresholds, such as will be developed during the subsequent regional plan updating phase, social and economic consequences must now be generic. They will, however, be explored in-depth in the environmental impact statement accompanying the regional planning process.

The Tahoe Regional Planning Compact is a carefully drafted document designed to assure representation of the values or points of view of nearly everyone concerned with the natural, social, and economic environment of the Lake Tahoe Basin. The very structure of the Compact discloses the method for integration of these values into the complete planning process involving both the adoption of thresholds and amendment of the regional plan. The Governing Body of the Agency is composed of local and statewide representatives from both California and Nevada who were placed on the Board by various appointing authorities. Therefore, the "values" which the Compact specifies must be maintained by the adopted environmental thresholds that will ultimately find form in the composite value judgements of the Governing Body when it adopts those thresholds and then carries them forward to the task of amending the regional plan. Perceptions of natural, social, and economic effects will underline the judgement of each Governing Board member and contribute to the composite value judgement of the whole.

B. Development Process: The process for preparing recommended environmental thresholds has been developed through a joint effort involving Agency staff and a consultant team retained to assist with the effort. The process is prescribed in the Final Work Plan for the Environmental Threshold Study dated December 2, 1981. It embodies an interdisciplinary team approach throughout the process with guidance and policy direction provided by the TRPA Governing Board. The following tasks are identified in the work plan:

1. Select Environmental Components
2. Develop Value or Goal Statements
3. Identify Environmental Variables
4. Model Relationship of Variables to the Environment

5. Select Alternative Threshold Sets
6. Determine Implications of Alternative Thresholds
7. Prepare and Circulate EIS
8. Prepare Draft Study Report
9. Conduct Hearings on EIS
10. Governing Body Certifies EIS
11. Governing Body Adopts Thresholds

This environmental impact statement was prepared following completion of tasks 1 through 6 and is now available for comment. Refer to the title page of this document for the review time period. Public Hearings on the EIS will be conducted in June and July before the Agency's Advisory Planning Commission. The TRPA Governing Board will conduct public hearings in May and June prior to adoption of thresholds anticipated in July.

Background and supporting material prepared by the staff and consultant team to complete the first 6 steps is retained at the offices of the Tahoe Regional Planning Agency. Specific reference to this work is noted at appropriate points throughout the environmental impact statement. Previous studies of the Lake Tahoe Basin, when appropriate, and the work completed in establishment of environmental thresholds are incorporated by reference into this EIS to reduce the bulk of the document. When incorporated, the material will be cited and briefly described. In addition, a draft study report has been prepared documenting data sources and interpretation, modeling and analyses conducted, and other technical studies completed. It will ultimately be published as a final study report fully documenting the threshold establishment process. All of these documents are available for inspection and review during normal business hours at the Agency's office, 2155 South Avenue, South Lake Tahoe, California.

C. Location: The region to be affected by the establishment of environmental thresholds is defined in the Compact as including Lake Tahoe; the adjacent parts of Douglas and Washoe Counties and Carson City lying within the Basin in Nevada; and the adjacent parts of El Dorado and Placer Counties within the Basin in California. Further, a portion of Placer County lying outside the hydrologic Lake Tahoe Basin at the northwest corner is also included in the region. This includes all land south and east of a line beginning at the Basin crestline and the north boundary of section 1 running west to the northwest corner of section 3 and then south to the intersection of the Basin crestline and the west boundary of section 10, all within township 15 north, range 16 east, Mt. Diablo Meridian. The accompanying map delineates the Tahoe Basin and indicates its urban features.

The Lake Tahoe Basin (region) is located on the California-Nevada border between the Sierra Nevada Crest and the Carson Range. Approximately two-thirds of the Basin is in California with one third in Nevada. In total, the Basin comprises about 501 square miles, 310 of which are land with the remaining 191 square miles the waters of Lake Tahoe. The Lake, the most dominate feature of the Basin, is full at an elevation of 6229.1 feet above sea level. It is approximately 12 miles wide, 22 miles long, and has a shoreline of 71 miles.

The Lake Tahoe Basin contains the incorporated area of the City of South Lake Tahoe and portions of El Dorado and Placer Counties, California and Washoe and Douglas Counties and Carson City rural area, Nevada. The Basin is within the First and Fourteenth Congressional Districts of California and the Northern Congressional District of Nevada. The Tahoe Regional Planning Agency is a separate legal entity governed by a Governing Body of 7 delegates from California and

7 from Nevada. There is also a nonvoting federal representative to the Governing Board. The organization, voting procedures, and other requirements of the Board are specified in Article III of the Compact.

D. Issues to be Addressed: In order to carry out the mandate that environmental thresholds be adopted, the Agency must identify components for which such thresholds will or may be adopted. The Compact requires standards be adopted for air quality, water quality, soil conservation, vegetation preservation, and noise. Subcomponents that will serve as the basis for the selection of specific thresholds in these areas have been developed in this environmental impact statement. Water quantity, wildlife, fisheries, recreation, and scenic components have also been formulated, and the Governing Board may, in its discretion, adopt thresholds for these resource areas.

The Compact requires that the environmental thresholds ultimately adopted maintain certain, identified values of the region or maintain public health and safety. Preliminary "value" or "goal" statements were therefore developed early in the threshold process in order to assess and narrow the otherwise infinite range of values the thresholds must maintain. Alternative environmental thresholds within the scope of these assessed values or goals have been developed. An environmental threshold will be selected by the Governing Body from among the alternative thresholds proposed in each component area.

Chapter III of this environmental impact statement displays further refinement of the goal statements with the recommended thresholds. Specific environmental thresholds which would carry out the goals are described. However, final policies, and indeed, values will be reflected only in the standards ultimately adopted by the Governing Body, whether or not they are the ones recommended now.

E. Preliminary Goal or Value Statements: Following are preliminary goal or value statements in each component area studied:

Water Quality

1. Attain and maintain levels of water quality in the lakes and streams within the Basin suitable to maintain the identified beneficial uses of Lake Tahoe (e.g., recreation, fisheries, water supply, aesthetics).

2. Reduce algal productivity to levels that do not impair beneficial water uses or deteriorate existing water quality conditions in the Lake Tahoe Basin.

3. Further degradation of the water quality of Lake Tahoe and its tributarties cannot be allowed if we are to preserve the Lake for future generations.

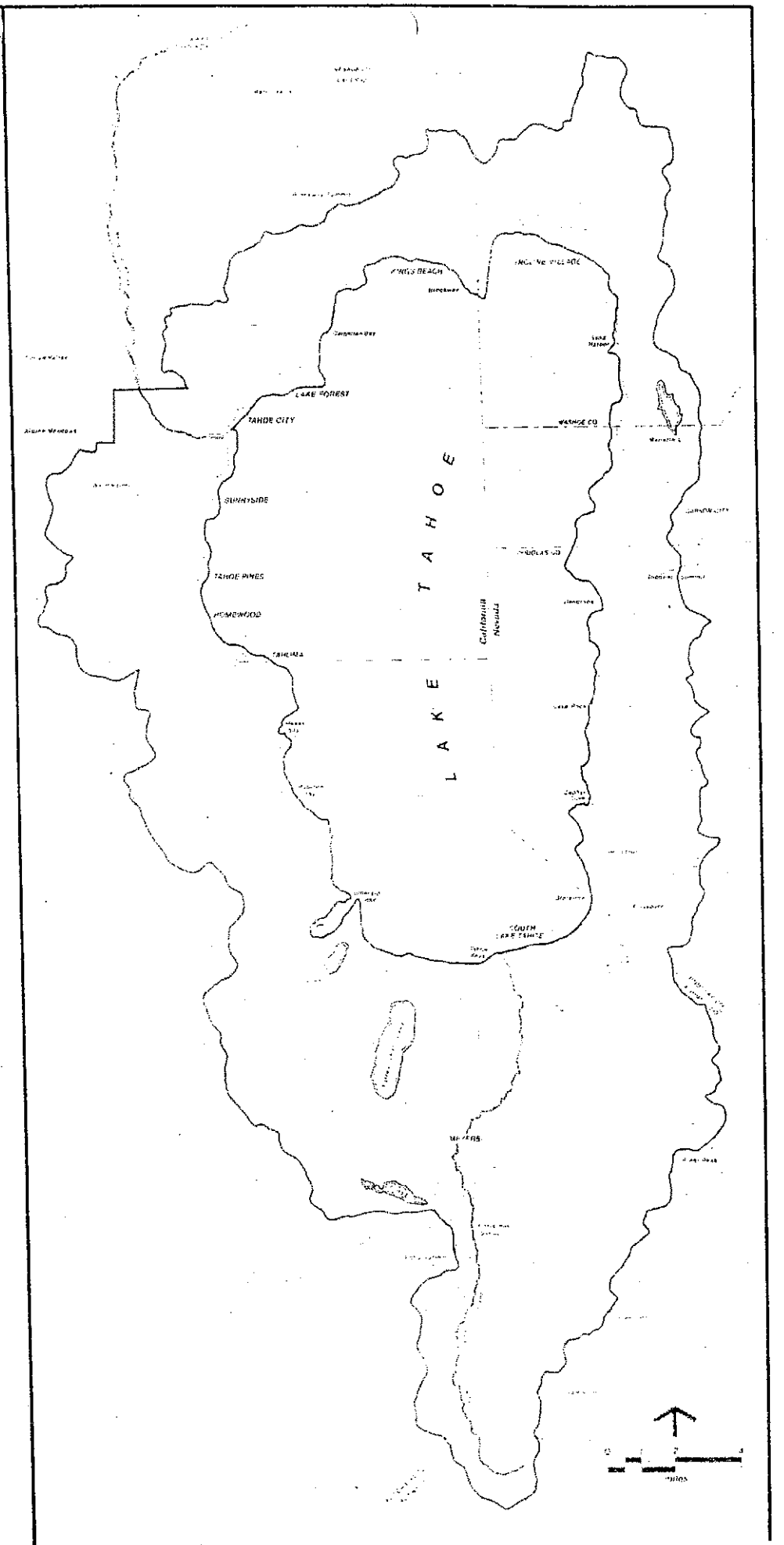
4. Where possible, restore all watersheds in the Basin so that they respond to runoff in a natural hydrologic function.

Water Quantity

1. Diversions of surface and groundwater should not exceed the limitations set by the California-Nevada Interstate Compact.

Lake Tahoe Basin

Urban Features



2. Achieve in-stream flow necessary for the identified beneficial uses such as recreation, fisheries needs, and aesthetics.

Soil Conservation

1. Land coverage and disturbance shall not exceed the level of use an area can tolerate without sustaining permanent damage through erosion and other causes.

2. Limit soil displacement to insure maintenance of soil productivity.

3. Restrict on-site erosion and resultant sediment transport to streams and lakes to levels that will not result in deterioration of existing water quality.

Air Quality

1. Attain and maintain state and federal air quality standards in the areas where they are not met and maintain air quality in areas that meet the standards.

2. Attain levels of air quality within the Basin suitable to maintain the identified beneficial uses of the Lake Tahoe Basin (e.g., recreation, vegetative preservation, aesthetics, public health and welfare).

3. Maintain or improve the clarity of the air and resultant visibility in the Lake Tahoe Basin.

Noise

1. Reduce or eliminate those activities in the Basin that produce damaging or distressing noise levels.

2. Provide for community and neighborhood tranquility.

Vegetation Preservation

1. Provide for a wide mix and increased diversity of plant communities in the Tahoe Basin including such unique ecosystems as wetlands, meadows, and other riparian vegetation.

2. Conserve threatened, endangered, and sensitive plant species and uncommon plant communities of the Lake Tahoe Basin.

Wildlife

1. Maintain suitable habitat for all indigenous species of wildlife without preference to game or non-game species through maintenance of habitat diversity.

2. Preserve, enhance, and where feasible, expand habitat essential for threatened, endangered, rare, or sensitive species found in the Basin.

3. Preserve, protect, and enhance habitats of special interest species.

Fisheries

1. Maintain or improve aquatic habitat essential for the growth, reproduction, and perpetuation of existing and threatened fish resources in the Lake Tahoe Basin.

Recreation

1. Maintain opportunities and facilities for the full spectrum of outdoor recreational uses.

Scenic

1. Maintain and enhance the dominant natural-appearing landscape for the vast majority of views and lands in the Basin.

2. Maintain and/or improve the aesthetic characteristics of the man-made environment to be compatible with the natural environment.

3. Restore, whenever possible, damaged natural landscapes.

4. Maintain levels of lighting necessary for public health and safety and in keeping with the unique environment of the Lake Tahoe Basin.

The proposed action and alternatives to it discussed in this environmental impact statement have been developed in response to the preliminary goals identified above. The goals have, in essence, provided the framework for development of alternative threshold sets as will be described in Chapter III of this document. The issues raised by the goal statements will also help to determine which effects need to be discussed more fully in Chapter IV, Environmental Consequences.

II. Affected Environment

A. Overview: A great wealth of information exists concerning the environment of the Lake Tahoe Basin. Some of the more recent efforts include:

Lake Tahoe Basin Water Quality Management Plan, Volume III, "Assessment of Water Quality and Environmental Impacts," Tahoe Regional Planning Agency, February 1977.

Lake Tahoe Environmental Assessment, with 13 Technical Appendices, Western Federal Regional Council, December 1979.

Lake Tahoe Basin Proposed Final Water Quality Plan, State Water Resources Control Board, State of California, September 1980.

Lake Tahoe Basin Water Quality Management Plan Draft Environmental Impact Statement, Tahoe Regional Planning Agency, February 1981.

Environmental Threshold Carrying Capacity Study Report (Draft), Tahoe Regional Planning Agency, May 1982.

This environmental impact statement will not duplicate descriptions contained in the above identified documents. They are incorporated in total by reference. It is important to focus primarily on those environmental components that will be affected by the adoption of thresholds. The list of components in this chapter becomes much narrower as not all aspects of the environment will be affected.

This chapter will describe the physical, biological, social, and economic environments to be affected. In the physical/biological categories are water quality and quantity, soil, air quality, noise, vegetation, wildlife, fish, recreation, and scenic components. The socio-economic environment to be affected may be such things as population, housing, employment, transportation, land uses, and public health and safety. Other components of the environment that will not be directly affected by the establishment of thresholds, such as mineral and energy use, grazing, timber, and certain other resource uses, will not be described in this EIS.

B. General Description: The "Tahoe Experience" is a unique experience created by a combination of an exceptionally clear, high elevation lake surrounded by spectacular mountain peaks. The natural, scenic beauty of this Basin has attracted many visitors over the years and has created a desire to visit for those who only see its beauty by way of photographs. The uniqueness of the Lake Tahoe Basin provides a wide variety of recreational opportunities found perhaps nowhere else in the world. Hiking in the Wilderness or along the Lake shore, sailing across the crystal blue water, skiing the slopes looking down on the Lake, camping, picnicking, or simply viewing the scenery are all a part of the "Tahoe Experience."

The Lake, which is the focal point of the Basin, is surrounded by magnificent mountain peaks. Freel Peak, at an elevation of slightly over 10,880 feet, is almost a mile higher than the surface of the Lake. The mountains are rugged and quite steep with about three fourths of the land area in excess of 30 percent slope. Soils are easily eroded on these steep slopes, especially when the vegetation is removed.

The Lake itself is the primary resource being addressed in the environmental threshold process. It is unique in its size, depth, and location. Lake Tahoe holds 126 million acre feet of water which is equivalent to almost 37.5 cubic miles (156 cubic kilometers). As mentioned previously, it is 12 miles (19.3 kilometers) wide and 22 miles (34.7 kilometers) long. The surface area is 192 square miles (500 square kilometers). The mean depth of the Lake is 1,027 feet (313 meters) with a maximum depth of 1,645 feet (505 meters). This maximum depth makes it the 10th deepest lake in the world. The average annual outflow of water over the dam into the Truckee River is about 181,500 acre feet.

The climate of the Lake Tahoe Basin is characterized by long but relatively mild winters and short dry summers. Pacific storms are responsible for most of the precipitation within the Basin which normally falls as snow. As the fronts approach from the west, the air mass must rise over the Sierra Nevada crest, losing most of its moisture in the process. As a result, the western side of the Basin has an annual average precipitation rate of 50 to 80 inches contrasted with 20 to 25 inches to the east. Summer precipitation is received in the form of occasional thunderstorms which rapidly give way to the normal clear sky and warm temperatures. Because of the high elevation of the Basin, summer evenings are cool and the growing season is relatively short.

The topography, in addition to being of high scenic quality, is a determinant in development, use, and environmental quality of the Basin. Man-made development is generally limited to the more gentle slopes adjacent to the Lake, primarily in South Lake Tahoe, Incline Village, and Tahoe City. These more gentle slopes are in private ownership. Outside the developed areas, the land is steeper and most often used by the transient or recreationist. This land is primarily in public ownership and provides the space for skiing, hiking, and other outdoor activities. The accompanying topographic map indicates major land form features of the Basin.

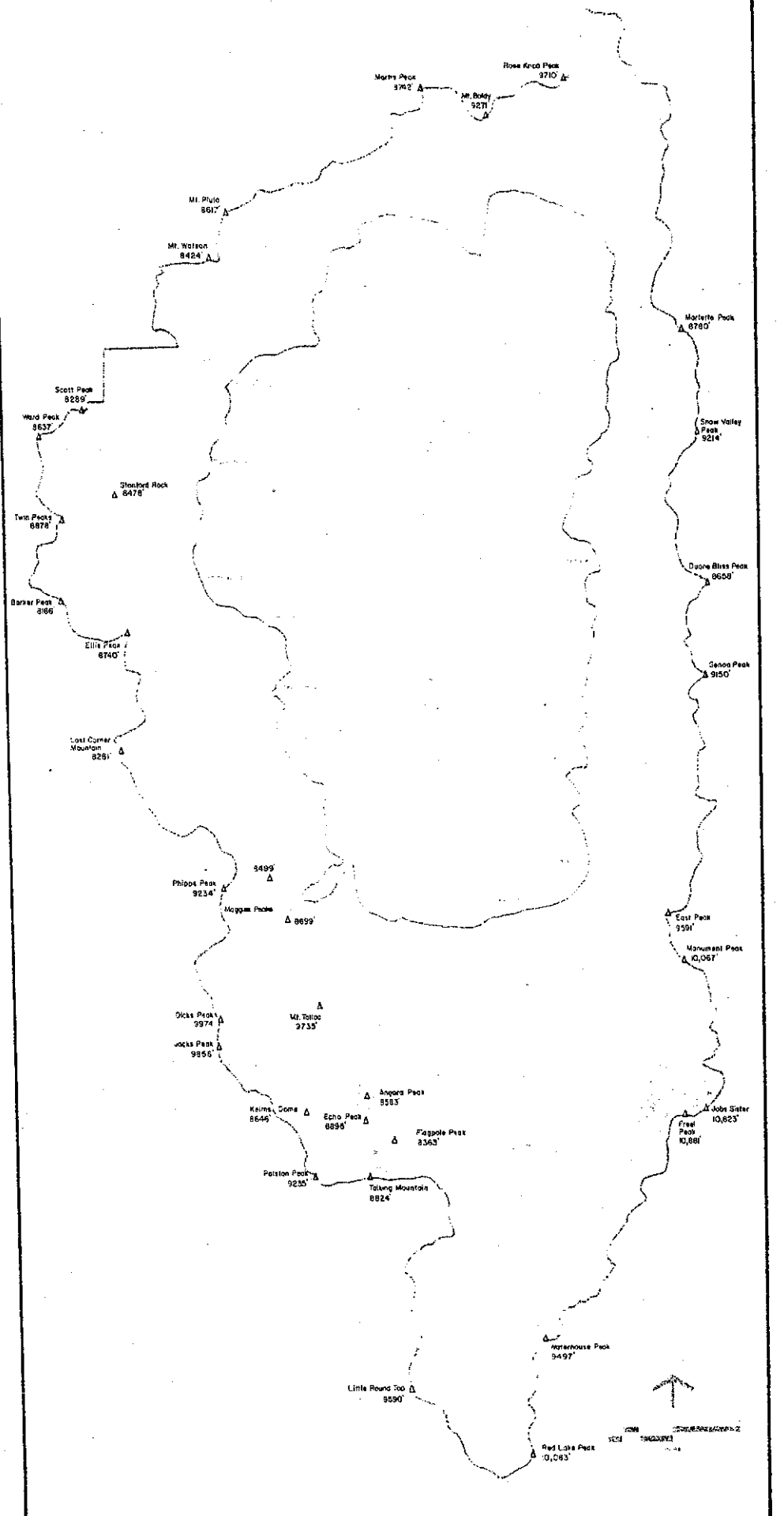
Sixty three separate watersheds drain the Basin directly into Lake Tahoe while one stream, the Truckee River, is the Lake's outlet. In addition, some land areas lying between discrete watersheds drain directly into the Lake. Topography of the Basin directly affects both surface and subsurface runoff and resultant water quality. This relationship will be discussed more fully in the Water section of this chapter.

Topography directly affects air quality within the Basin. The "bowl-like" shape of the Lake Tahoe Basin combines with local wind conditions in the summer to create a mixing that moves away from the Lake during the day and back towards the Lake at night. Air movement can become stagnant and often compressed by temperature inversions that restrict venting of the Basin. The inversion layer in the summer is strong but shallow and normally breaks up by about 9:00 a.m. Winter inversion layers can last longer. Geography and its effect upon air quality will be discussed more fully in the Air section of this chapter.

Granitic rock underlies the entire Lake Tahoe Basin with about half the exposed land area consisting of granite. Of the remainder, one-fourth of the Basin, primarily at the north end, consists of volcanic deposits with the remaining quarter being glacial, alluvial, and lake deposits. The geologic components, through natural processes, produce the geologically young and poorly developed soils of the Basin. They will be described more fully in the Soils section of this chapter.

Lake Tahoe Basin

Topographic Features



The geology of the Lake Tahoe Basin can be described by identification of six major geomorphic units. They are glaciated granitic uplands, glaciated volcanic flowlands, streamcut granitic mountain slopes, streamcut volcanic flowlands, depositional lands, and over steepened slopes. The groups are relatively large areas of land exhibiting similar characteristics that combine to become permanent elements of the ecosystem. Geomorphic units were the basis for Dr. Robert G. Bailey's Land Capability Classification of the Lake Tahoe Basin. The classification system has been adopted by the Agency as the system for determining capability for development and permitted impervious cover. Dr. Bailey's Guide, issued in 1974, is incorporated by reference and will be referred to periodically throughout this EIS.

C. Water Quality: The discussion of Lake Tahoe's water quality that follows, is a fairly simple explanation to help the reader understand the environmental impacts of setting water quality thresholds. For a more complete discussion of water quality, see the threshold study report.

The preceding background section included a discussion of the basic physical dimensions of the Lake and the Basin. With regard to quality, Lake Tahoe's waters are extremely clear. Only a few lakes in the world can rival Tahoe's clarity, including Crater Lake in Oregon and Lake Baikai in Russia (WFRC, 1979). Lake Tahoe is "ultra-oligotrophic," meaning that it is extremely clear with low concentrations of nutrients which support algae growth, and high oxygen levels. Tahoe's algal productivity is only slightly higher than that of permanently frozen Lake Vanda in Antarctica (EPA, 1980).

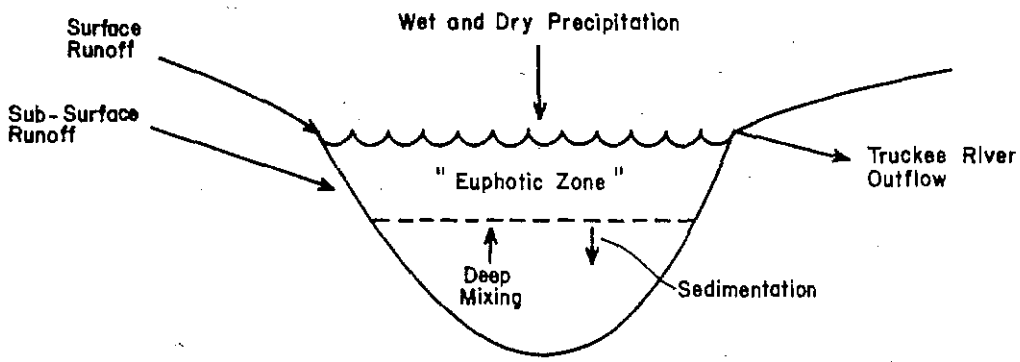
Like most lakes, Lake Tahoe is "stratified" during much of the year with colder, denser waters staying in the bottom layer and warmer, lighter waters staying in the top layer with little mixing between the layers. However, unlike most lakes which usually mix from top to bottom in the winter, Lake Tahoe does not always mix in the winter months. The depth and duration of winter mixing are extremely variable (Goldman, 1981). Some mixing of the surface layer of the Lake occurs as the result of winds and currents the year round, but this type of mixing does not significantly affect stratification.

Under undisturbed conditions, Lake Tahoe would remain clear through long periods of geologic time. (The Lake has been extremely clear, one must assume, since the era of glaciation.) As long as the geology of the Basin stays the same, the Lake will gradually become shallower as it fills with sediment and debris and experiences higher rates of algal growth and lower clarity. This process, known as "eutrophication," would happen so slowly under natural conditions that it would be imperceptable to man.

Algae, like all living organisms, require three essential elements (carbon, nitrogen, and phosphorus) and many trace elements to live and grow. In lake ecosystems, carbon is available in great abundance. Thus the availability of nitrogen, phophorous and trace elements dictates the rate of algae growth. For about 10,000 years, Lake Tahoe has been at or near an equilibrium in which the amount of nutrients available to support algae growth has not changed. In other words, under natural conditions, sources of nutrient input roughly equal "losses." The following figure depicts the principal sources and losses (sinks) of the most important nutrient, nitrogen, for the "euphotic zone" of the Lake, which extends to a depth of 105 meters or 330 feet. The euphotic zone is that part of the Lake through which sufficient light penetrates to support algal

photosynthesis. The sources of nitrogen to the Lake include both wet and dry precipitation directly on the Lake from the atmosphere, surface and subsurface tributary flows, and fixation of nitrogen gas from the atmosphere in certain types of algae. The surface and subsurface tributary flows may contain human inputs such as sewage or fertilizer leachate. Also, the deep "aphotic" waters of the Lake contain a large store of nitrogen which, during mixing events, contributes greatly to nitrogen concentrations in the euphotic zone.

Principle Sources and Sinks of Euphotic Zone Nitrogen



The Lake can lose nitrogen through four pathways: Denitrification, permanent sedimentation, outflow via the Truckee River, and sewage export. Certain bacteria, generally found in anaerobic (oxygen-deficient) soils, can convert dissolved nitrogen to nitrogen gas, but the amount of this "denitrification" is small. The exact amount of nitrogen lost to permanent sedimentation on the Lake's bottom is unknown. The estimated loss of nitrogen via outflow (Truckee River and sewage export) is between 2 and 4 metric tons (tonnes) per year.

Lake Tahoe's great clarity contributes to the existence of deep water plant communities. They grow in sediment on the Lake's bottom at depths up to 152 meters (500 feet). Apparently, there are sufficient light and nutrient levels at these depths for these unusual plants to survive.

Surface and sub-surface flows from the Basin's watersheds carry a continuous load of nitrogen to the Lake. The amount of nutrients generated by a specific watershed depends on the rainfall, soils, vegetation, and land use within the watershed. Normally, vegetation minimizes erosion and intercepts many nutrients before they reach the Lake.

Given the existing data on the various nitrogen sources and losses, it is difficult to establish an accurate nitrogen budget, or balance, for the Lake. However, the threshold study estimates that under natural conditions, sources and losses are basically balanced, but under existing conditions, sources exceed losses. Precipitation has higher concentrations of nutrients than the Lake or

its tributaries. One study showed a concentration of total nitrogen in melted snow 2.5 times greater than concentrations found in Lake Tahoe (WFRC, 1979).

Nearly half the surface inflow to the Lake comes from only four of its 63 watersheds -- Trout Creek, the Upper Truckee River, Taylor Creek, and Ward Creek. The accompanying map delineates the watersheds. The water quality of the tributaries draining natural areas is generally comparable to the water quality in the Lake. The lands immediately surrounding the tributary streams, known as "stream environment zones" (SEZ's), are extremely important to tributary water quality, since the lush vegetation in these zones helps control erosion impacts and allows for vegetative uptake of nutrients from runoff. Tributary flows deliver about 300,000 acre-feet of water to the Lake each year. It is not known how much groundwater flows into the Lake as sub-surface flow (TRPA, 1977).

The quality of runoff is an important determinant of the Lake's water quality, and is one of the only components of the nutrient budget that people can control. (Another controllable component may be atmospheric deposition.) One of the reasons for the Lake's reknowned clarity is that the area of the drainage basin is small compared to most other lakes. The surface area ratio of the drainage basin to the Lake's surface is only 1.6:1 (Goldman, 1981).

There are hundreds of smaller lakes in the Basin in addition to Lake Tahoe, with a combined surface area of about five square miles. There has been little monitoring of these lakes. Because of their smaller size, these other lakes may be more vulnerable to pollution and eutrophication than Lake Tahoe itself. However, many of them are remote and essentially undisturbed by humans. The largest of the other lakes is Fallen Leaf Lake, located close to Emerald Bay on the southwest shore of Lake Tahoe. Limited data indicate that the water quality of Fallen Leaf Lake, while still within the good range, is significantly lower than Lake Tahoe's water quality (ESA, Inc. 1982). One reason for this may be that residents of the Fallen Leaf sub-basin have in the past disposed of sewage through subsurface leach fields. Fallen Leaf Lake discharges into Lake Tahoe via Taylor Creek.

Subcomponents: The aquatic system for examining water quality within the Lake Tahoe Basin can be broken down into six major subcomponents. They are groundwater, surface runoff, tributary or stream flows, lakes other than Tahoe, littoral or nearshore waters of Lake Tahoe, and pelagic or open waters of the Lake. External factors such as precipitation, vegetation loss, soil disturbance, and man's land use activities have varying impacts upon each of the subcomponents. Flows containing nutrients and/or sediment will ultimately reach the Lake and affect the pelagic waters of Lake Tahoe. The cause-effect correlation of sediment and nutrient movement must be evaluated as a cycling process within the Basin's aquatic system. Environmental thresholds will be attempted for each of the subcomponents where there are sufficient data available to clearly define a specific threshold level.

Standards: A complete discussion of federal, state, and local water quality standards appears in Appendix C. For the purpose of establishing environmental thresholds, the most important standards are the clarity and algal productivity standards for the pelagic and littoral portions of the Lake, the tributary water quality standards for nitrogen, phosphorus, iron, and suspended sediment, and the uniform runoff standards adopted by TRPA as part of the Lake Tahoe Water Quality 208 Plan.

The State standards for Lake Tahoe require that clarity and algal productivity in both the offshore (pelagic) zone and the nearshore (littoral) zone should not worsen from those values observed between 1967 and 1971. Analysis of the ambient water quality data shows that, to meet these standards, pelagic algal productivity should not exceed 52 grams carbon per square meter of Lake surface per year ($gC/M^2/yr$), and that clarity should not diminish from the Secchi disk readings during that period (28 meters). (A Secchi disk is an instrument used to measure clarity. It is a white plate, 20 inches in diameter, which observers lower into the Lake until it disappears from view.) The State standards also dictate that algal productivity in the nearshore (littoral) zone should not exceed twice the value for the pelagic zone.

Historical Trends: In general, there is a downward trend in water quality in Lake Tahoe and its tributaries. This trend is the result of accelerated eutrophication which, in turn, is the result of a change in the natural equilibrium the Lake has been in since the glaciers. As discussed above, natural changes in Lake Tahoe's water quality were extremely slow, partially because the sources and sinks of nutrients were essentially balanced. With the development of the Basin for recreational, commercial, and residential uses starting in the mid-1950's, humans have upset the natural equilibrium by increasing nutrient loads.

Clarity, perhaps the most important measure of water quality, has decreased in the pelagic zone from an annual average Secchi depth of 31.2 meters in 1968 to 27.6 meters in 1981. Winter clarity, representing both the clearest and most stable conditions of the year, has decreased more, from 33.6 meters in 1968 to 14.9 meters in 1981 (average clarity, December to March).

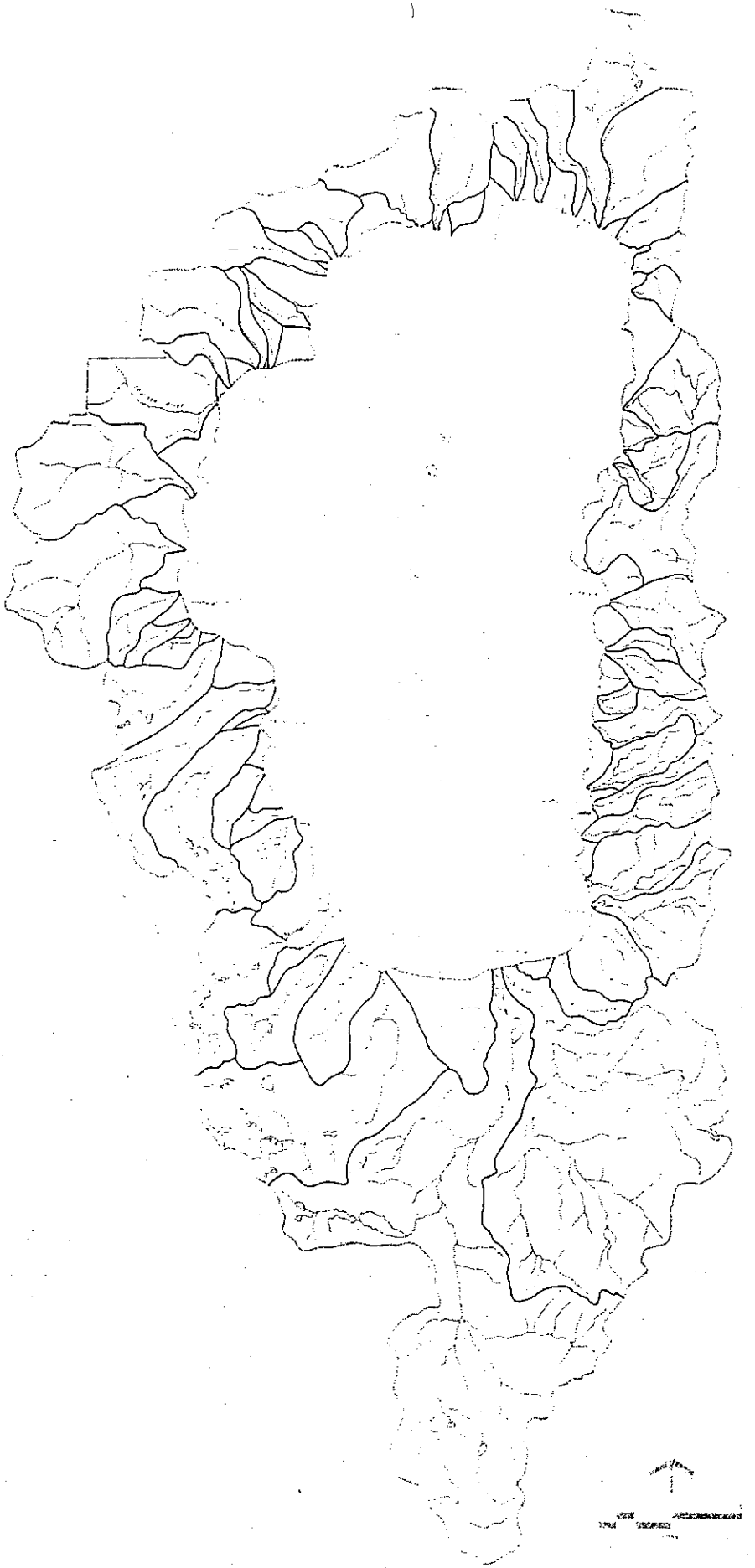
Scientists have measured the Lake's algal productivity since 1959, and since 1967 have made weekly or bi-weekly measurements. The data show that algal productivity (i.e. primary productivity) increased 110 percent from 1959 to 1980, an average of 5.2 percent per year (Goldman, 1981). Intensive studies conducted at many sites around the Lake from 1968-1971 show a correlation between the fertility or productivity of Lake waters and the degree of development in the adjacent watersheds. Conceptually, one would expect this to be true since development increases nutrient loads by displacing vegetation and altering the hydrology of the watershed, and since tributary flows do not mix instantly upon reaching the Lake.

To many, the most dramatic evidence of changing water quality is the growth of attached algae (periphyton) in the littoral or nearshore zone. These slimy plants, such as Gomphonema and Ulothrix, constitute about 10 percent of total algal productivity in Lake Tahoe but are the most visible evidence of eutrophication. One study showed a relationship between attached algae growth and development of adjacent watersheds. Loeb (1980) used a unique underwater laboratory to measure this growth. Also, the attached algae consist primarily of blue-green algae which can "fix" or use nitrogen gas from the atmosphere and may, therefore, be a significant additional source of Lake nitrogen in the long run.

The algal productivity of nearshore areas would be higher than that observed in the deep lake due to the littoral zones shallowness and proximity to tributary flows. However, in recent years, the algal productivity data show a steady increase in pelagic productivity in relation to the littoral zone. In other

Lake Tahoe Basin

Watersheds



words, the usual difference in algal productivity is becoming smaller. Unfortunately, scientists have gathered little data on littoral zone quality since the intensive surveys of the Tahoe Research Group in 1968-1971. The data show that littoral algal productivity increased during that period. Productivity varies from place-to-place, year-to-year, and month-to-month, but in general, the most productive areas of the littoral zone are the areas at the South Shore just east of the Upper Truckee Rive, Crystal Bay on the North Shore, Emerald Bay, and the Truckee River outlet at Tahoe City. There is little data on clarity or transparency in the littoral zone.

Because of the existing trends in clarity and algal productivity, it is clear that the Lake violates State standards for these two parameters since the standards reflect conditions in the Lake between 1968 and 1971. Today's annual average Secchi disk depth, for example, of about 27 meters falls short of the standard by 1 to 2 meters. The data show the littoral zone also has violations of algal productivity at various times and locations around the Lake.

A major goal of the threshold study was to attempt to determine a relationship among clarity, algal productivity, and annual nutrient loads. The data show a correlation between clarity and algal productivity, indicating that algal growth contributes to the decrease in clarity. To determine whether there is a relationship between loads and algal productivity, it was first necessary to make annual load estimates. Other studies have based their estimates of nutrient loads to Lake Tahoe on extrapolations of sediment runoff data. The threshold study, however, used measured nutrient loads on several tributary streams as a basis for loading estimates. Loading estimates for the last few years are highly variable depending on prevailing hydrologic and climatic conditions.

The conclusion of the threshold study is that annual runoff is not the only determinant of long-term water quality trends in the Lake. The pool of nutrients already in the Lake, which appears to be increasing each year, strongly influences the trends of algal production. The amount of nitrogen available to algae in the euphotic zone each year depends as much on the depth of mixing in the Lake as on runoff quantity or quality.

Over the long run, clarity in Lake Tahoe will not increase, and primary production will not decrease, as long as the accumulated load, or storage, of nutrients in the Lake increases. To make exact predictions of future water quality would require a precise nutrient budget, which to date has not been developed. But the available data indicate that algal productivity in the Lake will continue to increase until one of three things happens: 1) Lack of light penetration starts to inhabit algae growth, 2) phosphorus or some other mineral required by the algae becomes the limiting nutrient in determining algae growth, or 3) remedial efforts decrease nutrient loads to the point where annual nitrogen sinks exceed sources and the accumulated load (storage) starts to decline. It is impossible to predict, at this time, when any of these events might happen.

If light penetration or the availability of some nutrient other than nitrogen limited algae growth, clarity and productivity trends would level off, but under these conditions, it is unlikely that water quality would recover. Due to the great depth and volume of the Lake and the small size of the surrounding watershed, the average residence time of a water molecule in the Lake is about 700 years. Thus, the Lake has a long "memory" of nutrient loading and stores a vast amount of nutrients, up to a hundred times greater than the amount runoff adds in some years.

Several agencies have monitored runoff quality from natural and developed watersheds in the late 1960's. The long-term trend in surface runoff quality from developed areas in the Basin is downward (TRPA, 1981). Surface runoff carries soil particles and nutrients to the Lake that would otherwise stay in the soil. Sediment and nutrient yields increase with increasing levels of disturbance and decreasing land capability. Nutrient concentrations increase with both erosion and the presence of impervious surfaces, which reduce the capacity of the soil-vegetation system to capture and hold nutrients. TRPA (1981) attributed 50 percent of controllable soil loss in the Basin to unvegetated areas and artifically over steepened slopes.

Some of the main types of erosion problems in the Basin are areas stripped of vegetation; unstable roadway slopes; unsurfaced roads, streets, and driveways; eroding road shoulders and ditches; and inadequate or unstable drainage systems. Some of the main sources of surface runoff not associated with erosion are roads, parking lots, rooftops, snow storage and disposal areas, construction sites, and golf courses. The Basin's forests, although they normally exhibit better runoff quality than developed areas, also have problems associated with timber harvesting, dirt roads, off-road vehicle use, livestock confinement and grazing, campgrounds, and ski areas.

Stream environment zones (SEZ's) are crucial to the intercepting and treatment of degraded surface runoff. An EPA study (Morris et al. 1980), showed that SEZ's where runoff moves as sheet flow provide effective treatment of surface runoff. However, SEZ's which have been channelized by concentrated runoff lose their treatment capacity and may actually contribute to sediment and nutrient loads. Over 3,000 acres of SEZ in the Basin have been subdivided or otherwise developed.

Because of these trends in runoff quality, the water quality of the tributaries also show degradation. Thirty-seven streams analyzed for the threshold study violated their total nitrogen, phosphorus, and iron standards three times more frequently than they met the standards. Developed watersheds discharge most of their sediments and nutrients during a few months of peak stream flows (TRPA, 1977). A 1976 study found significant reductions in the abundance and diversity of aquatic organisms downstream of disturbed areas (Lahontan Board, 1976). In the worst cases, silt smothered organisms which provide food for fish, interfered with recreation, and impaired tributary aesthetics. Because all watersheds in the Basin have roads, there are no truly undisturbed watersheds.

Trends in groundwater quality are not known, although groundwater may carry a nutrient load to the Lake of the same order of magnitude as the load from surface runoff. Leonard et al. (1979) found that although groundwater flows in Ward Creek were only about 1/10 of surface flows, their nitrate concentrations were ten times higher than those in surface flows. The trends in water quality for the other lakes in the Basin are also unknown. More information is needed in these areas, especially on groundwater quantity, quality, and movement.

D. Water Quantity: The Lake Tahoe Basin forms the upper watershed of the Truckee River. The Truckee River originates in the Basin, flows through California into Nevada, and terminates at Pyramid Lake. The Tahoe Basin and Truckee River are within the Great Basin. Lake Tahoe and its tributaries provide the water for the beneficial uses in the Basin. Consumptive water use is provided for by the California-Nevada Interstate Water Compact.

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The quantity of water in the Tahoe Basin is a function of precipitation, groundwater interflow, and surface runoff in terms of supplying water to Lake Tahoe. Precipitation is beyond the direct influence of man but groundwater and surface runoff can be affected.

Precipitation within the Lake Tahoe Basin follows a normal pattern beginning with fall rains, then turning to snow as winter progresses. The majority of the precipitation, 55 to 70 percent, usually occurs between December and March. At Lake level, 75 to 80 percent of the precipitation is normally snow while above 8,000 feet elevation, 90 to 95 percent is snow. A high pressure system off the west coast normally keeps storms from developing in the summer months. The summer is dry with the exception of occasional thunderstorms and infrequent tropical storms from the south.

Groundwater and surface runoff, both as overland flow and runoff through tributaries, and precipitation falling directly on the Lake surface are the principal mechanisms by which water enters Lake Tahoe. Some runoff water is lost before reaching the Lake due to evaporation from land surfaces and transpiration by vegetation. The United States Geological Survey (Crippen and Pavelka, 1972) estimated 53 percent of the precipitation falling in the Basin was lost to these two processes. The precipitation that eventually reaches the Lake does so through tributary flows which are made up almost entirely of interflow from groundwater and overland flow from storms and snowmelt.

Water consumed (consumptive use) within the Lake Tahoe Basin is not returned to the Basin's water supply but is exported as treated sewage. (See the discussion in Section R, Public Health and Safety of this Chapter.) Water is supplied to the Basin's consumers from 93 separate supply systems. Since all the water sources are high quality, very little if any treatment is required. Some surface water is chlorinated before use.

More than half of all water use occurs in the south shore area but use in the Incline Village and Crystal Bay areas has been increasing rapidly. Seasonal variations in water use are dramatic with summer use more than double the amount used in the winter months.

Water quantity is very closely related to water quality. Quantity is also important from the standpoint of fisheries needs, it contributes to the visual environment, and it is essential for the recreation experience offered in the Tahoe Basin. Refer to each of these headings in this chapter for further discussion of each component.

Subcomponents: Water quantity as a component for which thresholds will be established, will be evaluated in terms of allocations for consumptive use and instream flow requirements. The consumptive use allocations deal with the legal limits set by California and Nevada. Instream flow volumes and levels are primarily a function of natural processes, except in certain streams where diversions occur. Thresholds for quantitative instream flows can be developed for streams based on fish habitat requirements. Quantitative instream flow requirements have not been developed for other uses. Instream flow thresholds for other streams will be based on achieving natural flow regimes.

Standards: Water quantity limits for consumptive use are set by the California-Nevada Interstate Water Compact ratified by the state legislatures in 1971. The Compact provides for California to allocate 23,000 acre feet/year and Nevada 11,000 acre feet/year. These volumes include all diversions within the Basin, including groundwater. In Nevada, the State Engineer allocates the rights to use all waters, since both ground and surface waters are public property. The California Water Resources Control Board Water Rights Division regulates only appropriative water rights. Use of riparian waters and groundwater in California is not subject to state water law when the water is put to beneficial use on the property from which it is diverted. The Agency may regulate development of riparian or goundwater sources in California to insure compliance with the Compact allocations through the Agency's permit process. Maintenance of instream flows essential for recreation, fisheries, and aesthetics may also be regulated by the Agency's permit process. Federal regulations, in addition to state nondegradation policies, require existing instream water uses to be maintained and protected.

Historical Trends: Natural Lake Tahoe was dammed as early as 1870 to regulate the outlet flow of the Lake. The first dams were made of wood with the present outlet dam being completed in 1916 (Scott, 1973). The outlet dam raises the surface level of the Lake 6.1 feet when full. This accounts for 720,000 acre feet of additional water storage which is less than one-half of a percentage of the total volume of Lake Tahoe. The consumptive use of Lake Tahoe is guided by the bi-state Compact allowing specific diversions to be legally permitted within each state and sets the minimum outflow of Lake Tahoe.

The California State Water Resources Control Board (1979) identified problems with capacity of distribution on the California side and concluded that if existing subdivisions were completely built out, water use would exceed the quantity legally available. The report also estimates there will probably not be enough water available in Nevada to support development beyond buildout of existing subdivisions. Incline Village and the Round Hill area are currently facing the problem of potential allocation shortages based on present water rights.

E. Soil: Soil within the Lake Tahoe Basin is an integral part of the structure and function of the natural ecosystem. Soil is a formation of organic and mineral material on the surface of the earth. Tahoe soils are products of weathering of either volcanic or granitic parent material. Soils are essential for supporting vegetation by providing a medium to anchor roots, store nutrients, and store water for growth. The physical, chemical, and microbiological composition of soils have substantial affect on the quality of water moving over or through the soil system.

Soil formation is a very slow process of both weathering and movement or deposition of the existing soils in the Tahoe Basin. Freezing winters and relatively dry summers experienced in the Sierras do not form soil as rapidly as warm, moist conditions of other areas of the country. As soils form and throughout their existence, they are subjected to wind and water erosion. If the forming process is more rapid than the erosional process, soil will form in place. People can alter the soil formation process as a result of their land use activities. It is important to attain or maintain a balance between soil formation and soil loss to provide the soil essential for continued plant growth. It is also important to prevent delivery of eroded soils containing nutrients and chemical elements into the streams and lake.

The Soil Conservation Service of the U.S. Department of Agriculture describes the soils of the Basin in a 1974 publication. This document with accompanying maps is incorporated by reference and is suggested reading if more information is desired. The soil survey identified and mapped various soil types within the Basin. These soils have been grouped into 10 soil associations. A soil association normally consists of one or more major soils and at least one minor soil. Soils in one association may occur in another but in a different pattern. The soil associations have been placed in one of three major groups depicted on the accompanying map. These groups are useful as guides in understanding the ability of the land base to accommodate various uses on a very broad scale. Site specific detail can only be obtained using a more intensive soil survey. The following describes the three major groups depicted.

1. Nearly Level to Gently Sloping Soils Along Streams, on Fans, and in Meadows. This soil group is poorly drained, normally associated with water, and subject to occasional flooding. It is found at an elevation from about 6,200 feet to 6,500 feet and makes up 5 percent of the surveyed area. The soil association making up this group is suitable for recreation, grazing, homesites, and related uses.

2. Nearly Level to Steep Soils on Moraines, Glacial Outwash Terraces, and Fans. The soils in this group are excessively drained to moderately well drained and are formed of water deposited sediment from granitic and metamorphic rock. Three soil associations make up this group normally found at elevations of 6,200 to 8,600 feet. This group makes up about 24 percent of the Basin. The soil associations within this group are favorable for homesites, timber, and limited grazing.

3. Gently Sloping to Very Steep Soils of the Mountains. The soils in this group are somewhat excessively drained to moderately well drained as they are formed in material weathered from granitic, fine grained volcanic, and metamorphic rock. These soils are in the mountains surrounding the Basin up to an elevation of over 10,000 feet. Six soil association make up this group, accounting for 71 percent of the Basin. The soil associations in this group are suitable for wildlife, recreation, timber, limited grazing, and homesites on the most gentle slopes.

Subcomponents: Soils will be evaluated in terms of three subcomponents for establishment of thresholds. The subcomponents include impervious coverage and surface disturbance, soil displacement, and stream environment zones. Each of these subcomponents is important to the soil resource from the standpoint of maintaining the productivity of the soil and preventing undue delivery of soil into the streams and lakes. These subcomponents have an important relationship with other environmental components such as vegetative cover and water quality.

Impervious coverage and surface disturbance affect the soils ability to function naturally as a medium for vegetative growth and storage of nutrients and water. Impervious coverage prevents any infiltration of precipitation and its associated nutrient load, resulting in near total runoff onto adjacent soils. The increased runoff volume provides added energy to the erosional capacity of the water. Similarly, the alteration of the soil due to compaction, removal of the vegetative cover, or alteration of the vegetative type will alter the runoff characteristics of the land surface, generally increasing the runoff volume and erosion

potential. Cover and surface disturbance also reduce the ability of the soil to store nutrients associated with precipitation and decomposition of organic matter such as leaves, needles, or vegetation. These sources of nutrients enter the soils by leaching or infiltration.

Within the Tahoe Basin, development of impervious coverage results in associated surface disturbance. Field studies indicate that for the various types of land use, there is a corresponding amount of surface disturbance which varies depending on the type of land use. As an example, for residential development, the amount of surface disturbance increases as the density of development increases. Analysis of data from subdivisions throughout the Basin indicate the natural vegetation decreases and is virtually eliminated as density approaches 50-60% (50-60% of the lots in the subdivision are developed) (Litton, 1981). Surface disturbance associated with commercial development is more intensive with the natural vegetation eliminated at 40% buildout. Alteration or removal of the natural vegetation which alters surface conditions will result in changes in the runoff, erosional capacity, and infiltration. These changes impact the soils of the area and ultimately the watershed.

Erosion of soil is a natural process which is accelerated by land uses which cause surface disturbance. Surface disturbance is a direct cause of soil displacement and loss above and beyond the natural erosional loss due to wind and water. Vegetation and the soil texture and structure play a major role in soil stability. If the surface is disturbed such that soil structure or surface is altered, or if the vegetative cover is removed, soil will be more susceptible to erosion. The severity of the disturbance, soil type, and exposure to precipitation and runoff will influence the amount of soil that will be displaced or lost.

Soils are displaced from one site to another within a watershed due to erosion. Some of the displaced soils are lost from the watershed when they are delivered into a drainage system and transported to a receiving body of water. When more soil is displaced from an area or watershed than is formed, the productivity, or the ability of the soil to support vegetation, is decreased. Decreased productivity will result in reduction of vegetative cover and is associated with reduction of nutrient and water storage capacity of the soil. Deposition of soils in suitable areas can increase productivity and establish vegetative cover within that area. It is important to maintain a balance of soil movement, deposition, and loss on a site or within the watershed to prevent loss of soil productivity and reduce soil delivery sedimentation into a drainage system.

Both surface disturbance and development of impervious cover remove vegetation from the Basin. This vegetation is extremely important as it is a part of a total system that is responsible for removing nutrients, particularly nitrogen, from precipitation which is stored in the soil. The nutrient removal process or nutrient uptake is extremely important in the nutrient balance in the entire aquatic system as discussed under Water Quality.

Stream environment zones (SEZ's) are not necessarily a product of the soil resource but are instead a combination of soil, vegetation, and streams knit together in a close, ecological relationship. SEZ's are areas influenced by and including the presence of streams, high water table, marshes, meadows, drainage ways, and floodplains.

Lake Tahoe Basin

Soil Association Groups

Group 1

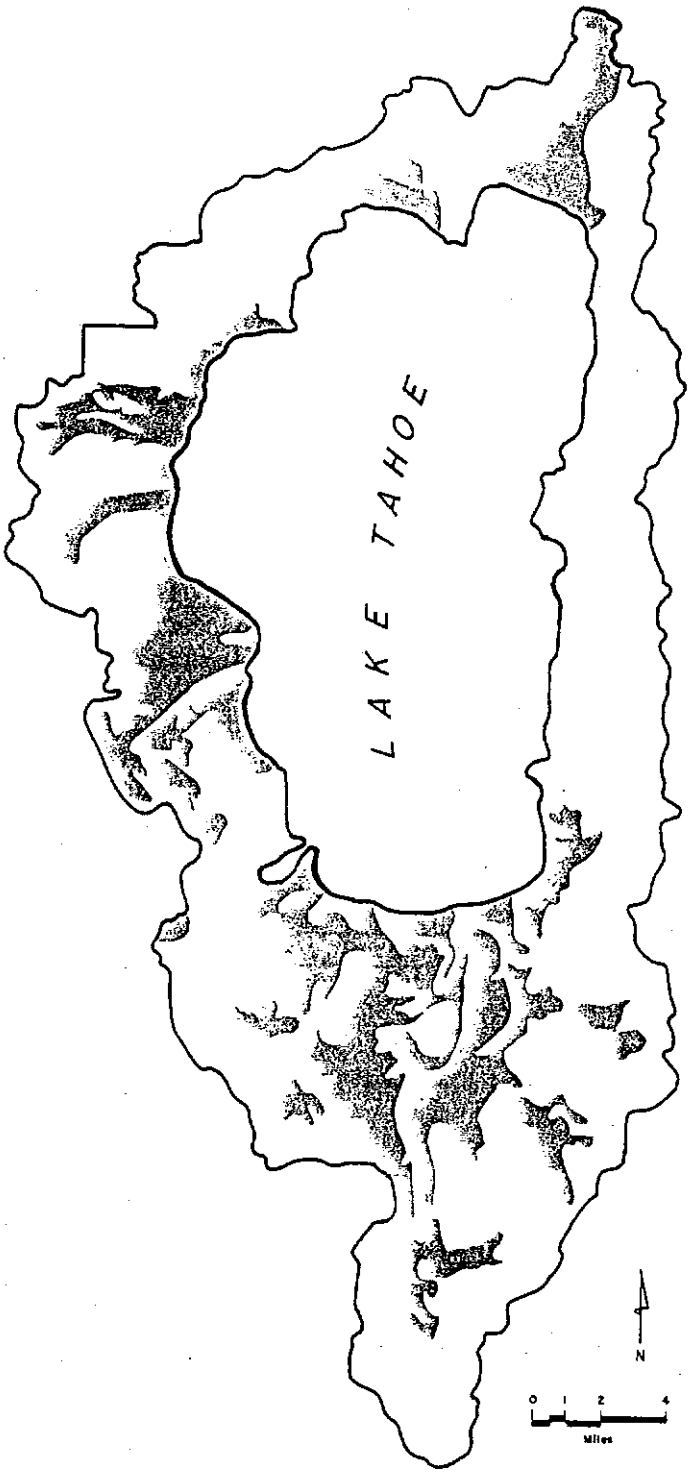
Nearly Level to Gently Sloping Soils Along Streams, on Fans, and in Meadows

Group 2

Nearly Level to Steep Soils on Moraines, Glacial Outwash Terraces, and Fans

Group 3

Gently Sloping to Very Steep Soils of the Mountains



SEZ soils are often the most productive soils in the Basin in terms of vegetative growth and nutrient storage. These soils, because of their proximity to drainage systems, are highly susceptible to the erosional energy of the runoff water and are easily delivered to the streams and Lake. Loss of these soils and accelerated erosion result from vegetative removal and surface disturbance in SEZ's which results in loss of productivity of the SEZ soils. Protection of the SEZ is important in maintenance of the soil resource. It is also important to water quality, fisheries, wildlife, recreation and visual resources and will be discussed in those components.

Standards: The Tahoe Regional Planning Agency has established a standard for the amount of impervious coverage permitted based on land capability. Land capability of the Tahoe Basin was determined in a study conducted in cooperation with the Agency and subsequently issued in 1974. (Land Capability Classification of the Lake Tahoe Basin, California-Nevada, by Robert G. Bailey, Forest Service, USDA). This document is incorporated by reference. Factors used in rating capability were principally soil type and geomorphic setting. Hazard ratings were assigned to both soil and geomorphic types to ultimately provide a range of capability classes from 1 to 7. The most restrictive, class 1, is subdivided into three subclasses - 1a, 1b, and 1c. The higher the capability class, the more tolerance for use. An allowable percentage of impervious coverage has been designated for each capability class to maintain environmental balance. These coverage standards are intended to keep the area not utilized for impervious coverage available to function naturally, thereby maintaining natural vegetation and soil capacity, and mitigating loss of the soil surface. The following table lists the total area within each capability class and indicates the allowable coverage. The accompanying map groups land capability classes into 4 categories and Appendix C displays the capability class by soil type.

Land Capability Class	Total area		Impervious Surface Allowable Coverage	
	Acres	Percent	Percent	Acres
7	3,030	2	30	909
6	8,800	4	30	2,640
5	16,730	8	25	4,182
4	7,050	4	20	1,410
3	12,900	6	5	645
2	4,770	2	1	47
1	148,750	74	1	1,488
Total	202,030	100	100	11,321

Standards for disturbance, in addition to allowable impervious coverage, are contained within the Agency's 1972 Grading Ordinance, 1973 Tree Conservation Ordinance, 1973 Timber Harvesting Ordinance, and Ordinance 81-5 implementing the Lake Tahoe Regional Water Quality Management Plan. Each of these ordinances limits types of activities that may take place on specific land capability classes. In addition, best management practices are followed in an effort to reduce the impacts of development and resource use within the Basin. The above listed documents are incorporated by reference.

The Soil Conservation Service, United States Department of Agriculture, has adopted nationwide goals that define acceptable levels of soil loss designed to maintain soil productivity. The values are derived from national averages for

the various soil types and are referred to as "T" factors. They establish a goal for the amount of soil that can be lost due to displacement or delivery from a given soil type without the loss of soil productivity. The "T" factors for the soil types of the Lake Tahoe Basin are described in Appendix C.

Stream environment zones and related hydrologic zones are defined by the Tahoe Regional Planning Agency's "Handbook of Best Management Practices." An SEZ is an area of land that surrounds streams, small lakes, and ponds. An SEZ is also defined to include a 25 to 100 foot buffer strip on either side of streams depending on their order, wetlands and areas of riparian vegetation, and areas inundated by a 100 year flood. The standard for activities prohibited within stream environment zones is found within the Agency's Water Quality Management Plan adopted in 1981. Temporary restrictions on construction, grading, and vegetation removal are applied to the SEZ's pending adoption of the Agency's regional plan. All activities on lots or parcels containing an SEZ are subject to Agency review and approval. Refer to the Tahoe Regional Planning Agency's Water Quality Management Plan for more specific detail.

Historical Trends: The impervious coverage in the Basin has only been regulated by the Agency since 1974. Prior to that time, the amount of impervious coverage associated with development was highly variable, dependent primarily on the type of land use and age of the development. Impervious coverage in many areas of the Basin far exceeds the present standards. Often these areas are near maximum density or buildout. The more recent subdivisions and planned communities have impervious coverage ranges closer to the standards.

Surface disturbance associated with the development of impervious coverage varies with type of land use, age, and density of development. In many areas of the Basin, the impervious coverage and surface disturbance combined account for 90-100% alteration of the natural surface condition. Surface disturbance is greater in the older and lower cost development areas since lots tend to be smaller and density of development greater.

Surface disturbance within the Basin has virtually been continuous since man has begun to use and develop the land and resources. Almost any use of an area of land results in some degree of soil disturbance. The use of land for sand and gravel pits, refuse dumps, and rock quarries create major surface disturbances, often eliminating the soil resource. These areas are mapped as part of the Soil Resource Inventory (SCS). Other existing surface disturbances include 454 acres of unvegetated roadway slopes, 221 acres stripped of vegetation, 462 miles of eroding roadway shoulders, 118 miles of unstable drainage systems, and 177 acres of eroding dirt roads. These measurements were obtained from Volume I, Problem Assessment of the Agency's Water Quality Management Plan.

Development and alteration of the stream environment zones have occurred since the beginning of the use of the Basin. Development within SEZ's has been prohibited with implementation of the Agency's Water Quality Management Plan. Other aspects of SEZ development are also described in discussions under vegetation, fish, and wildlife.

F. Air: The clean alpine air of the Lake Tahoe Basin contributes to its uniqueness. The ability to see from rim-to-rim across a large expanse of water and to breath clean air are a part of the "Tahoe Experience." Concern is being expressed about the "cleanliness" of the air as one sees haze forming more often

Lake Tahoe Basin

Land Capability

High Hazard
Class 1a, 1c, 2

Wetlands
Class 1b

Moderate Hazard
Class 3, 4

Low Hazard
Class 5, 6, 7

now with extended periods of reduced visibility. In addition, state and federal carbon monoxide standards are being exceeded, ozone and other pollutants damage the vegetation, and concern is expressed about air pollution contributing to further deterioration of Lake Tahoe.

Air quality within the Basin reacts to both internal and external factors. These factors can be broken down further into natural and human factors. Natural factors include large scale, external weather patterns, local weather characteristics, topography, and other features of the Basin. Human factors include population levels, transportation systems, and land use patterns and activities. Both factors can either be generated within the Basin or transported in from outside.

Natural factors vary with summer and winter weather conditions. During both seasons, high levels of air pollution occur when winds are very light and pollutants are not dispersed. The air aloft is warmer than surface air resulting in an inversion layer that traps pollution at lower levels. Summer weather conditions are dominated by fair weather high pressure systems, broken occasionally by storm systems moving through the Basin. During the summer, clear, cloud free weather accelerates reactions in the atmosphere that produce ozone, commonly called smog.

Winter weather is dominated by Pacific storm fronts moving inland, bringing moisture to the Basin. During storm periods, high air pollution levels do not normally occur. Between storms, the atmosphere tends to stratify into different layers forming an inversion. The warmer layers are higher with little mixing between layers, trapping the pollution near the ground.

The population of the Lake Tahoe Basin consists of both year-round residents and non-residents or those visiting. Pollution is normally linked to the number of people within the Basin. The higher the population level, the more pollution produced. The transportation system used within the Basin greatly influences both the amount and geographic location of air pollution. Simply, the more people using private automobiles rather than mass transit, the higher the pollution levels. Land use patterns and activities influence the amount of generated pollution. Casinos, recreation sites, summer homes, and tourist facilities attract users, who in turn travel to the activity and generate air pollution. Air pollution is also transported into the Basin from industrial and agricultural activities in the surrounding areas.

Subcomponents: Twenty-one state and federal air quality standards exist for 12 pollutants within the Basin. Not all are viewed as requiring adoption of a threshold for some standards will most likely never be exceeded and others are a result of processes that are not present within the Lake Tahoe Basin. It has been determined that thresholds should probably be established for carbon monoxide, ozone, acid deposition, particulate matter, visibility and odor. Other pollutants such as nitrogen dioxide, sulfur dioxide, sulfates, lead, hydrogen sulfide, hydrocarbons, ethylene, and vinyl chloride will not be discussed except as they relate to the subcomponents for which thresholds will be established. The most restrictive of the federal or state standards will continue to apply to these other pollutants since this process will not recommend a threshold or change of the Standard.

Carbon monoxide (CO) is a tasteless, odorless, and colorless gas slightly lighter than air. It affects humans by replacing oxygen in the body, reducing the needed supply of oxygen to tissues. Carbon monoxide is the product of incomplete combustion of fossil fuels. In the Tahoe Basin, the primary culprit is burning of gasoline in automobiles. Because it disperses fairly rapidly, higher pollution levels are normally found only where traffic congestion is the greatest. Even though there are more automobiles in the summer, winter concentrations of CO are higher because lower temperatures cause less complete combustion of gasoline and winter meteorological conditions trap the pollutant very close to the ground.

Ozone is not emitted directly into the air but is the product of a complex set of chemical actions involving hydrocarbon compounds and oxides of nitrogen reacting with sunlight. Increased levels of sunlight at higher elevations accelerate the process of converting nitrogen oxide to nitrogen dioxide and therefore the rate at which photochemical pollutants are produced. The Basin's bowl like topography and daily wind conditions move the pollutant back and forth within the Basin. The pollutant is trapped, producing a potential problem, until the Basin is blown clean by a storm front or other condition. Ozone, commonly called smog, damages vegetation, "corrodes" rubber, causes nose and throat irritation, and may cause increased numbers of asthma attacks.

Acid deposition is the wet or dry atmospheric fall-out of sulfates and nitrates, commonly referred to as "acid rain." It is related to chemical and ecological changes in rivers and lakes. It has been linked to damage of aquatic and terrestrial ecosystems, damage to building materials, and painted surfaces. Acid deposition is suspected of causing crop damage, reduced forest productivity, and contamination of drinking water sources. The sulfates and nitrates making up "acid rain" are formed from gaseous emissions of sulfur dioxide and oxides of nitrogen. Sulfur dioxide is primarily emitted by industrial operations and in the case of the Lake Tahoe Basin, just about all the sulfates are transported into the Basin. Oxides of nitrogen result primarily from automobile emissions and industrial activities.

Particulate matter is any liquid or solid particle suspended in or falling through the air. Particulate matter produced by human activities within the Basin comes from wood combustion, construction activities, and vehicles traveling on paved and unpaved roads. Some particulate matter is transported into the Basin during periods of agricultural burning, forest fires, and other activities occurring in surrounding areas. The amount of particulate matter produced by residential wood combustion in the Basin is high in the winter. Higher particulate matter concentrations usually occur at the same time carbon monoxide and ozone pollution is highest. Particulate matter affects humans by causing respiratory problems, aggravation of cardiovascular diseases, cancer, and is the primary cause of visibility degradation within the Basin.

There are two types of visibility problems that occur within the Lake Tahoe Basin. The first is a regional or Basin-wide problem while the second is subregional in nature. The regional visibility problem is characterized by a uniform reduction in visual range in all directions. The overall impact is a reduction in contrast and a change in color. Objects are visually "flattened" and the scenic quality of the view is degraded even though the distance can be small relative to the visual range.

The Basin-wide problem, according to a visibility study conducted by the Environmental Protection Agency in 1981, is related to the concentration and type of particles in the air. The accompanying map indicates locations of visibility monitoring instruments and particulate sampling. The results indicate regional visibility degradation is due primarily to the presence of particles less than 2.5 microns in diameter. The study also showed that certain particles degrade visibility more, six times more effectively in the case of sulfates, than other particles.

The subregional visibility problem in the Basin is characterized by a layer of haze that often hangs over the City of South Lake Tahoe and Incline Village. This layer of haze causes a reduction in visual range, obscures the sky and horizon, and produces changes in background color and value. The primary impact results from the layer of haze containing a "brightness" and color that is different than the background, distorting or blocking those views.

The only threshold related to odor that is being considered is the presence of diesel exhaust fumes emitted from buses and to a lesser extent other diesel engines. The fumes are often objectionable, especially when encountered in congested traffic conditions.

Standards: State and federal standards exist for each of the subcomponents identified above with the exception of acid deposition and odor. They are indicated in the following table.

Pollutant	Averaging Time	California Standard	Nevada Standard	Federal Standard
Carbon Monoxide (ppm)[a]	12 hours	10	---	10
	8 hours	6	6	9
	1 hour	40	35	35
Ozone (ppm)[a]	1 hour	0.10	0.10	0.12
Particulate Matter (ug/m^3)[b]	Annual	60	75	75/ 60[c]
	24 hours	100	150	260/150[c]
Visibility (miles at 70% humidity)	Daily	30	30	----

a. ppm means parts per million
b. micrograms per cubic meter
c. secondary standard or standards to protect public welfare

The 6 parts per million 8 hour state standards have been adopted in California and Nevada because it was felt carbon monoxide posed a greater risk to health at higher elevations than at sea level. This was thought to be especially true for visitors not acclimated to higher altitudes. The ozone standards differ based on various technical interpretations of available research studies. It is interesting to note the federal ozone standard is the most recent to be adopted -

February, 1979. Although no standard currently exists for acid deposition, the State of California will be considering legislation in the near future. Particulate matter standards are inadequate for protecting public health since factors of size and chemical composition are not accounted for in the standard. The visibility standard is subjective, based on human observation rather than measurable criteria. Each of these standards will be evaluated more fully as thresholds are developed in the next chapter.

Historical Trends: Overall air quality, as expressed at the start of this section, has been declining with increasing population use and development within the Basin. The following discussion of trends will be directed specifically to each of the subcomponents - carbon monoxide, ozone, acid deposition, particulate matter, visibility, and odor.

Carbon monoxide concentrations closely follow traffic patterns and are the highest where congestion is the greatest. Carbon monoxide is monitored in two ways. The first is microscale monitors usually located 10 meters from the nearest traffic lane while the second is the middle neighborhood scale generally located away from the roadway. The following table gives maximum value 8 hour concentrations of carbon monoxide at a few selected areas in the Lake Tahoe Basin. The measurements are shown as parts per million for the years indicated.

California Microscale Monitors

Location	1977	1978	1979	1980	1981
South Tahoe WYE	9.4	10.3	10.0	12.4	----
Kaelin Building	----	----	15.0	18.0	14.1
Al Tahoe & U.S. 50	----	----	13.8	12.6	12.5
Sonora Fire Station	----	----	15.4	12.6	14.0
Stateline	----	----	----	19.0	15.0

California Middle Neighborhood Scale Monitors

Location	1977	1978	1979	1980	1981
Bijou School	----	----	4.9	4.8	5.1
ARB Office near Park Avenue	4.5	3.6	3.8	5.1	5.4

Nevada Middle Neighborhood Scale Monitors

Location	1977	1978	1979	1980	1981
Stateline	13.6	10.6	10.8	7.1	7.0

Ozone is monitored within the Lake Tahoe Basin at two monitoring stations in the south shore area. The stations are located near the casino core area. The following table indicates the highest values recorded in parts per million concentrations of ozone averaged for 1 hour for the years 1975 to 1980.

	1975	1976	1977	1978	1979	1980
Stateline, Nevada	.12	.11	.06	.11	.09	.08
Park Avenue, California	.09	.10	.09	.10	.08	.08

Lake Tahoe Basin

Visibility Monitoring Instruments

35mm Camera and Contrast Measuring Instrument

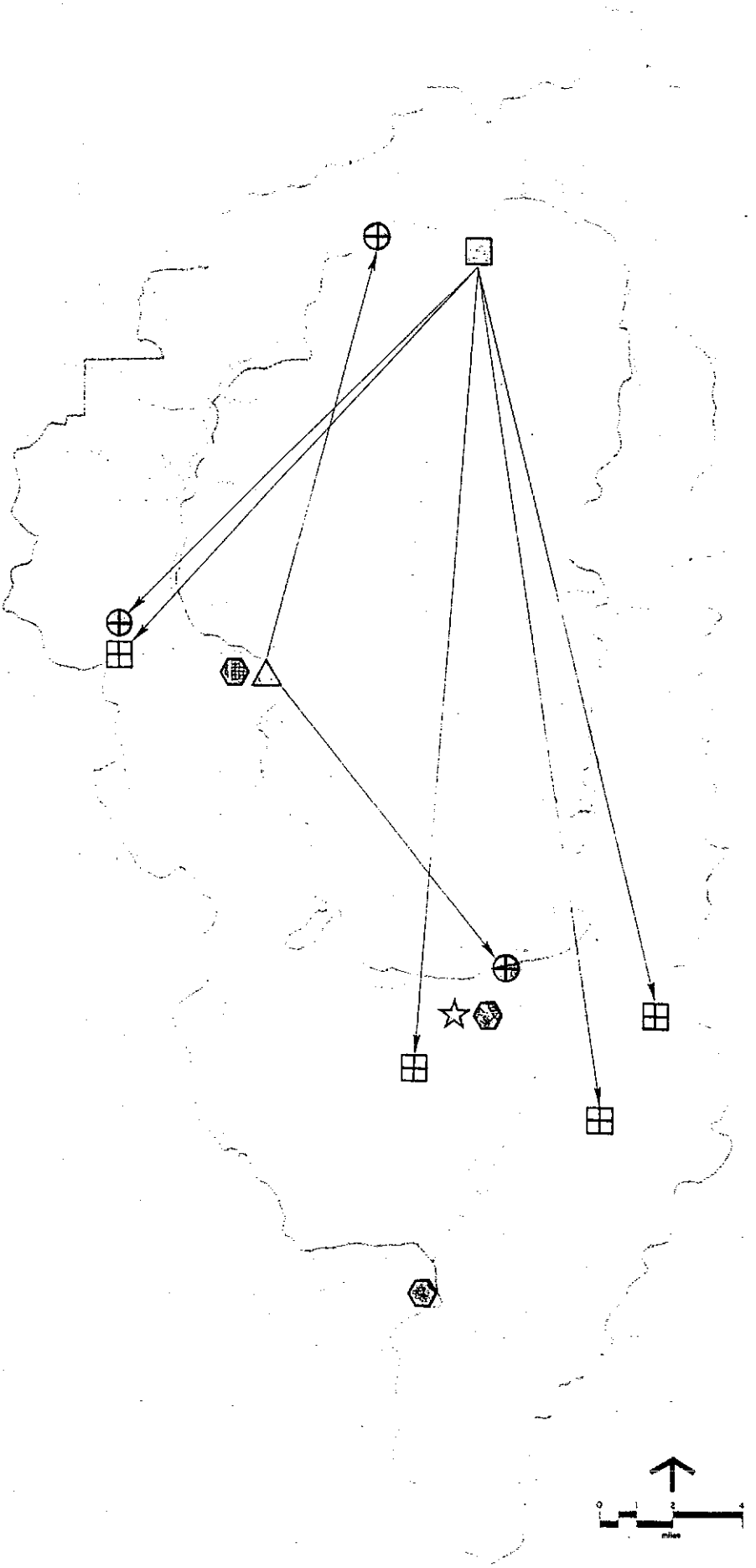
Contrast Measuring Instrument Target

35 mm Camera

35mm Camera Target

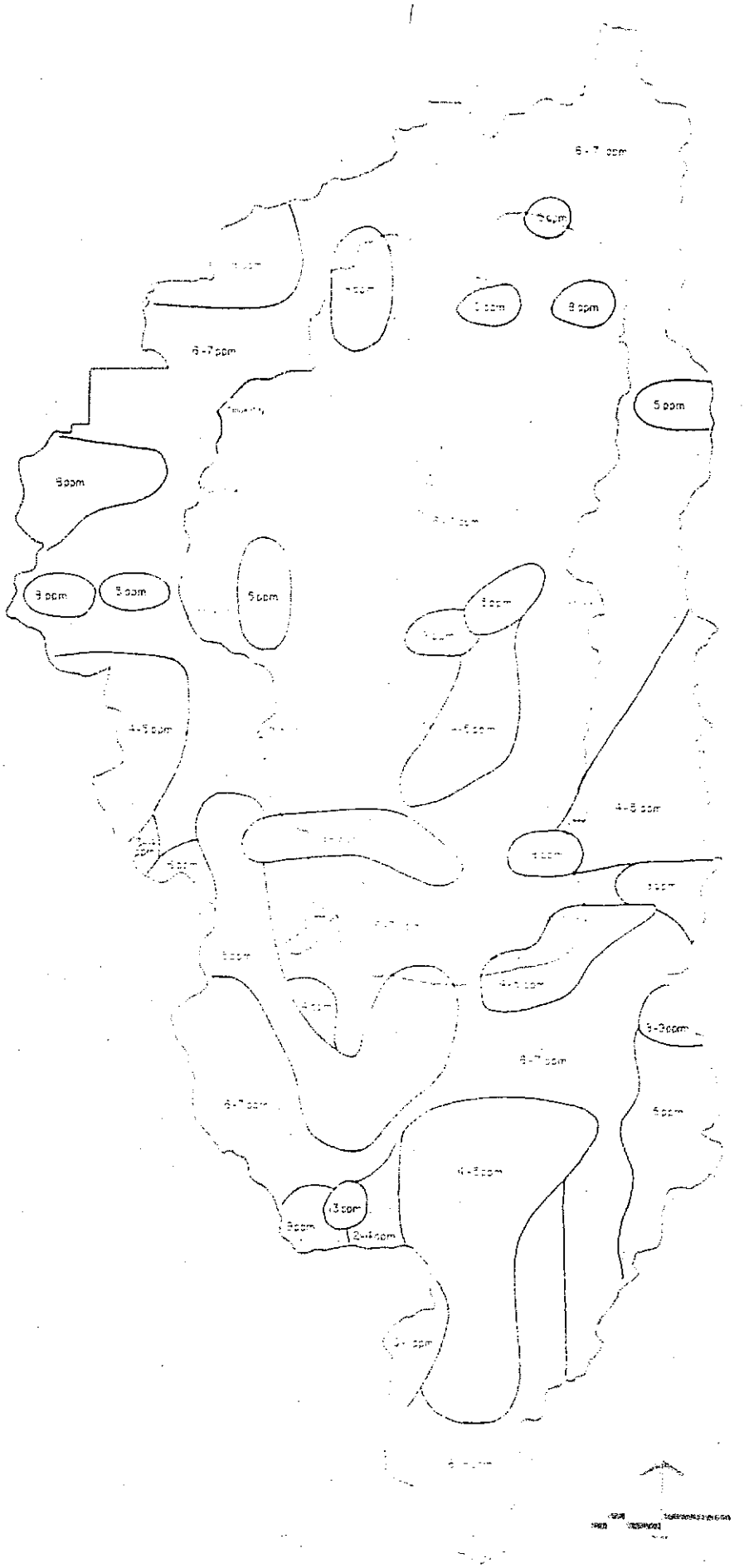
Light Scattering Measurement Instrument Location

Particle Sampling Location



Lake Tahoe Basin

Estimated Ozone Values



Source: California Air Resources Board

These data indicate an overall improvement in air quality with respect to ozone. This has probably occurred as a result in the decrease in emissions from automobiles and a levelling off in the number of vehicle miles travelled in the Basin. The above figures are for the entire year but examination of the data show there is not a great seasonal variation. The data may not realistically show the peak ozone values within the Basin because the highest concentrations are normally found downwind of urban areas. More realistic values would probably be anticipated if monitoring were conducted downwind of the City of South Lake Tahoe near Glenbrook and/or Luther Pass. To illustrate this point, the accompanying map indicates predicted values of ozone using a photochemical dispersion model. Values are indicated in whole numbers as parts per one hundred million. This analysis was completed using only one year's, 1977, emissions and meteorological data. Although it indicates site specific values, it is only an indication as there was not sufficient data for a complete analysis.

During the 1978/79 and 1979/80 water years, the average pH of rain falling on the Basin was 5.2 and 5.1, respectively. The background pH level in California ranges between 5.2 and 5.4 with environmental effects not occurring until a level below 5.0 is reached. Therefore, acid rain is not considered a problem in the Basin. However, nitrate deposition to Lake Tahoe has been shown to be a significant source of nutrient loading to the Lake.

The current particulate matter standards are inadequate for protection of public health as they do not reflect particle size and chemical composition. The current monitoring instruments measure particles less than 100 microns in diameter and the standard is relatively high. However, only particles less than 10 microns can be inhaled causing adverse health effects. In the new future, the Environmental Protection Agency is expected to adopt a particulate matter standard based on a particle size less than 10 microns. The ranges EPA is considering in the new standard were compared to measured values in the Basin. Based on this comparison, it is not necessary to develop a particulate matter threshold related to adverse health effects. The current standard will continue to apply.

Visibility has not been measured in the past so there is no quantifiable trend information. Current data have been obtained from a six month study conducted from June through November, 1981. This amount of data cannot quantify historical trends. Long time residents and frequent visitors do report visibility has decreased over the years. It is known visibility decreases as the number of particles that scatter light increases.

It is not possible to quantify fumes produced by diesel engines. Therefore, there are no historical trends to be identified.

G. Noise: Sound is created when an object moves such as the rustling of leaves when the wind blows, air passing through vocal chords, and the movement of speakers of a sound system. The movements cause vibrations of the molecules in the air in waves similar to the ripples created when a rock is tossed into a pond of water. As the vibrations reach our ears, we hear what is called sound. Sound can become noise when it is loud or disagreeable. The Tahoe Basin, like many mountainous areas, provides a high degree of serenity. But, with increased urbanization and use, the background noise levels begin to rise.

There are many noise sources within the Lake Tahoe Basin. Vehicles traveling the highway 28, 50, and 89 corridors generate various levels of noise dependent on the type of vehicle and season. Aircraft noise is loud and widely broadcast even though intermittent. Additional sources include refuse collection, pets, the party next door, construction and maintenance equipment, off-highway vehicles, motorboats, and some industrial operations.

Research has shown there is a strong link between noise exposure, both in terms of intensity and duration, and a level of disturbance or annoyance. It is assumed people prefer quiet to noise and will seek a quiet environment after prolonged exposure to noise. There are, in addition to intensity and duration, other factors such as pure tone components, time of day, the activity being interfered with, and an individuals prior attitude to the specific noise source that contribute to "noiseness."

Noise seems to create more physical stress and behavioral reactions among wildlife species than it does to humans. This may be due to their sensitivity to a greater range of sound frequencies and their lack of understanding to noise. Animals will avoid areas where unexpected or unpleasant noise occurs. This may require new food sources, nesting areas, migration routes, and home territories to be located. Increased noise levels may also mask or cover sound, making it difficult to detect enemies, locate mates, and care for their young. Response to noise varies by species and individuals within species. Not all increased noise levels are harmful for some animals seem to adapt to noise that is predictable and/or unchanging. Aspects of wildlife needs will be discussed further in the Wildlife section.

Subcomponents: Noise levels can be measured on two scales - the single event and the cumulative impact of repeated noise events. The first scale measures noise generated by things such as chain saws, snowmobiles, motorcycles, and boats at a single event level or frequency. The second scale is based on the cumulative impact of repeated noise events that occur over a period of time and are measured as a community noise equivalent level (CNEL). This measurement is based on a "noise" average over a 24 hour period.

Noise, whether a single or cumulative event, varies geographically throughout the Basin. It varies with the type of use, the level of development, and the naturalness or undeveloped aspects of an area. The accompanying map indicates areas of concern for noise by use type. Environmental thresholds for noise must recognize the various land use categories within the Basin and must be specifically established for both the source and the following land uses:

Commercial areas
Hotel/Motel facilities
High density residential
Low density residential
Open waters of Lake Tahoe
Rural outdoor recreation areas
Urban outdoor recreation areas
Wilderness and roadless areas
Critical wildlife habitat areas

Standards: Sound is quantified by a meter that measures units called decibels (db). A weighting of the high and low sounds is made to approximate the way an average person hears sounds. The adjusted sounds are called "A weighted

Lake Tahoe Basin

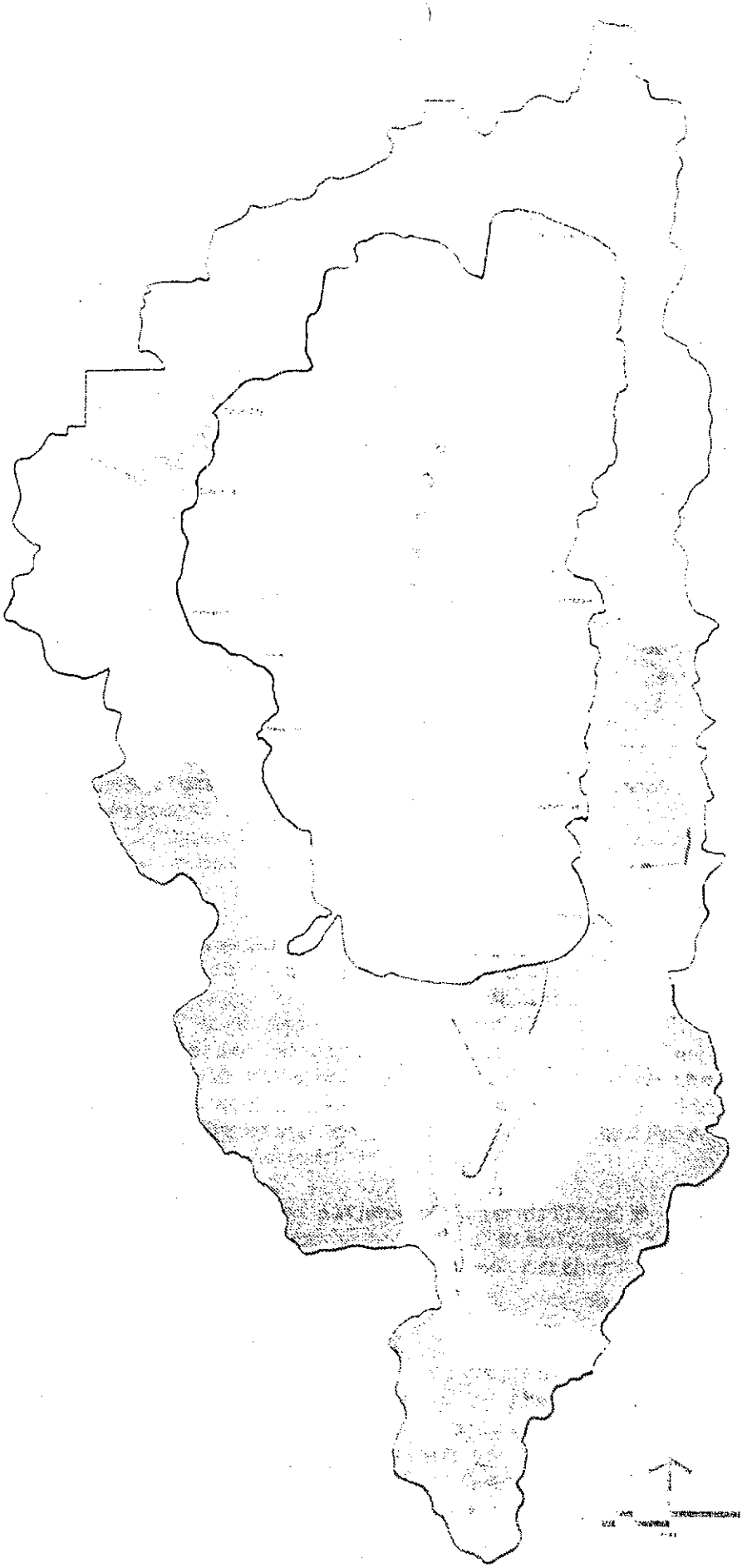
Land Use Noise Categories

Critical Wildlife Habitat Area

Airport Impacted Area

Residential Area

Wilderness and Roadless Areas



levels" and are indicated as dbA. This A weighted decibel scale begins at zero representing the faintest sound humans can hear. A very quite radio at home is at about 40 dbA, normal conversation is 60, a rock and roll band at about 110, with the threshold of pain at 140 dbA. The loudness of sound varies by individual but tests of large numbers of people reveal a sound level of 70 appears to be twice as loud to the listener as the level at 60.

Federal standards do not exist for noise levels although numerous guidelines have been published. State standards exist in California but not Nevada for specific vehicle types under given roadway speed and loading conditions. They are summarized from the California Vehicle Code subdivision 23130 and 23130.5.

Vehicle Type or Combination of Towed Vehicles	35 MPH or Less on Level Ground Away from Intersections	35 MPH or Less on Any Grade and at Intersections	35 MPH or More on Any Grade and at Intersections
More than 10,000 pounds	---	86 dbA	90 dbA
More than 6,000 pounds	82 dbA	---	---
Motorcycle	77 dbA	82 dbA	86 dbA
Any Other Motor Vehicle	74 dbA	76 dbA	82 dbA

The Tahoe Regional Planning Agency has a standard for motorboats on Lake Tahoe of 86 dbA at 50 feet. The California Regional Planning Agency has a standard of 60 CNEL in residential land use areas. Other entities have produced guidelines relating to noise levels and land use compatibility within the Basin but none have been adopted as standards.

Historical Trends: Noise levels within the Lake Tahoe Basin have not been monitored over time, making it difficult to quantify a trend of average noise levels. Data do exist for the Lake Tahoe Airport and is published in a May 1980 study of "Airport Noise Control and Land Use Compatibility". Measurements were made and CNEL levels plotted for aircraft conditions existing at that time. The 75 CNEL measurement did not extend beyond the limits of the runway. Both the 65 and 70 CNEL measurements were primarily within the physical boundaries of the airport while 60 CNEL extended to slightly north of highway 50 at the Upper Truckee River.

Noise monitoring data was also collected in 1977. Although it is difficult in a period of 4 or 5 years with only one measurement to establish a trend, the monitored data help provide an indication. These data are discussed further in the Study report.

H. Vegetation: Vegetation is a major component of the Tahoe Basin's natural environment with as many as 903 species and 258 subspecies, varieties, and hybirds found. Species richness in the Basin is enhanced by the presence of alpine plant communities, mountain meadows, wetlands, and riparian vegetation. The unique geographic location of the Basin allows the sharing of plants normally found in the Cascades and Great Basin provinces. Conifer vegetation is distributed over approximately 85% of the total land area, making it the dominant vegetative featu[illegible] the landscape.

Subcomponents: Extensive stands of vegetation exist within the Tahoe Basin and seemingly there is a wide variety of plants. But most plants are found in single community types of relatively even-aged timber. It is important to recognize that vegetation within the Tahoe Basin is undergoing continual change just as all other plant ecosystems pass through successional stages or seres. This process ultimately leads to a climax community of fir since meadow and shrub communities are eventually invaded and replaced by these conifers. Man's interference with natural processes is largely responsible for the dominance of mature conifer vegetation and the absence of younger or earlier successional vegetation. The vegetation component can be subdivided into common, aquatic, uncommon plant communities, and sensitive and/or endangered plants.

The common plant community of conifer vegetation, as described previously, covers about 85% of the land area within the Basin. It consists of a yellow pine forest that circles Lake Tahoe from the shoreline to an elevation of about 6,400 feet. Common trees within this plant community include white fir, Jeffrey pine, and incense cedar. The red fir forest extends upward from the limits of the pine forest to an elevation of about 9,000 feet. Dominant tree species include red fir, lodgepole pine, western white pine, mountain hemlock, and western juniper. Whitebark pine and mountain hemlock comprise the subalpine forest above 9,000 feet. Most stands are of an even age with a noticeable lack of young or immature trees. Understory plants associated with conifer communities include manzanita, sagebrush, western serviceberry, Sierra spirea, and snowbrush.

Open canopy communities are those plant communities growing in open areas, apart from conifer vegetation. Together, they comprise only a small proportion of the "common" vegetation. The shrub association is a well developed plant community resulting from past burning or logging activities that have opened up the forest canopy. Greenleaf manzanita and tobacco brush are the dominant species. The sagebrush scrub association is distinct from the shrub association as it is found on the east side of the Basin on dry slopes. It is dominated by sagebrush and bitterbrush. The meadow associations have both wet and dry components and are found at all elevations in the Basin. Principal plant species within dry meadows include bentgrass, fescues, mountain squirrel tail, alpine gentian, whorled penstemon, asters, mountain brome, and cornlilies. Wet meadows contain sedges and rushes along with mountain bentgrass, tufted hairgrass, marsh marigold, elephant heads, tinker's penney, and mountain timothy. Also included in this grouping is deciduous riparian vegetation. The principal associated species include willows, mountain alder, and quaking aspen.

In addition to the terrestrial vegetation, there is a limited aquatic plant association that is both interesting and unusual. There are three vegetative types within the association - emergent plants, algae, and submerged plants. Emergent vegetation is found in shallow water and includes pond lilies, buckbeen, mare's tail, pondweed, common bladderwort, bottle sedge, and common spikerush. Algae include both attached (periphyton) and floating (phytoplankton) species. The algae is discussed more fully in the water quality section. Submerged plants are found to depths of 500 feet in Lake Tahoe. They are unique plant communities for they are found no where else in North America at such depths. Aquatic mosses occur at depths from 100 to 400 feet, liverworts from 200 to 400 feet, stonewort in depths of less than 150 feet, and filamentous algae, the most abundant plant below 300 feet.

Uncommon plant communities are, as the name implies, uncommon. Distinguishing attributes may include the value of the community related to scientific interests, aesthetics, uniqueness, or its functional role in the ecosystem. Such distinction is made for several plant communities in the Basin, one of which is deepwater plants. Two bog areas are also included - Grass Lake and Osgood Swamp. The bogs contain a unique assemblage of plant species, provide favorable habitat for a wide variety of water dependant wildlife species, and are in close proximity to several different plant community types. These communities are an attraction to recreationists and provide for water runoff retainment and perform water cleansing functions. Despite their common attributes, each site also has its own unique qualities. Forest Service reclamation efforts have successfully restored many of the past qualities of Osgood Swamp, making it an area valuable for wildlife habitat and nature study. Grass Lake is a rare example of a true "quaking" bog where the ground vibrates or quakes when walked upon.

Another uncommon plant community is a population of cushion plants located on the high ridge areas of Freel Peak and Jobs Sister. The term "cushion plant" refers to small plants that are specially adapted to tundra like conditions of high winds, frigid temperatures, shallow soils, and short growing seasons. These plants are unique to this part of the Sierra Nevada although other representative populations grow further south along the crest of the Sierra from Yosemite National Park to the Mammoth Lakes area. The most distinctive plant species are alpine phlox, dwarf ragwort, and species of Draba, an arctic-alpine plant of the mustard family.

Sensitive and/or endangered plant species are found within the Lake Tahoe Basin. These are plants that are considered vulnerable to extinction. Various laws and policies provide that positive steps are to be taken to assure protection of each species regardless of land ownership or management responsibility. The known species are:

Carex paucifructus. Populations of this species, commonly called Sierra sedge, were once found in the high meadows of Desolation Wilderness. It is considered to be one of the rarest plants in California and is endemic to only El Dorado, Sierra, and Tuolumne Counties of the Sierra Nevada. It has not been observed in El Dorado County since the late 1800's.

Lewisia pygmaea longipetala. Long petaled lewisia is a fleshy perennial with rose colored petals. It is found at high elevations in moist cracks of granite or in moist, gravelly volcanic soils. Small populations occur at Crystal Range, Keith's Dome, and Triangle Lake in Desolation Wilderness.

Draba asterophora v. macrocarpa. This species is found near Cup and Saucer Lakes in Desolation Wilderness. The populations are small and extremely limited in distribution. Their restriction to the vicinity of lake margins makes them susceptible to disturbance.

Draba asterophora v. asterophora. This species is found on Freel Peak, Jobs Sister, and Mount Rose in sandy areas between stones or in crevices. The populations on Mount Rose are near the highway which subject them to various forms of disturbance.

Rorippa subumbellata. This species, commonly called Tahoe yellow cress, is somewhat fleshy, lies close to the ground, and has small yellow four petaled flowers. Primary habitat includes moist backshore areas and dry sandy soils on backshore bluffs. Tahoe yellow cress is restricted to the shore areas of Lake Tahoe and totalled about 750 plants in 1980, a decrease of nearly 35% over the 1979 population. Locations of the plant include Glenbrook, Logan Shoals, Nevada Beach, Edgewood Golf Course, Tahoe Meadows, Upper Truckee Marsh, Taylor Creek, Tahoma, Ward Creek, Baldwin Beach, and near the boundary of Meeks Bay Vista and Rubicon properties. It is especially susceptible to human disturbance and innundation.

All of the above listed plants are in a threatened status according to the Smithsonian listing, listed as sensitive by the Forest Service, and are candidate species for the Federal Endangered Species Act of 1973. The California Native Plant Protection Act lists Rorippa subumbellata as endangered. Rorippa may be listed as endangered under federal legislation this spring. The California Native Plant Society lists all as rare and endangered.

The accompanying map shows the site locations of the three terrestrial uncommon communities and the sensitive plants. Population sites are also shown for Draba stenoloba var. ramosa. This plant was recently removed from the sensitive listing based on new information and the discovery of abundant populations outside the Basin.

Standards: Some protection against the loss of deciduous riparian vegetation, wetlands, and grasslands is provided by the TRPA Grading Ordinance which prohibits grading and/or earth disturbance and construction activities in stream environment zones. Tree removal is generally regulated by permit under TRPA and California Tahoe Regional Planning Agency Ordinances. Land use ordinances of both Agencies generally permit vegetative removal only within the area to be occupied by a building and access ways.

Threatened and endangered plant species must be identified and protected from any activity that jeopordizes the species or its habitat under provisions of the Endangered Species Act of 1973. The policy of the Forest Service, United States Department of Agriculture, is to treat even candidate species as though they are already on the federal listing. The sensitive plant designation by the Forest Service, the agency responsible for managing most of the public lands in the Basin, offers the most direct form of protection for the plants. Additional protection for state listed species on state and private land is provided under provisions of the California Native Plant Protection Act and NRS 527.270 of the Nevada Code.

Historical Trends: Vegetation abundance and composition is changing continuously. The most dramatic impact to the Basin's vegetation occurred during the Comstock mining era of the mid to late 1800's. Large areas of the Basin were clearcut to supply timber for mines and homes in Nevada. Although large amounts of sediment and nutrients were likely added to the Lake at that time, the disruption was short lived as vegetation quickly pioneered the denuded soils. New growth following the logging initially consisted mostly of grasses and brush. Conifer trees eventually became re-established and the acreage extent of meadows and other open areas has diminished. Marsh, meadow, and deciduous riparian vegetation now comprise only 7% of the total Basin vegetation. According to the Land Management Plan prepared by the Forest Service, much of this riparian vegetation on private land is already disturbed or targeted for development.

Lake Tahoe Basin

Sensitive Vegetation

Sensitive/Endangered Plants

CA = Carex paucifructus

LE = Lewisia pygmaea var. longipetala

DA = Draba asterophora var. asterophora

DM = Draba asterophora var. macrocarpa

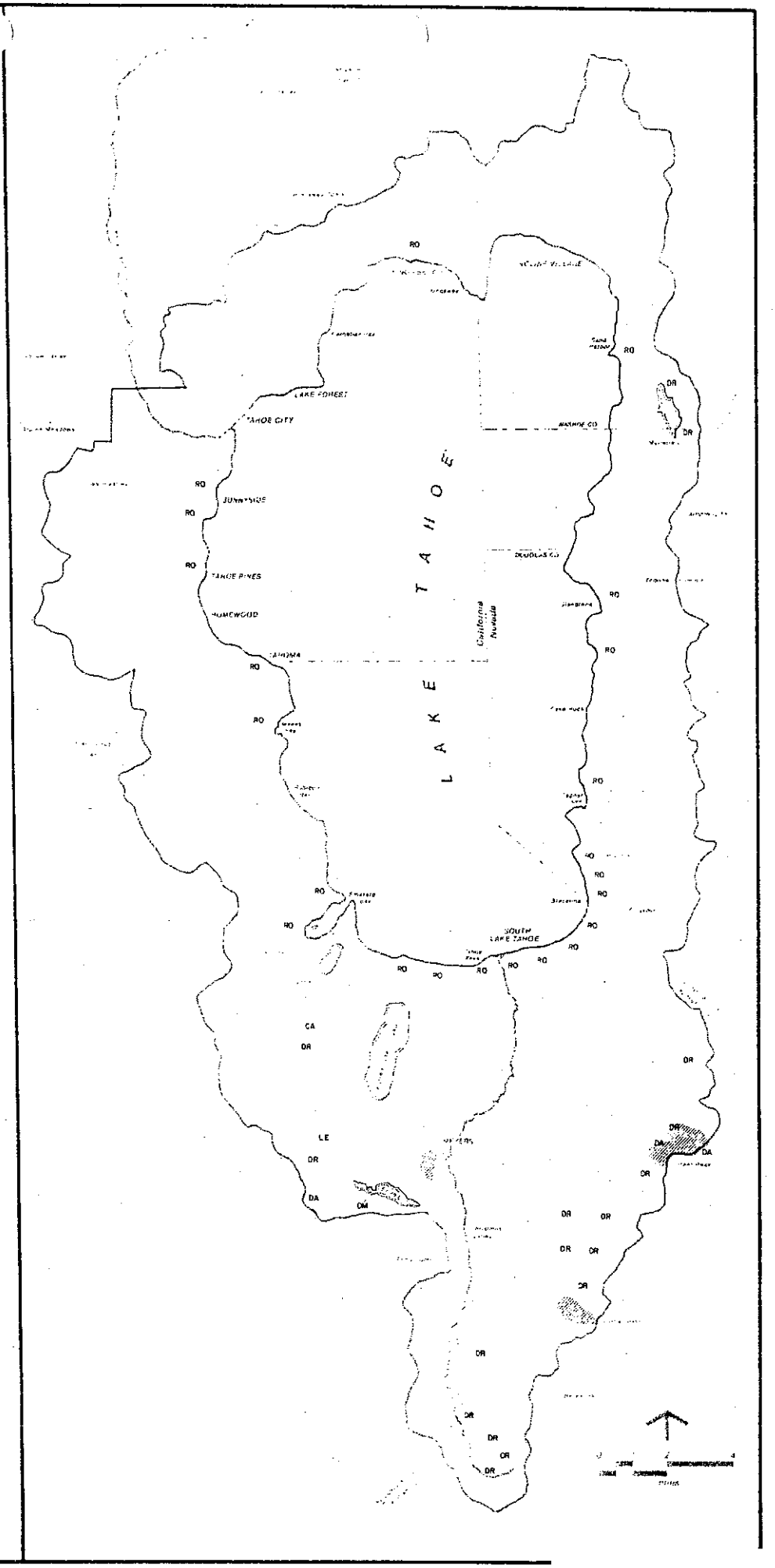
DR = Draba stenoloba var. ramosa

RO = Rorippa subumbellata

Uncommon Plant Community

Cushion Plant Community

Bog Community



Open areas consisting of grass and shrub vegetation are dwindling in size as they are replaced by invading conifer species. Policies of fire protection prevent the return to and maintenance of early successional stages such as meadows and brush fields. Overall, timber stands are approaching mature age. Forest management schemes and policies of land managing agencies are being evaluated to address these concerns.

Natural or man-modified succession of plant species is not the only impact on the vegetation of Lake Tahoe. Large quantities of vegetation have been removed from private lands within the Basin in recent years. Urbanization has reduced the total acreage of marsh areas by 75%, meadows by 50%, and riparian zones by 35% according to the Western Federal Regional Council's 1979 Environmental Assessment. The Truckee Marsh in South Lake Tahoe is one of the most severely altered plant communities as about 340 acres of valuable marsh habitat was replaced by residential land uses.

Other losses of vegetation within the Basin can be attributed to buildings, paving, and other developments. Ozone, commonly called smog, is a product of automobile use that also damages or destroys various tree species. Deicing salt is a major cause of damage to or loss of roadside conifers. Damage may occur as far as 60 feet from the edge of the road but the most severe impact is generally within 15 feet. Weakened trees, regardless of the source of injury, are more susceptible to attacks from beetles, other insects, and disease organisms. If the insect or disease organism takes over, plant mortality usually follows.

Population trends of the vegetation within the Basin are not fully quantified. It is known, as pointed out above, that certain populations decline while others may flourish.

I. Wildlife: Birds, mammals, reptiles, and amphibians are a natural component of the Tahoe Basin's environment. About 260 different species of wildlife can be found at various times of the year throughout the Basin. Wildlife adds to the visitors enjoyment of Lake Tahoe and is an indicator of the natural health of the area. The basic requirements of wildlife include food, water, cover, and space. Rarely does a single habitat type provide all these essential elements but instead, combinations of different terrestial and aquatic communities are usually needed to fulfill the needs of even a single species. The availability of habitat determines the variety of wildlife present while the amount of habitat generally determines the abundance of each species.

A wide range of different food options need to be available to meet the food requirements of many different species. All need to eat but few prefer the same diet. Wildlife depend on three general categories of food - insects, plants and seeds, and meat. Species have adopted different feeding habits and tastes so that competition for each food category is reduced.

Water requirements of wildlife vary considerably between species. Some animals require a close and dependable supply of water to drink while others may be able to go for exceptionally long periods of time without water. Water is also a part of the life cycle requirements or primary habitat for such species as amphibians, waterfowl, and beaver. Water also influences the abundance, variety, and distribution of vegetation which indirectly regulates wildlife populations by controlling the amount of available food and cover.

Cover requirements of animals differ between species and seasonally within species. For example, breeding displays of certain birds are performed in the open while nesting may occur in much denser cover. Deer generally browse for food in open or sparse vegetation but seek out thickets for shelter. All species also need some sort of escape cover. Dense vegetation seems to be the most preferred cover type but rocks, burrows, and open water also permit wildlife to hide or escape from predators.

Space is an essential habitat component for wildlife in that most species are territorial and establish home ranges. Territories are spacing mechanisms established by individual species during the breeding and nesting seasons. The size of territories directly limit the number of individuals able to use a particular habitat. Home range includes the area an animal needs to satisfy food, water, cover and space requirements. The type and number of species able to inhabit a region largely depends on the proximity and availability of all these resources.

Subcomponent: Wildlife are present within the Lake Tahoe Basin because certain habitat needs are available. It is the intent of the threshold study to understand the basic requirements of all indigenous species and develop means for supplying the needs into the future. Wildlife is subdivided for discussion purposes into subcomponents of common, special interest, and threatened/endangered.

Vegetation, as a component of an animal's habitat, provides the primary link between habitat availability and common species abundance within the Lake Tahoe Basin. It is believed the "common" species of wildlife can be most effectively managed on a gross scale by providing for habitat diversity. Habitat diversity is best provided in the Basin by maintenance or enhancement of such vegetative communities as wetlands, shrublands, and meadows. Wildlife would also benefit from management strategies that would increase the structural diversity of forest vegetation. In other words, wildlife need to be supplied with a choice of seral stages rather than just the mature conifers that currently dominate the landscape.

The second wildlife subcomponent is the special interest group which includes species that are typically uncommon and/or have a high degree of aesthetic appeal to visitors and locals. Deer and waterfowl fall into this category along with golden eagle, goshawk, and osprey populations. The habitat needs of these species are special and need to be managed accordingly. The accompanying map indicates generalized locations for each of the special interest species, except for deer, as well as the threatened and endangered species described in the following paragraph.

The third subcomponent to be dealt with is the threatened and endangered wildlife species. Two species, the American bald eagle and peregrine falcon are listed as endangered on the federal list developed in response to the Endangered Species Act of 1973. The States of California and Nevada also list these species as endangered. Bald eagles regularly winter in the Basin but the last known nest has been inactive since 1971. Peregrine falcons have not been recorded as nesting in the Lake Tahoe Basin since 1940. These species and their critical or essential habitat receive special consideration on National Forest and state lands. The species are supposed to be protected from active disturbance on all lands, including private lands.

Lake Tahoe Basin

Wildlife Population Sites

Waterfowl Habitat

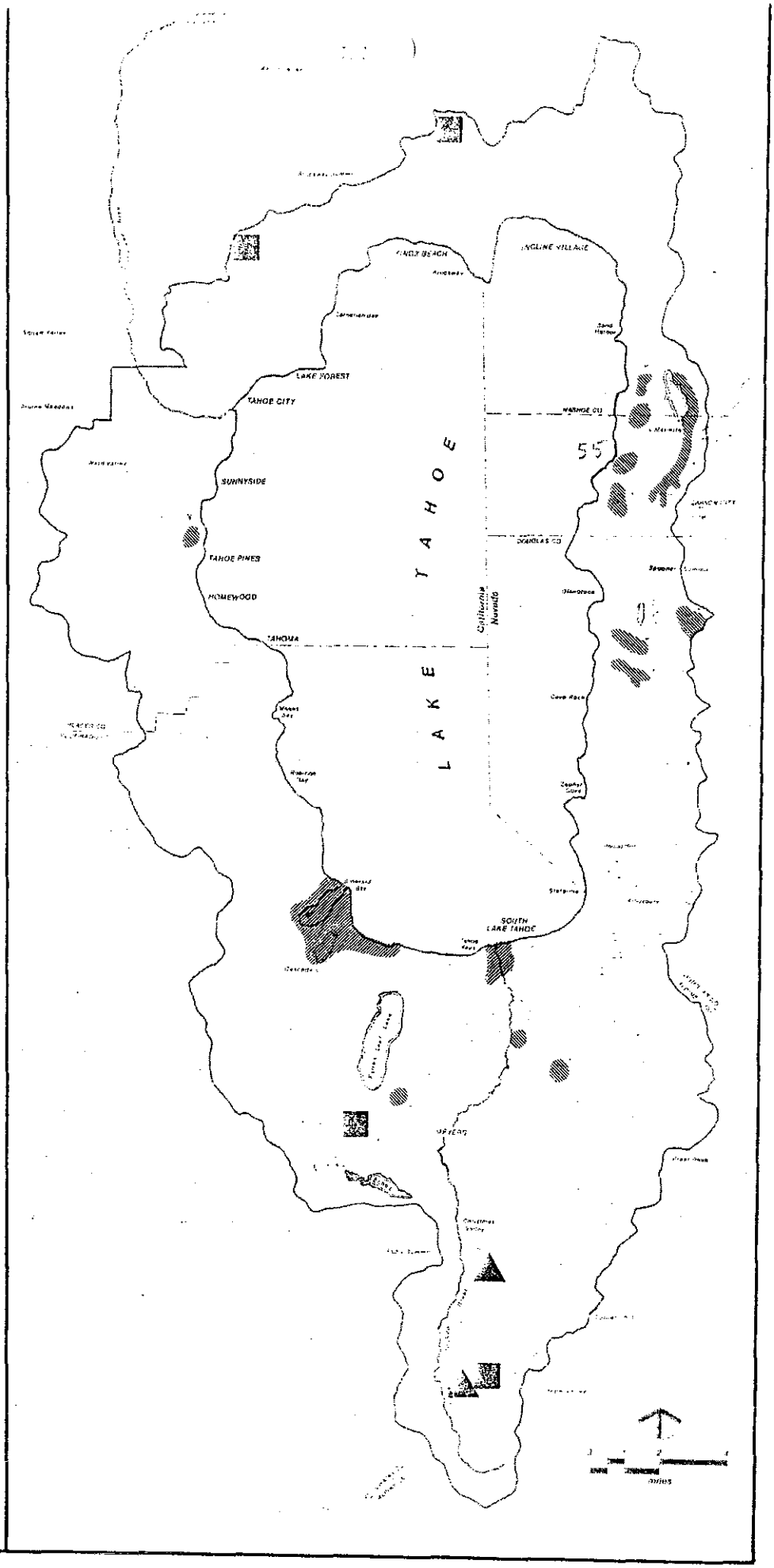
Bald Eagle Winter Habitat

Goshawk Nesting Site

Golden Eagle Nesting Site

Osprey Nesting Site

Peregrine Falcon Nesting Site



Standards: Standards that protect wildlife habitat within the Lake Tahoe Basin originate from the Federal Endangered Species Act of 1973 and from U.S. Forest Service policy. Standards provide for the conservation of identified species and their habitat needs and the ultimate recovery of the species. The Forest Service in the Lake Tahoe Basin has developed and actively pursued management and recovery policies for the bald eagle, peregrine falcon, osprey, and goshawk. Each species is provided special protection and consideration in Forest Service land use practices.

The Forest Service also has a snag policy that promotes retention of dead trees for wildlife use. The objective of the policy is to provide habitat, distributed over time and space, to maintain self sustaining populations of all snag dependent and cavity dependent wildlife species. The California and Nevada Game and Wildlife agencies are developing deer management plans for the Carson River and Truckee/Loyalton interstate deer herds. The Basin provides fawning and summer range for these herds. Meadow vegetation and shrubs provide valuable forage habitat.

State policies for wildlife are administered through the California Department of Fish and Game and the Nevada Department of Wildlife.

Historical Trends: Trend information on wildlife can be collected through measurements of species abundance, diversity, or richness. Changes in habitat quality can also be monitored as an indicator of wildlife "health." Trend information for wildlife species in the Lake Tahoe Basin is not readily available although there have been population counts of some species. Monitoring of the Truckee-Loyalton and Carson Deer herds has been continuous since 1960. Current populations are well below management projections. The Tahoe Chapter of the Audubon Society maintains species lists of birds and has made Christmas population estimates dating back to 1975. Increasing trends are unusual except for species such as Canada geese whose wintering populations are up in recent years. Other species dependent on wetland habitat seem to be especially vulnerable to changing land use patterns and have declined both in abundance and occurrence.

Wildlife populations are regulated by the distribution, type, and amount of available habitat. Because finite amounts of food, water, cover, and space exist, there is a limitation on the number of animals of a given species that can be maintained. Modification of the habitat can either increase or decrease the number of individuals that can be accommodated. The alteration of habitat can be used as management strategies to improve habitat but more often habitat alternation is an unintentional act that can directly damage the wildlife resource.

Wildlife habitat has been adversely modified or lost with almost every land use change that has occurred within the Basin. When this happens, species die or move to less favorable habitat. They do not simply move elsewhere because other areas are already inhabited to full capacity. Adding more individuals to an already fully occupied habitat leads to habitat deterioration and reduced productivity. Habitat loss can be incremental with construction of single homes or devastating with wholesale development.

Habitat has also been lost or made totally unavailable to wildlife without any physical alteration. On-site or adjacent activities can create a nuisance that, depending on the duration, timing, and intensity, can prevent full utilization of certain habitats. Traffic and human noise is tolerated to varying degrees by

different wildlife species but some disturbances are just not tolerated, causing loss of that particular habitat. Passive recreational uses such as hiking and camping can also displace wildlife especially when the activities are concentrated in locations having riparian, aquatic, and meadow vegetation. Perhaps the most intense form of disturbance to wildlife results from harassment by free roaming dogs that chase the wildlife. Dog depradation on waterfowl and deer is especially severe in Placer and El Dorado Counties according to the California Department of Fish and Game. For this reason, lands adjoining developed areas often provide only marginal habitat. Wildlife populations will continue to decrease and species diversity will change as development and other encroachment removes usable habitat.

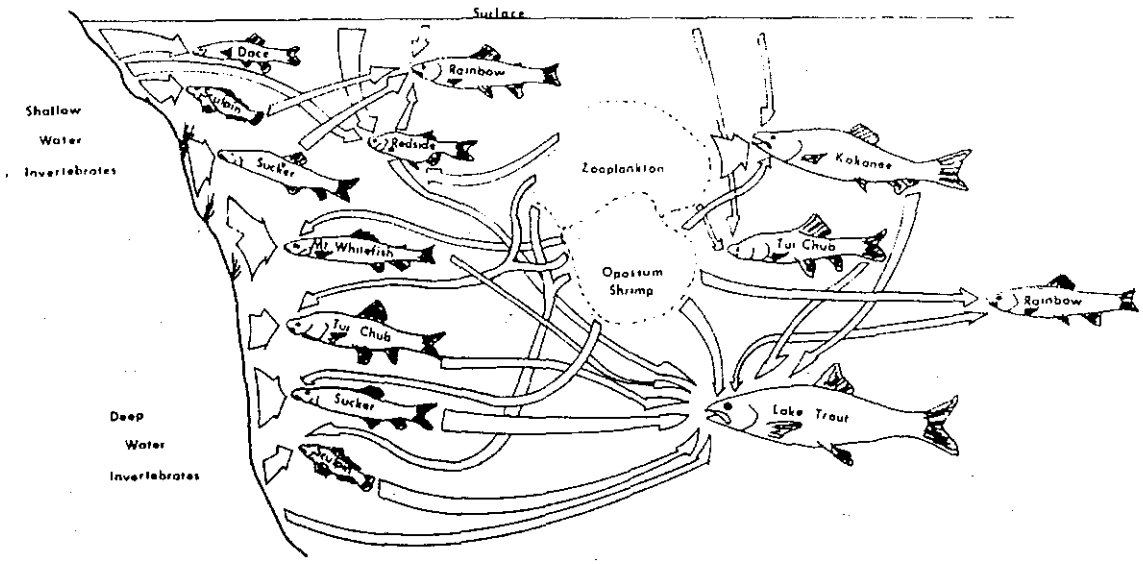
Another human/wildlife problem pertains to bears. Favorable habitat for bear is found in some of the higher elevations of the Basin. However, unfavorable interactions with people have increased in recent years due to a variety of reasons, including the placement of homes in the more rural areas of the Basin. Bears are increasingly attracted to rural and even some urban settlements in search of food. In most instances, only garbage cans are disrupted but the potential for harm to humans exists. Problem bears are usually live-trapped and released outside the Basin.

J. Fisheries: The fisheries resource of the Lake Tahoe Basin has always been an integral part of Lake Tahoe's environment. The waters of the Basin supported a commercial fishery through the early 1900's. Lake and stream angling is still a popular activity within the Basin. The habitat requirements of fish vary considerably between different species but all have the same general requirements of food, water, and cover. In addition, all have special needs for spawning and nursery habitat.

All fish need water but the type and kind of need differs by species and even seasonally within a single species. Brook trout are the most common stream resident since they can survive in streams with only minimal flows. Larger tributaries support year round residents of several other species including rainbow trout and mountain suckers. But most of the fishes reside in Lake Tahoe as it is the only constant source of water since the tributaries are subject to great fluctuations in water volume. However, both elements are essential to even the Lake residents since spawning habitat is largely provided by the tributaries.

The preferred food items of fish vary between species and within species, depending on the size of the fish. A simplistic food chain for fish begins with the sun's energy, along with nutrients, providing elements necessary for the growth of algae and other water plants. Algae are consumed by invertebrates and some fishes but then the chain of events gets rather complicated as fish feed on invertebrates and each other. The figure on the following page depicts this food chain relationship (modified from Moyle, 1976).

Instream and lake cover is necessary to provide shelter and protection for both the fish and invertebrate populations. Rocks, submerged logs, and overhanging banks are examples of cover found within the aquatic system. Riparian and other stream-side vegetation is also important for providing shade to guard against rapid change in stream temperatures.



Spawning habitat is supplied by gravel and rubble found in the riffle areas of streams and within the shallow margin of the Lake. Depending on the species, the fish deposit their eggs either on or beneath these surfaces. Large particle sizes of gravel or rock rubble allow the eggs to settle into the spaces and crevices between them, providing a degree of protection from predators. The porosity of a gravel bottom also enhances the exchange of oxygen between the eggs and the water.

Young fish, once hatched, seek out calm water where they can find food and hide from predators. In streams, this type of habitat is provided in areas containing rock, rubble, and gravel. Good nursery habitat in the Lake is provided in wetland type areas and among deepwater vegetation. The vegetation in these areas affords excellent cover and provides favorable habitat for insects needed for food by the young fish.

Subcomponent: All existing fish species within the Lake Tahoe Basin are vital to the ecological balance of the total fishery resource. To achieve and maintain the resource, an essential level of quality habitat must be provided if viable populations of all species are to be maintained. The fishery habitat base can be considered under 2 categories; Stream habitat and Lake habitat.

Streams within the Basin fall into two general categories. First are those streams that support only resident populations of fish and second are those that support both resident and migratory populations. Within each of these categories, streams are ranked as excellent, good, and marginal according to their existing and natural potential as a fishery based upon characteristics that include flow, cover, spawning quality, food, gradient, and presence of barriers or obstructions. The non-native brook trout is the principal game species in the streams although some rainbow, brown, and cutthroat trout are also found. Of all the different lake fishes, all species, except the mackinaw use the streams for spawning and nursery habitat. The following table indicates the existing ranking of miles of streams within the Basin for both resident and migratory

habitat. The ranking, as shown on the accompanying map, does not include approximately 156 miles of other tributary streams. These feeder streams are often intermittent and therefore do not support a fishery but are important from the standpoint of providing water flow and food to the ranked streams.

Ranking	Resident	Migratory	Total
Excellent	17	7	24
Good	51	14	65
Marginal	62	67	129

The Lake Tahoe environment is a much more complex fish habitat than the stream system. It provides all the necessary habitat components to be used in part or in total by the various species. Some fishes live most of their lives in the Lake, returning to specific streams only for spawning purposes. Perhaps the most critical zone in the Lake is the nearshore, an area from the shoreline to a depth of 30 feet, where food and spawning habitat is concentrated. This zone was inventoried and separated into categories of excellent, good, and marginal habitat. There currently exists 2,776 acres of excellent, 3,172 ranked good, and 2,813 marginal acres (see accompanying map). The quality of the habitat was based on substrate quality and other factors such as disturbance and habitat modification resulting from man's activities. The Lake sport fishery today includes in order of abundance, mackinaw, domestic rainbow, lake, brown, and wild rainbow trout along with kokanee salmon and whitefish.

Standards: No standards currently exist that address the level at which the fish resource should be maintained. However, several policies have been adopted to protect fish habitat in the Lake. The Tahoe Regional Planning Agency has adopted a moratorium on pier construction and under the 208 Water Quality Management Plan, discourages the issuance of permits for construction in prime fish habitat. In addition, the California Department of Fish and Game policy for proposed private pier and buoy development in Lake Tahoe is to:

1. Recommend against any pier and buoy projects that are proposed in a "prime fish habitat" area.

2. Recommend against any proposed development which will have an adverse impact upon a marsh.

The policy of the Nevada Department of Wildlife is that "each application for any new private piers, mooring buoys, jetties, breakwaters, floating docks, etc. within the green zone (prime fish and aquatic habitat) be judged on its merits with the thought in mind that the area which is judged to serve as prime fish and aquatic habitats be protected from unnecessary and unreasonable interference. All applications for private facilities within the redzone (prime shore spawning ares) will be evaluated on an individual basis."

The United States Fish and Wildlife Service is charged with responsibility for protection, preservation, and, if possible, enhancement of the fish, wildlife, and related ecological resources of the United States. In order to fulfill its responsibility, they have adopted a policy which is to:

Lake Tahoe Basin

Stream Fishery Quality

Existing

Resident

Excellent

Good

Marginal

Migratory

Excellent

Good

Marginal

Feeder Streams

NOTE: Truckee River drainage not considered in this analysis

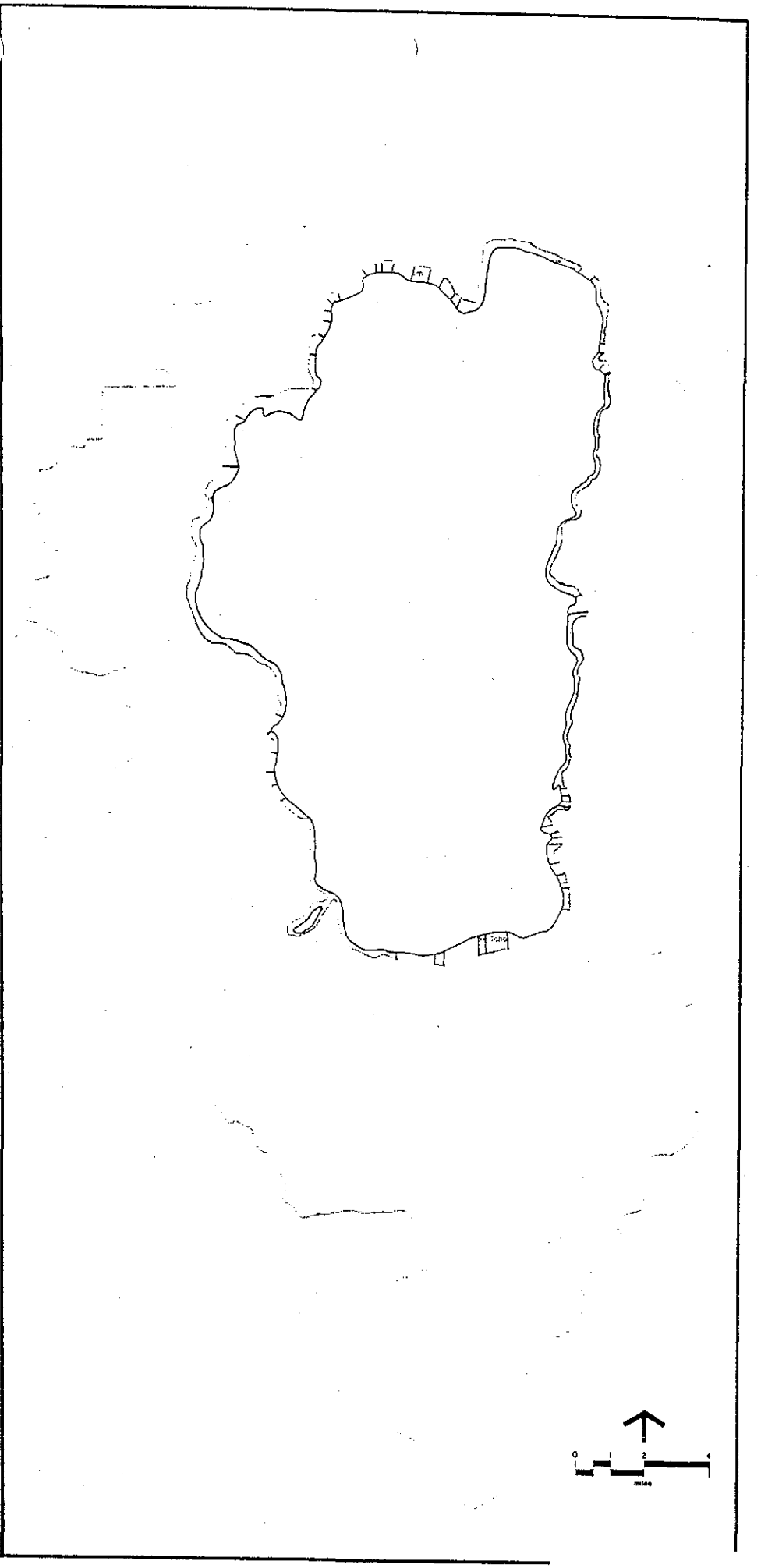
Lake Tahoe Basin

Shallow Lake Fish Habitat

Excellent

Good

Marginal



1. Recommend against issuance of all permits for individual, private docking facilities in prime fish habitat. Special considerations will be given to public facilities proposed in highly populated areas.

2. Recommend against issuance of all permits for individual, private docking facilities in significant fish spawning areas when use of existing public facilities is practicable.

3. Recommend against issuance of all permits for docking facilities, public or private, in or proximate to biologically important stream inlets.

4. Recommend against issuance of all permits for docking facilities, public or private, which would adversely affect marsh or riparian habitats.

5. Recommend against issuance of all permits for public facilities in prime fish habitat or in significant spawning areas unless:

   a. The shoreline is intensively developed;

   b. There is no less sensitive alternative site; and

   c. All reasonable measures to reduce adverse impacts have been incorporated into the plan and compensation for unavoidable damage has been provided for.

6. Encourage the storage of boats on land, and the use of community launching ramps in areas of lesser biological significance or in nondesignated areas.

Other versions of these policies have been adopted or are being considered by the U.S. Army Corps of Engineers, the Lahontan Water Quality Control Board, and the State Lands Commission.

In addition, the Lahontan cutthroat trout, once the major species within the Basin is protected by the Endangered Species Act of 1973. The Lahontan cutthroat is listed as threatened and efforts to reintroduce the species are being considered by various state and federal agencies.

Historical Trends: Detailed accounts of the fishery in Lake Tahoe in the late 1800's and early 1900's are described in Volume II of "The Saga of Lake Tahoe" by Edward B. Scott. This and other accounts speak of abundant populations of Lahontan cutthroat trout and mountain whitefish. Up to 25 commercial fisherman worked the Lake during the summer mouths shipping tons of fish in ice cars to restaurants as far away as Chicago. The Washoe Indians also harvested fish in the streams during times of peak migration. Introduction of non-native fishes has taken place throughout the history of the Tahoe fishery. Overharvest, increased competition for food with non-natives, and habitat destruction have contributed to the demise of the Lahontan Cutthroat. Now, lake trout (mackinaw) dominate the species composition of the Lake. Other less abundant sport fish include rainbow and brown trout, kokanee salmon, and mountain whitefish. Non-game fish populations are also believed to be down from historical levels.

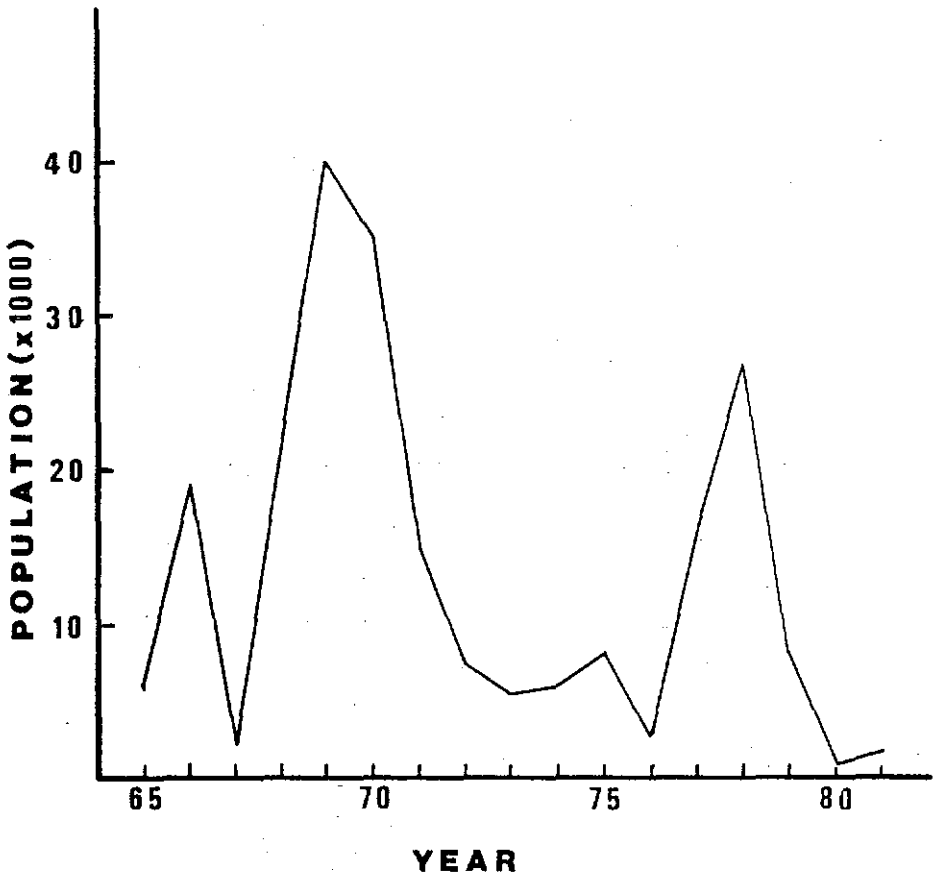
There are a number of methods used to monitor the health of the fisheries resource. The first is to monitor harvest to determine the kind and number of fish being caught while the second is to examine stream populations to determine spawning and resident populations. Both approaches applied over time provide trend information pertaining to species composition, size, and abundance. Limited monitoring of the Basin fishery dates back only to 1960 so there is no long term trend information. Creel census conducted by the Nevada Department of Wildlife generally show a decreasing trend of angler success and increased proportion of smaller fish. The following table indicates that the lake trout catch is generally decreasing in size and that they are getting harder to catch. The graph on the following page indicates that spawning runs of kokanee salmon have declined and it is felt spawning runs of other fishes have likewise declined.

Trend Information on the Tahoe Mackinaw Fishery.*

Year	Proportion of Catch Greater than 25" (%)	Average Length (inches)	Catch Per Hour
1961	3.2	18.3	.167
1962	4.0	18.8	.165
1963	3.0	18.1	.190
1964	4.7	18.6	.142
1965	2.8	18.6	.105
1966	3.0	18.4	.173
1967	5.9	18.6	.128
1968	4.9	18.9	.161
1969	4.6	18.9	.178
1970	2.5	17.8	.206
1971	6.2	18.3	.157
1972	7.2	19.1	.154
1973	3.2	17.9	.226
1974	2.0	18.2	.167
1975	2.7	18.6	.119
1976	0.9	17.9	.159
1977	1.1	19.0	.181
1978	1.9	19.1	.185
1979	1.3	18.4	.196
1980	1.5	17.9	.162
1981	0.7	17.6	.172

* From Lake Tahoe Job Progress Reports (Calif. and Nev. Dept. Fish and Game 1962-1965, Frantz 1966-1981, Frantz 1961).

The conclusion reached from all available data is that the species composition of the Tahoe Basin fishery has changed over time with fish abundance and size down from historic levels. The potential of the Basin fishery is limited by the quantity and quality of available habitat. For example, fish can feed and reproduce only to the extent that feeding and spawning habitat is available. The natural potential can also be further limited by unnatural events causing further habitat loss or degradation.



Damage to the fish resource occurs when the natural potential of the habitat is affected either through habitat modification or disturbance. Sport fishing is normally not detrimental as long as reproduction outpaces the rate of harvest. The commercial harvest of the late 1800's probably contributed to the demise of the Lahontan cutthroat trout but the impact was reduced somewhat by movement of additional fish into the Basin from Pyramid Lake.

The most direct impact upon fish habitat is through alteration or modification of existing conditions. Damage occurs to spawning habitat when the silt load exceeds the flushing capacity of the stream. As silt covers the spawning gravels, it can suffocate the eggs, kill bottom dwelling organisms essential for food, and make the gravels unavailable for future spawning. Other direct impacts include alteration or actual removal of spawning and feeding habitat through stream channelization, dredging, and removal of rocks and gravels in the shorezone of the Lake.

Poor culvert and bridge design and installation can act as blockages to fish migrating up the Basin's streams to spawn. Rainbow trout, brown trout, and other species have been effectively blocked from entering certain streams because a

facility is installed too high or spreads the flow over too wide an area. Diversions of water from streams for irrigation, drinking supplies, snow making, and other purposes have a similar impact by reducing the volume of water necessary within the stream to support the fishery. Other forms of habitat damage results from contamination by surface runoff from city streets, roads, and parking lots that contribute oils, gasoline, and antifreeze to the stream environment. Stockpiled snow can also contribute salt, sediment, and other pollutants to streams as it melts. In addition, urban trash, with old tires being the most common item, contributes to degradation of fish habitat.

Habitat may be lost to fishes without any physical alteration if disturbances keep the fish away from suitable spawning and or feeding areas. One of the major forms of disturbance is noise associated with recreational activities such as swimming and boating. Lake Tahoe is so clear that fish are easily frightened by noise or sights originating up to 300 feet away. What would otherwise be quality habitat will be avoided if continuous or persistent disturbances prevail.

K. Recreation: Visitors to the Lake Tahoe Basin are attracted by the many recreational opportunities provided. Gambling, evening entertainment, and outdoor activities are the primary recreational uses. The Lake Tahoe Environmental Assessment, cited at the beginning of this chapter, states that 74 percent of the Basin's visitors gamble and 61 percent take advantage of the casino's shows. This is contrasted to an average of only 27 percent that participate in some sort of outdoor recreational activity such as swimming, hiking, snow skiing, fishing, boating, and tent and recreational vehicle camping. It is not the intent of this environmental threshold study to deal with gambling or other indoor activities, therefore, the remainder of this environmental impact statement will deal only with outdoor activities.

Outdoor recreation is dependent upon an environment that first possesses physical attributes attractive to the potential users. Secondly, clear air, clean water, the presence of fish and wildlife, and maintenance of the scenic or visual resource further enhance the recreation environment. Once the attributes are available, recreational activities take place in either developed sites or dispersed areas of the Basin. Developed use is dependent on facilities and includes sites such as campgrounds, beaches, picnic grounds, boat ramps, ski lifts, and resorts. Dispersed area use does not require significant constructed facilities for activities such as hiking, backpacking, ski touring, and auto touring to take place. In addition, urban activities such as tennis, golf, swimming, and organized sports take place within the Basin.

Each of the above identified activities require different types of environments to provide high quality opportunities. The Forest Service has a system which inventories lands by degree of isolation and natural environment as contributors to recreational activities. The system is called the Recreation Opportunity Spectrum, ROS. Area size, distance from roads, and interactions with other users are ROS criteria. The following table indicates the spectrum class and recreational settings provided for each. Further information on the ROS system is available from the Forest Service, USDA.

RECREATION OPPORTUNITY SPECTRUM

Spectrum Class	Recreational Setting
Primitive (P)	Area is characterized by essentially unmodified natural environment of fairly large size. Interaction between users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of man induced restrictions and controls. Motorized use within the area is not permitted.
Semi-Primitive Non-Motorized (SPNM)	Area is characterized by a predominately natural or natural appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is not permitted.
Semi-Primitive Motorized (SPM)	Area is characterized by a predominately natural or natural appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. The area is managed in such a way that minimum on-site controls and restrictions may be present, but are subtle. Motorized use is permitted.
Roaded Natural Appearing (RNA)	Area is characterized by predominately natural appearing environments with moderate evidences of the sights and sounds of man. Such evidences usually harmonize with the natural environment. Interaction between users may be low to moderate but with evidence of other users prevalent. Resource modification and utilization practices are evident, but harmonize with the natural environment. Conventional motorized use is provided for in construction standards and design of facilities.
Rural	Area is characterized by substantially modified natural environment. Resource modification and utilization practices are primarily to enhance specific recreation activities and to maintain vegetative cover and soil. Sights and sounds of man are readily evident, and the interaction between users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for special activities. Moderate densities are provided far away from developed sites. Facilities for intensified motorized use and parking are available.

Modern-Urban (MU)	Area is characterized by a substantially urbanized environment, although the background may have natural-appearing elements. Renewable resource modification and utilization practices are to enhance specific recreation activities. Vegetative cover is often exotic and manicured. Sights and sounds of man on-site are predominate. Large numbers of users can be expected, both on-site and in nearby areas. Facilities for highly intensified motor use and parking are available with forms of mass transit often available to carry people throughout the site.

The accompanying map indicates ROS classes of the Lake Tahoe Basin as inventoried by the Lake Tahoe Basin Management Unit of the Forest Service and McDonald and Associates. There is no primitive class and rural and urban have been combined. This is a generalized map indicating currently existing opportunity that was initially prepared for National Forest System lands only but then expanded to include the entire Basin. The acreage within each class is as follows:

Class	Areas	Percent of Total
Semi-Primitive Nonmotorized	98,600	48
Semi-Primitive Motorized	5,620	3
Roaded Natural Appearing	48,370	23
Rural, Urban	53,190	26

In addition to the land areas identified above, Tahoe's shoreline also provides a unique recreation experience. Of the total 71 miles of shoreline, approximately 22 miles is fronted by publicly owned land managed primarily by the Forest Service, the States of California and Nevada, and the City of South Lake Tahoe. The Shoreline includes approximately 10 miles of undeveloped shorezone on the east side of the Lake where access is limited to boats and foot trails. The developed regional beaches are those outside urban areas requiring travel to be reached while urban beaches are normally the heavily used areas close to urban centers. Use of the total shoreline resource is restricted by ownership, the presence of piers, and other private development.

Subcomponents: Outdoor recreation opportunities, for purposes of the threshold study, are viewed in terms of land and shoreline resources. The type of land opportunities range from the semi-primitive character of Desolation Wilderness to highly developed campgrounds in the rural, urban environment. Shorelines likewise range from the highly developed state and local sites to the remote stretches of virtually inaccessible beach. Thresholds will be developed to protect recreation opportunities afforded by undeveloped areas, encourage access to land and shorelines, protect characteristics of area recreation sites, and protect future opportunities for developed sites. Specific activities or facilities will not be prescribed.

Standards: The National Wilderness Act of 1964 establishes a process to insure an enduring wilderness resource for the people of the United States. Wilderness is designated by the Congress. A part of the Desolation Wilderness lies within the Basin and is managed by the Forest Service to retain the primeval character and natural conditions of the area. In addition to the 21,300 acres of

Lake Tahoe Basin

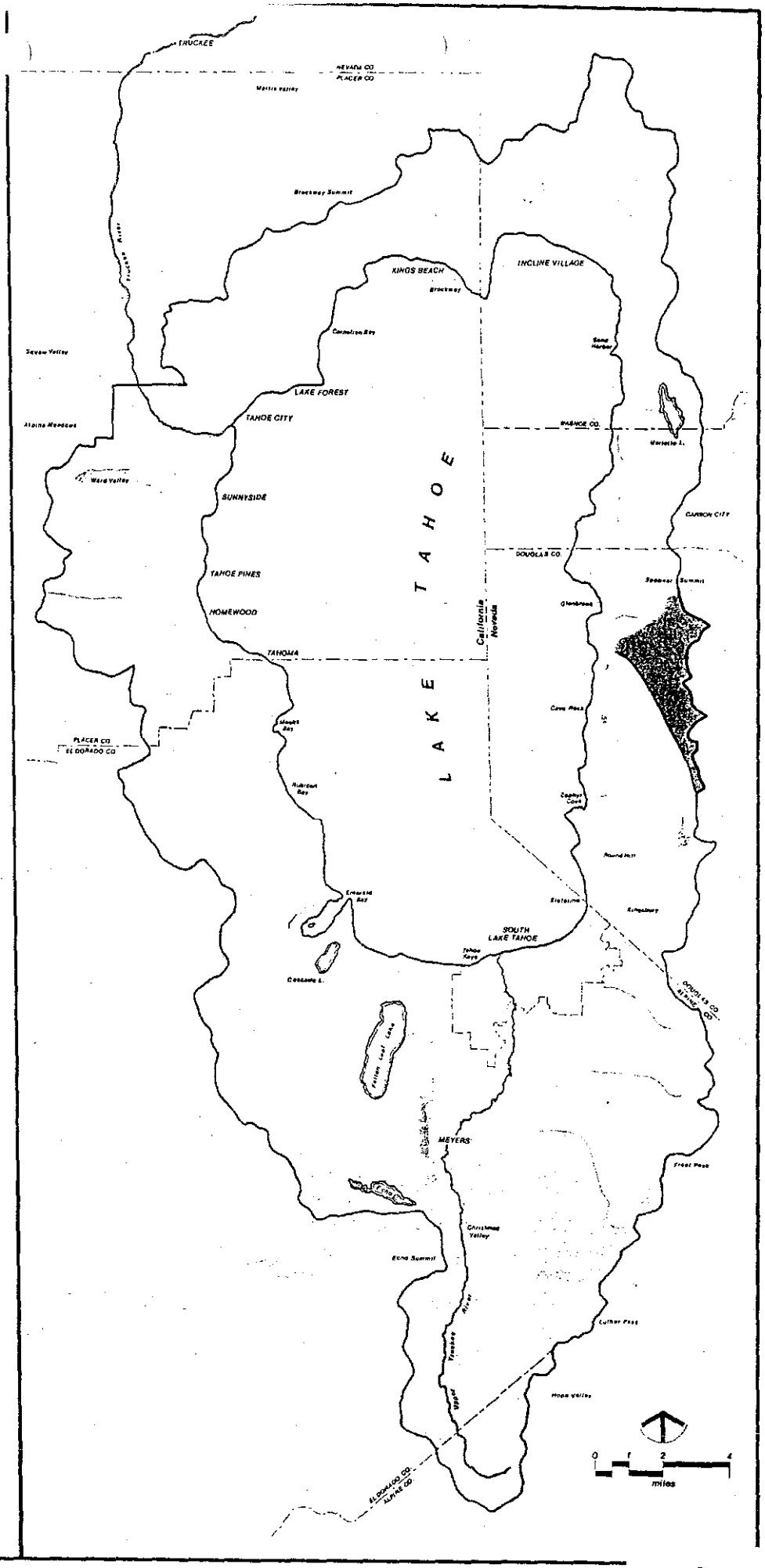
Recreation Opportunity Spectrum (ROS) Classes

Rural, Urban

Roaded, Natural

Semi-Primitive, Motorized

Semi-Primitive, Non-Motorized



Wilderness in the Basin, the Forest Service has also reviewed and evaluated 43,540 acres of roadless areas for consideration as part of the National Wilderness Preservation System. Designation by the Congress of any part or all of the area for wilderness would afford the same management as is currently applied to Desolation.

Forest Service goals for management of the recreation resource on public land is directed toward providing a broad range of outdoor recreation opportunities for public enjoyment and education. National Forest System lands are managed to provide those forms of recreational opportunity that relate to the special beauty and natural features of the Basin. TRPA policy is similar in that recreation opportunity should be provided only to the extent that it does not impair natural environmental characteristics of the Basin nor the quality of the Tahoe experience. The emphasis from both agencies is on quality rather than quantity.

Management of the recreation opportunities is also a responsibility of state and local agencies. Although set standards do not always exist, policy statements from each state and local agency direct management of the recreation resource. California and Nevada, along with all the included counties and cities, are continuously involved with recreation planning and management.

Historical Trends: Prior to the turn of the century and continuing for almost 50 years, the Lake Tahoe Basin was a recreational playground for the more affluent members of our society. Large estates and several family oriented resorts met the needs of these people. Towards the end of World War II, visitation to the Basin increased rapidly creating a demand for more recreational development to temporarily house people who wanted the Tahoe experience. It was at about this same time that skiing at Heavenly Valley became popular, making the Lake Tahoe Basin a year round recreation destination.

Overall recreation use within the Basin has increased dramatically from 11.2 million recreation visitor days (rvd's) in 1970 to 20.8 in 1978. (A recreation visitor day is a measurement of use equal to one 12 hour visit, 12 one hour visits or combinations equal to a person spending 12 hours in recreational activities.) The breakdown in this use is depicted as follows:

Activity	1970	1978
Gaming	4.4 million rvd	9.0 million rvd
Outdoor Use	5.1 million rvd	5.4 million rvd
Other	1.7 million rvd	6.4 million rvd
Total	11.2 million rvd	20.8 million rvd

"Other" recreational uses are described as general rest and relaxation and include time spent in second homes, hotel/motels, and restaurants. One of the important reasons cited in the past for visiting Tahoe is the opportunity for rest and relaxation. The above information was obtained from the 1979 Lake Tahoe Environmental Assessment cited at the beginning of this chapter.

Demands for recreation use will in all likelihood continue to increase unless the "Tahoe experience" is reduced by increased development and congestion within the Basin. Some visitors seeking a more relaxed, natural environment may go elsewhere but those seeking gaming, nightlife, and other intense forms of recreation

will continue to visit the Lake Tahoe Basin. Increased population in nearby metropolitan areas and even in other communities just outside the Basin will increase demand for recreation.

L. Scenic: Scenic quality is perhaps the most often identified natural resource of the Lake Tahoe Basin. Visitors to the area enjoy views of a magnificent lake sitting within a forested mountainous environment under clear blue skys. The Tahoe Basin is unique in that it combines visual elements normally found in several different landscape settings into one clearly defined region exhibiting exceptionally high aesthetic values.

The high scenic quality of the Basin is the result of several factors. First, and probably most important, is the Lake itself, a dominant element that is the focal point in a single, large feature landscape type. The distinctive mountain landforms surround the flat plane of the Lake, creating an enclosed landscape type. The edges between sky and ridgetops, between water and shore, and between vegetation and rock all add interest to the scenic landscape. Finally, numerous smaller features such as streams, rock formations, sand beaches, and rocky shorelines each create small feature landscapes at a more intimate scale.

The majority of the visitors to Lake Tahoe experience the scenic qualities of the Basin while traveling on the major highways or from the Lake itself. Naturally, development and use occur along these roadways, often interrupting views of the natural landscape of the Basin. Buildings, signs, fences, and other features block views and also can add to visual pollution. Public land, the majority of which is managed by the U.S. Forest Service, is generally not as developed as the private lands within the Basin. The Forest Service manages these lands for a full range of benefits including aesthetic values. These lands are the backdrop for the Basin and generally provide the majority of the natural scenic values so highly prized.

Subcomponents: Scenic resources for major roadways and the Lake Tahoe shoreline were evaluated. This work included an updating of a previous scenic travel route analysis developed by the Forest Service with a reinventory and evaluation of the scenic resources within each roadway and shoreline unit.

The visual study undertaken by the Forest Service in 1971 defined 43 roadway units on the highways of the Basin based on visual limits or environments, structural unity, and landscape continuity. The shoreline was likewise divided into 33 units. Scenery within each unit was evaluated based on man made features, physical distractions, roadway characteristics, views toward the Lake, general landscape views, and the variety of scenery. Numerical ratings were assigned to each roadway and shoreline unit.

The 1971 visual analysis was updated initially in 1978 and then again in 1982 as a part of the threshold study. The roadway units and areas indicating significant change are displayed on the accompanying map.

The Scenic Resources Inventory provides detailed identification and documentation of the scenic resource. Visual resources within individual roadway and shoreline units have been mapped, photo documented, and described in narrative text. Three roadway units were added during the updated inventory for a total of 46 roadway units. The complete scenic inventory is available for review in the office of the Tahoe Regional Planning Agency.

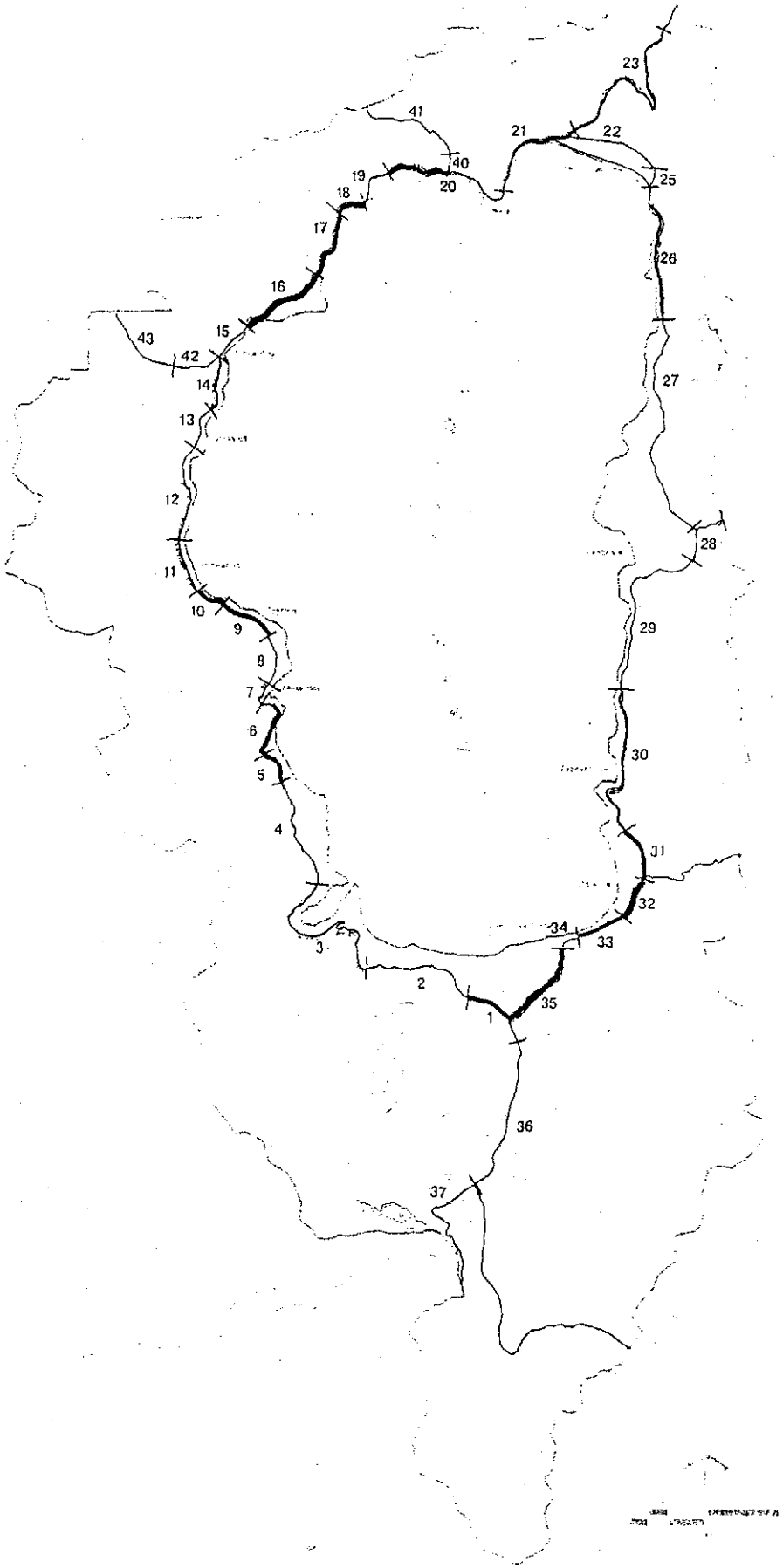
Lake Tahoe Basin

Roadway Unit Inventory for Scenic Analysis

Roadway Units

1978 Change

1982 Change



In the inventory, the landscape viewed from roadway units is described in terms of foreground, middleground, and background views of natural landscapes; the "man-made" environment; views of the Lake; first views of the Basin from entry points; and special landscape features that add scenic interest. The scenic quality of each unit has been ranked based upon the number of attractions viewed and the quality of that view. For example, views of natural landscape features uninterrupted by manmade development rank higher than views competing with or blocked by buildings. Also, large scale panoramic views rate higher than focused or intermittent, obscured views.

There is a degree of repetition in the analysis of the scenic resource as viewed from the Lake as many of the same foreground, middleground, and background views from the road are seen from the shoreline. The quality of the scenic views is based upon the number and quality of views provided by each shoreline unit. For example, a view of a shoreline free of piers or other construction ranks higher than one where numerous piers and buildings exist.

Each roadway and shoreline unit was assigned a numerical rating of 1, 2, or 3 equal to low (1), moderate (2), or high (3) visual quality. A few exceptionally high quality units are given a 3+ rating. The scenic quality rankings are based upon four criteria - unity, vividness, variety, and intactness. The rankings are for comparison purposes only and are not definitive. These rankings, coupled with the sensitivity to change can then become thresholds for maintenance or improvement of scenic quality.

Standards: Uniform standards for maintenance of the Lake Tahoe Basin scenic resource do not exist. There are, however, a whole series of adopted goals, policies, and implementing regulations for protection of certain aspects of the visual resource. The Forest Service manages public lands for a variety of multiple resource uses in an "attractive forest" setting. Activities planned on National Forest System lands are evaluated for their potential impact on the visual environment. TRPA and CTRPA likewise have general plan elements and ordinances that prohibit development or resource removal that are complimentary to maintenance of the visual resource. The City of South Lake Tahoe and each County have plans and/or ordinances to maintain a scenic resource within the Basin. The policies of each of the above entities are available for review at the TRPA office.

Historical Trends: Few data are available to quantify the changes in the scenic qualities of the Lake Tahoe Basin during the past century. The Basin is much more aesthetically pleasing today than it was during the logging days of the late 1800's. There was a period of time when the scars of clearcut logging disappeared and the area was once again a remote and exceptionally beautiful place where only a few came to visit. Development, with its attendant residential and commercial structures adjacent to the existing roadways, began to change the appearance of the Basin after World War II. Narrow, low standard roads that fit nicely into the landscape were replaced with faster, wider roads requiring massive cuts and fills and earth movement.

Visitors to the Lake Tahoe Basin want facilities to supply their food and housing needs. Motels and restaurants built to accommodate these needs began to advertise with the result that roadside signs began to detract from the natural environment. Utilities and their resultant cleared corridors were constructed to provide heat and light to Basin residents. More facilities such as campgrounds,

ski areas, and casinos were needed to meet an ever increasing public demand. Each new development has carried a price with it in terms of the Basin's scenic qualities.

The major source of data on historical trends of the visual resource begins in 1971 with the Forest Service study, "Scenic Analysis of Principal Travel Routes in the Lake Tahoe Region." This report assigned a numerical rating of 6 to 30, with the higher numbers representing higher visual quality, to each of the 43 roadway segments. Shoreline units were evaluated with a similar system except the potential range for ranking each of 33 units was 3 to 15. The roadway analysis was updated in 1978 as part of the effort for planning in the South Tahoe Public Utility District and the Douglas County Sewer Improvement District. This update showed that of the 43 roadway units originally evaluated, 15 had undergone some degree of visual degradation in the intervening years. The deterioration was due to new development and construction, signing, and roadway grading.

The roadway and shoreline analysis has been re-evaluated as part of the environmental threshold carrying capacity study. The travel route ratings were completed in April, 1982 using the same roadway and shoreline units and the same evaluation criteria used in past studies. In addition, three more roadway units have been included in the analysis. Results show further deterioration of 13 roadway units and that 16 shoreline units have undergone visual change since the original 1971 analysis. Change is documented for each roadway and shoreline unit as follows:

Unit No.	Unit Name	Ratings 1971	1978	1982
1	Tahoe Valley	14	11	11
2	Camp Richardson	20	20	20
3	Emerald Bay	27	27	26
4	Bliss State Park	22	22	21
5	Rubicon Bay	23	17	17
6	Lonely Gulch	21	17	17
7	Meeks Bay	12	13	13*
8	Sugar Pine Point	23	23	23
9	Tahoma	15	13	13
10	Quail Creek	18	14	14
11	Homewood	14	14	13
12	Tahoe Pines	19	19	17
13	Sunnyside	14	14	14
14	Tahoe Tavern	17	15	13
15	Tahoe City	12	12	12
16	Lake Forest	18	15	13
17	Cedar Flat	18	17	17
18	Carnelian Bay	16	14	14
19	Flick Point	14	14	14
20	Tahoe Vista	14	11	10
21	Stateline	21	21	20

Unit No.	Unit Name	Ratings 1971	1978	1982
22	Crystal Bay	21	15	12
23	Mt. Rose Highway	27	27	25
24	Tahoe Meadow	26	26	26
25	Ponderosa Area	12	12	12
26	Sand Harbor	27	27	26
27	Prey Meadow	27	27	27
28	Spooner Summit	16	16	16
29	Cave Rock	24	24	23
30	Zephyr Cove-Lincoln Park	19	19	18
31	Meadow	18	14	14
32	Casino Area	15	10	13*
33	The Strip	9	6	6
34	El Dorado Beach	16	16	16
35	Al Tahoe	10	6	7*
36	Airport Area	15	15	15
37	Echo Summit	26	26	26
38	Upper Truckee River	18	18	18
39	Alpine Summit	24	24	24
40	Brockway Cutoff	15	15	15
41	Brockway Summit	21	21	21
42	Outlet	10	10	10
43	Lower Truckee River	20	20	20
44	Kingsbury Grade			13
45	Pioneer Trail North			10
46	Pioneer Trail South			20

* Indicates Improvement.

The 1971 and 1978 shoreline ratings and the 1982 update are shown in the following table.

Shoreline Unit No.	Shoreline Unit Name	Ratings 1971	1982
1	Tahoe Keys	11	9
2	Pope Beach	9	8
3	Jameson Beach	8	8
4	Taylor Creek Meadow	13	13
5	Ebrite	9	9
6	Emerald Bay	13	12
7	Bliss State Park	12	12
8	Rubicon Point	13	12
9	Rubicon Bay	6	6
10	Meeks Bay	9	9
11	Sugar Pine Point	11	11
12	McKinney Bay	9	9
13	Eagle Rock	12	11

Shoreline Unit No.	Shoreline Unit Name	Ratings 1971	1982
14	Ward Creek	10	10
15	Tahoe City	5	5
16	Lake Forest	6	5
17	Dollar Point	11	10
18	Cedar Flat	9	8
19	Carnelian Bay	5	5
20	Flick Point	9	8
21	Agate Bay	8	8
22	Brockway	11	10
23	Crystal Bay	12	11
24	Sand Harbor	12	12
25	Skunk Harbor	13	13
26	Cave Rock	12	10
27	Lincoln Park	10	8
28	Tahoe School	12	11
29	Zephyr Cove	10	9
30	Edgewood	11	11
31	Bijou	9	9
32	Al Tahoe	10	9
33	Truckee Marsh	14	14

The 1982 update to the previous inventories was conducted by the landscape architectural firm of Wagstaff and Brady. Ratings are available for review at the TRPA office.

M. Population: Nearly all documents cited in the overview of this chapter provide a discussion of population, housing, employment, and many other socio-economic indicators. The action being proposed in this environmental impact statement does not directly affect in a quantifiable way any of these factors. Action to be taken subsequent to the adoption of environmental thresholds will indeed affect the social and economic environment and will be fully described in the environmental impact statement prepared to discuss amendment of the general plan. Accordingly, this and the next 4 or 5 sections will only highlight some of the discussion. The reviewer is directed to the cited documents if more detail is required.

Population within the Lake Tahoe Basin is recognized as being within one of two major categories: residents, including permanent and seasonal; and visitors, including second home owners, gaming visitors, and outdoor recreationists. Growth in the resident population has increased about five times since 1960 while visitor population has almost doubled since 1970. These comparisons are for average summer days. Peak summer day populations increase the average by about 40 percent. Total winter populations are only about one-half that of the summer. The 1980 average summer populations by jurisdiction were reported as follows in the Draft Enviornmental Impact Statement for the Lake Tahoe Basin Water Quality Management Plan prepared by the TRPA in February, 1981. These include resident and overnight visitors only.

California	-	City of South Lake Tahoe	50,700
	-	El Dorado County	20,600
	-	Placer County	25,900
	-	TOTAL	97,200
Nevada	-	Douglas County	13,600
	-	Washoe County	13,500
	-	TOTAL	27,100
Basin Total			124,300

Major urban centers within the Lake Tahoe Basin are all located along the shoreline. The City of South Lake Tahoe is the largest urban center and the only incorporated community. El Dorado County includes all the area on the south and part of the west shore not within the City's limits. Almost the entire shoreline in Placer County is developed with Tahoe City being the largest community. The Incline Village area of Washoe County in Nevada has been growing very rapidly in the last decade. Douglas County residents live predominately in the Stateline area of the south shore. About 80 percent of the Basin's population resides in California while about 20 percent live in Nevada.

N. Housing: Housing within the Lake Tahoe Basin is composed of single and multifamily dwelling units occupied by permanent, seasonal, and second home owners. Tourist facilities are also available for the many visitors to the Lake. Housing for residents has increased to accommodate what has been an expanding job market associated with expanded recreational facilities and in response to demands for second homes. Likewise, tourist facilities have increased as more visitors come into the Basin for recreational purposes.

The number of dwelling units within the Basin increased about 6.5 percent per year between 1970 and 1975 and then jumped to 9.4 percent between 1975 and 1978. The following table indicates the number and type of dwelling units in the Basin in 1980. The figures come from the February, 1981 DEIS for the Water Quality Plan prepared by the Tahoe Regional Planning Agency. In the table, single family includes detached single dwelling structures; multiple family includes duplexes, triplexes, fourplexes, apartments, condominiums, and mobile homes; and tourist includes hotels, motels, and campgrounds.

	Single	Multiple	Tourist	Total
California	22,010	9,020	10,880	41,910
Nevada	4,900	5,300	3,000	13,200
Basin Total	26,910	14,320	13,880	55,110

Multifamily housing units are found primarily in South Lake Tahoe, Incline Village, and Tahoe City while single family units occur throughout the Basin. Tourist facilities are clustered predominately in the south shore and north shore stateline areas. Seventy-nine percent of the dwelling units are located in California but the rate of increase has been greatest in Nevada in recent years. The most significant growth rate has been in multiple family units in Nevada while single family units have declined from 72 percent of the total in 1970 to 65 percent in 1978. Seasonal and second homes represented about 56 percent of the total dwelling units in 1970 but declined to about 44 percent in 1978.

O. Employment: The Lake Tahoe Environmental Assessment prepared in 1979 for the Western Federal Regional Council divides industries that provide jobs and income to an area into basic and non-basic. Basic are those industries that bring income in from outside the Basin while income of non-basic industries is largely derived from within. In the Lake Tahoe Basin, the major basic industries are gaming, construction, hotel/motel operation, and outdoor recreation. All, with the exception of construction are directly related to tourism. Construction is in the basic category since a large portion is financed by out of Basin sources. Non-basic industries are service related and include wholesale and retail trade, finance, medical, educational, and government services.

The Environmental Assessment indicates employment in the non-basic industries accounts for about 51 percent of the total. Gaming leads the basic industry employment with about 33 percent followed by construction at 7, hotel/motel at 5, and outdoor recreation at about 4 percent. The percentages remain fairly constant in winter and summer but winter employment is only about 75 percent of summer employment. This reduction is in response to decreased tourist activity in the winter. Occupancy rates in hotel/motel rooms decrease from an average of 77 percent in the summer to 28 percent in winter, an indicator of tourist activity.

The tourist oriented economy of the Lake Tahoe Basin has seen employment grow 107 percent between 1970 and 1978. As a basic industry expands, new jobs are created which in turn increase the demand for goods and services in the non-basic industries. It is estimated that every new job in a basic industry creates an average of 1.04 new jobs in a non-basic industry.

P. Transportation: The Lake Tahoe Basin is easily accessible to the approximately seven million people who live within a four hour drive. Visitors arrive by highways, air, and rail systems.

Highway travel has been the dominate transportation system to get into the Basin with the private automobile being the chief mode. Charter bus is also provided and it, along with Greyhound commercial bus service brings in visitors. The California Tahoe Regional Planning Agency measured external trip distribution during the peak summer month of 1977 and found 70 percent of the highway traffic destined for Tahoe approached from California and 30 percent from Nevada. In California, access was evenly split between those going to the north shore and those to the south. Of the 30 percent coming from Nevada, 20 percent use U.S. Highway 50 with 5 percent each on the Mount Rose Highway and Kingsbury Grade.

The larger of the two air facilities serving the Basin is at South Lake Tahoe and provides general aviation and commercial air carrier services. The Tahoe-Truckee airport is just north and outside the Basin. It is basically a general aviation facility but commercial commuter service is available. Air travel into the Basin is becoming more popular with the number of people using commercial facilities increasing 4.8 times between 1970 and 1978. General aviation only increased 1.1 times during this same period.

Rail travel into and out of the Basin is not a major means of transportation. Service is provided by AMTRAK at Truckee on the line between Reno and San Francisco. Lack of adequate ground transportation from the station to destination points within the Basin and a frequency schedule of a very limited number of trips per day are the primary reason it is not fully utilized.

Transportation within the Lake Tahoe Basin is primarily by the private automobile. Public transit is provided in the City of South Lake Tahoe with a bus system operating 24 hours a day, year round. In addition, several casinos in the south shore area operate shuttle service from local motels to the casinos. Ski buses serve the south shore area in the winter moving patrons from their motel to the slopes. There is also taxi service on the south shore. Bus service also is provided on the California side of the north shore area. Taxi service on the north shore serves both California and Nevada. In addition to ground transportation, service between south and north shore areas is provided by excursion boat in both summer and winter.

Q. Land Uses: Land use within the Lake Tahoe Basin is the responsibility of a variety of agencies. Public land is administered by the Forest Service and the States of California and Nevada, the City of South Lake Tahoe, the counties, and improvement districts. The Tahoe Regional Planning Agency and the California and Nevada TRPA also have responsibility for different aspects of land use planning as do the counties and cities within the Basin. Although various plans from all entities exist, the current goal is to complete the environmental threshold carrying capacity study and then amend the TRPA general plan to provide a single enforceable plan for development and use within the Basin.

Land use controls within the Basin are a combination of a 1971 TRPA plan, a 1975 CTRPA plan and 1980 update, and the Lake Tahoe Basin Water Quality Management Plan, May, 1981. The plans, in summary, provide for adherence to the land capability system limiting site coverage and also place a temporary prohibition on development in capability classes 1, 2 and 3 and stream environment zones. In addition, the plans contain land use elements or zoning requirements for the Basin. This Agency's 1977 data show the number of acres of an existing type of land use and the area zoned in the plans for that use. The acres of each are shown in the following table:

Land Use District	Existing Land Use	Zoned General Plan
Rural Estates	2,488	2,337
Low Density Residential	13,308	19,198
Medium Density Residential	1,626	1,504
High Density Residential	1,074	2,270
Medium Tourist Residential	3	3
Tourist Commercial	1,024	1,320
General Commercial	1,123	1,503
Recreation	2,207	4,328
Public Service	727	898
Conservation Reserve	---	1,753
General Forest	174,538	163,004

Article V of the Tahoe Regional Planning Compact, Public Law 96-551 requires the TRPA to amend the regional plan for the Basin subsequent to the adoption of environmental thresholds. The new plan will contain five elements - land use, transportation, conservation, recreation, and public services and facilities elements. This plan, not the adoption of environmental thresholds, will define maximum population densities, permitted uses, and other requirements for the Basin.

Article VI of the Compact has placed a partial moratorium on development within the Basin until adoption of the new plan or May 1, 1983, whichever is earlier. New subdivisions, planned unit developments, and condominiums are prohibited. Residential units are limited to 530 per year in California and 1,078 in Nevada. Commercial square footage is also limited. In addition, construction or expansion of sewage treatment facilities, highways, parking garages, and gaming facilities is restricted.

R. Public Health and Safety: Public health and safety is primarily a function of the ability of an area to meet the public's demand for water, sewage treatment, solid waste disposal, electricity, heating fuel, medical facilities, and fire and police protection. Each of these utilities is a product of local government, improvement district, or franchised private vendor. Demands for these services increase as resident and visitor populations increase. The amount of each must be fully capable of maintaining the needs of the peak day of the year, realizing demand will be reduced drastically at other times.

The action proposed in this environmental impact statement will not produce any impacts upon these utilities. The establishment of thresholds does not, as a singular action, affect population or development within the Basin. Subsequent action, as the general plan is adopted, will affect these components of the Tahoe Basin and the impact will be fully evaluated in an EIS. Reviewers are encouraged to read the documents cited in the overview of this Chapter if more information is needed.

Water for consumptive purposes is provided to Basin residents and visitors by 93 separate water systems. Roughly half is from groundwater sources and half from surface diversion. The water sources are of high quality requiring little if any treatment. Maintenance of water quality at both surface and groundwater sources is necessary to retain the purity of the Basin's drinking water supply.

Sewage generated in the Lake Tahoe Basin is treated and then exported out of the Basin for disposal. Four sewage districts, two in California and two in Nevada, serve the Basin. Capacity for each of these facilities is controlled by the size of the collecting pipes and the ability of the plant to treat the volume of sewage. Overflows, spills, and exfiltration from the systems carry with them the potential for water quality and other environmental degradation.

Solid waste is also collected and exported out of the Basin for disposal. Three landfills currently provide repositories for Tahoe trash - one in California and two in Nevada. The capacity of the disposal sites is constrained both by the amount of land available and the political agreements that govern use of the sites.

Electricity and fuel for heating are, with the exception of some wood, all imported into the Basin. Electrical transmission lines and natural gas pipelines bring service to Basin consumers. Peak demand is in the winter for both these utilities and coincide with cold days and winter visitors. LP gas and fuel oil for heating and cooking are brought into the Basin by truck. Wood is being used in lieu of or supplemental to other forms of heating in more residences each year. It is estimated 10 to 20 percent of the wood consumed originated in the Basin with the remainder imported.

Medical facilities, educational systems, and police and fire protection are provided as local government services. They are also responsible for building inspections and permits, public works, public and environmental health services, community development, and local parks and recreation within their respective jurisdictions. In addition, many special purpose districts provide health, education, and fire protection services.

III. Alternatives Including The Proposed Action

A. Process for Developing Alternatives: A variety of alternatives exist for the establishment of environmental thresholds for each environmental component. Since it is not feasible to develop every conceivable option, the task has been one of reducing the possibilities to a reasonable number for review. The task has been made somewhat easier by two factors: 1) the existence of adopted standards and 2) constraints provided by goal statements approved by the Governing Board. Both of these factors narrow the range of potential threshold standards. In addition, the Agency must look at the no action alternative which will be described in more detail.

Setting alternative threshold levels for each environmental component has proven to be a major undertaking when dealing with such broad aspects as water, air, vegetation, and others. Thresholds, to be understandable as well as measurable, must be related to specific locations, types, and time. For this reason, each environmental component has been subdivided into the following subcomponents.

Component	Subcomponents
Water Quality	Pelagic Lake Tahoe Littoral Lake Tahoe Tributary Flows Surface Runoff Ground Water Flow Other Lakes in the Basin
Water Quantity	Water Use Instream Flows
Soil Conservation	Impervious Cover Soil Productivity Surface Disturbance Stream Environment Zone
Air Quality	Site Specific Contaminant Basin Wide Contaminant Regional Visibility Subregional Visibility
Noise	Single Noise Event Average Noise Level
Vegetation Preservation	Common Terrestrial Vegetation Uncommon Plant Communities Sensitive Plant Species Aquatic Plant Communities
Wildlife	Common Species Special Interest Species Threatened and Endangered Species
Fisheries	Shallow Lake Habitat Stream Habitat

Outdoor Recreation	Undeveloped Lands Shorezone Areas Access Developed Recreation
Scenic	Roadway Units Shoreline Units

Thresholds will be explored for each of the listed subcomponents in terms of pollutant concentrations, emission rates, loading rates, areal and lineal extent, and in some cases, statements for maintenance of environmental quality. Alternative thresholds through the remainder of this chapter are described under each subcomponent heading. We have not attempted to combine individual thresholds for an all inclusive threshold set. Environmental consequences, identified in Chapter IV, will likewise be described for each component through the range of alternatives developed.

B. Alternatives Considered and Eliminated From Detailed Study: Various alternatives were considered during the threshold establishment process with some being eliminated from further study. Those that were discarded represent extreme ends of the threshold spectrum and a no action alternative. The following discussion highlights each of the three options and the reasons for their elimination from detailed study.

Maximum Environmental Protection: This alternative, although singular in nature, represents a range of thresholds that begins with the most restrictive of thresholds considered in detail and carries it to a maximum protection or virtually "natural" condition within the Basin. By its very nature, this alternative would establish thresholds that would require restrictions upon and ultimately elimination of residents and visitors to the Basin. It leans towards a non-development philosophy of protecting environmental quality at the expense of human, social, and economic needs. This alternative, implemented to its most restrictive degree, conceivably would require "buy-out" of existing development within the Basin. It becomes very obvious that this alternative has, at the least, serious questions regarding economic feasibility and social acceptability. It is being eliminated from further detailed study in favor of those alternatives that achieve a level of environmental quality while still providing the potential for human use and enjoyment.

Minimum Environmental Protection: This alternative is the opposite of the previous and represents again a possible range of thresholds that begins with the most lenient of those considered in detail and runs through to the point of eliminating standards for achieving environmental quality. In its extreme, liberal or non-existent environmental thresholds could provide for maximum growth, use, and development without regard for environmental protection. The Basin could conceivably become another metropolitan area with all the potential for environmental degradation experienced elsewhere. It would maximize economic returns at the expense of the physical, biological, and many aspects of the social environment. This alternative is eliminated from further detailed study because it would not achieve the Compact requirements of maintaining significant natural resource values, does not meet the goals established by the Governing Body of the Agency, and violates federal, state, and local standards established for protection of the environment.

No Action: There are two types of no action alternatives available for consideration in the establishment of environmental thresholds. The first is basically hypothetical as it would require no action be taken - i.e., environmental thresholds would not be established. This alternative is not feasible, for the Tahoe Regional Planning Compact requires adoption of thresholds within a given period of time for air quality, water quality, soil conservation, vegetation preservation, and noise. The second type of no action alternative is based upon the continuation of current direction or intensity of use without change for those components included in the Study but not requiring adoption of thresholds. No action would be taken to change existing and projected environmental standards. This alternative will be described more fully with discussion of water quantity, wildlife, fisheries, recreation, and scenic resources throughout this environmental impact statement. These discussions will also provide an indication of trends if thresholds are not adopted and implemented.

C. Alternatives Considered in Detail: The proposed action and alternatives to it are considered in detail in this section under individual environmental component headings. The range of alternatives presented is constrained by the goal statements identified in Chapter I and by adopted standards, when they exist for specific components. The proposed action in each case is the staff and consultant team recommendation for the environmental threshold standard that best maintains the values identified in the Compact. It is not necessarily the Governing Board's preference but only represents a recommendation to the Board that it is the best scientifically acceptable standard. If a threshold is not recommended for a particular environmental component and an adopted standard exists for that component, the existing standard will continue to apply.

1. Water Quality: This discussion of environmental threshold for water quality component includes recommended and alternative thresholds for the six water quality subcomponents: the pelagic zone, the littoral zone, the tributaries, surface runoff, ground water, and the smaller lakes in the Tahoe Basin. The thresholds for the pelagic zone cover ambient algal productivity, ambient clarity, and the nitrate-nitrogen loading rates. The littoral zone thresholds cover ambient algal productivity and biomass of attached algae. The tributary thresholds apply to ambient nutrients and suspended solids concentrations and stream environment zones. The surface runoff thresholds cover concentrations of nutrients and suspended solids in runoff. the thresholds for groundwater and the other lakes in the Basin are narrative thresholds.

Pelagic Lake Tahoe. The threshold study analysis shows that maintenance of Lake Tahoe's exceptional clarity and low algal productivity requires decreased nitrogen loads to the Lake. The trends in algal productivity and clarity follow trends in accumulated loads of nitrogen, the limiting algal nutrient in the Lake. As the accumulated load increases, primary algal productivity increases and clarity decreases. If the accumulated load decreases, primary productivity will decrease and clarity will increase. To slow the existing rate of increase in the accumulated load, nitrogen loads from tributaries must be controlled. To stabilize or decrease the accumulated load will probably require improved tributary water quality in combination with air quality improvements.

The objective of the thresholds for pelagic water quality is to balance nitrogen sources and losses and, over time, return clarity and algal productivity to the levels the State standards mandate. This objective may be extremely difficult to

accomplish both technically and financially. The recommended thresholds fo pelagic water quality are:

Ambient Clarity (annual average Secchi disk depth at index station): 28.7m

Ambient Clarity (average Secchi disk depth, December through March, at inde station): 32.4m.

Ambient Primary Productivity (integrated annual average at index station measured in carbon uptake): 52 $gC/m^2/yr$

Nitrate-Nitrogen Loading: over a 20-year period, a 40 percent decrease i annual loading of nitrate-nitrogen from tributaries (measured in NO_3 as N)

The estimated annual loading rate of nitrate nitrogen, NO_3, as an average of 197. through 1981 values, is 10 tonnes (metric tons) of NO_3 as N. Thus, the recommended loading threshold is equivalent to a reduction in the annual load of abou four tonnes, NO_3 as N. Possible alternative thresholds for pelagic Lake Tahoe are:

Ambient Clarity (annual average Secchi disk depth at index station): 26.2m

Ambient Clarity (average Secchi disk depth, December through March, at index station): 26.8m

Ambient Primary Productivity (integrated annual average at index station, measured in carbon uptake): 86 $gC/m^2/yr$

Nitrate-Nitrogen Loading: over a 20-year period, a 20 or 60 percent decrease in annual loading of nitrate-nitrogen from tributaries (measured in NO_3 as N)

The recommended ambient thresholds for the pelagic zone are equivalent to the State standards. The alternatives represent existing (1978-1981) values. Since the Compact directs thresholds to be at least as stringent as existing State standards, the recommended ambient thresholds are most appropriate. Also, setting the ambient thresholds at the recommended level supports the concept of non-degradation, which is a part of both State's standards for Lake Tahoe. There are no existing federal, state, or local standards for nitrate-nitrogen loading.

The threshold study report will include a discussion of the feasibility of alternative methods for meeting the threshold on nitrate-nitrogen loads. Previous planning studies have estimated the costs and effectiveness of controlling sediment discharges to the Lake, but nitrate-nitrogen loads are not necessarily tied to sediment, since nitrate is highly soluble and mobile in the environment. At a national level, there is little information on the costs of controlling nitrogen concentrations in runoff from urban, suburban, and forest lands such as those in the Tahoe Basin. Vegetation, erosion control, runoff detention, improved land management, and other non-structural methods show the greatest promise for controlling nitrogen loads. No appropriate waste water treatment technology exists to control nitrogen loads once in the Basin's streams and lakes.

Littoral Lake Tahoe. Much less data exist for the littoral zone than the pelagic zone. The only quantitative data for the littoral zone are from a set of intensive studies conducted in 1968 through 1971. There are insufficient

data on littoral zone clarity and transparency to recommend a threshold, and there are no data from recent years (e.g., 1981) to delineate existing conditions and suggest alternative thresholds.

Generally, measures to protect the pelagic zone and meet the pelagic zone thresholds will also have beneficial impacts on the littoral zone of the Lake. The recommended thresholds for the littoral zone are:

Ambient Primary Productivity (annual average, measured as a ratio of littoral phytoplankton productivity to productivity at the Lake index station): shall not exceed average values observed in 1968-1971, as reported in the threshold study report.

Specific values for selected locations are:

Upper Truckee/Trout Creek inflow area: 1.27

Crystal Bay: 1.3

Tahoe City, near Truckee River dam: 1.11

Rubicon Creek inflow area: 0.99

Emerald Bay: 1.83

Periphyton (attached algae) biomass (maximum value of standing crop): Not to exceed values observed in littoral zone from 1968-1971, as reported in the threshold study report.

The recommended thresholds for the littoral zone are more stringent than the existing state standards, since the state standards dictate that primary productivity in the littoral zone shall not exceed twice the value observed at the Lake index station. On an average over the four-year period of record, no station for which data exist violated this standard, although there were sporadic violations at certain times. (See the study report for more details on littoral zone water quality.) There are no alternative thresholds identified due to insufficient data on existing littoral zone quality.

Tributaries. Analysis of data on tributary nutrient concentrations for the threshold study showed that tributaries frequently violate the existing state standards. Data on 37 streams, distributed around the Basin, showed that violations of state standards for nitrogen, phosphorus, and iron were three times more common than compliance with the standards. Improvements in tributary water quality will be necessary to protect the pelagic and littoral zones of the Lake, and to protect the tributaries themselves. Until a precise nutrient budget for the Lake is known, it is difficult to refine the existing tributary standards for the purposes of preserving Lake Tahoe's water quality.

Therefore, the recommended water quality thresholds for the tributary streams are the existing applicable state standards for concentrations of nitrogen, phosphorus, iron, and suspended solids. It is recommended that the existing state standards be adopted as interim thresholds, pending further study and evaluation of the relationship of tributary flows to the Lake's nutrient budget. Tributary standards vary from stream to stream. For details on tributary standards, see

Appendix C. No feasible alternatives to this recommended tributary threshol have been identified.

The tributary threshold also covers stream environment zones, which provide cost-effective treatment of nutrient-laden runoff, and are also beneficial to soil, vegetation, wildlife, fish, and visual resources. The recommended threshold is: protection, preservation, enhancement, and--where feasible and necessary to regain natural treatment capacity--expansion of stream environment zones. The threshold study identifies no feasible alternative to this recommended threshold.

Surface Runoff. Runoff quality is a major determinant of tributary water quality and must improve to support the pelagic zone, littoral zone, and tributary thresholds. The existing regional water quality plan sets uniform standards for maximum values of total nitrogen, total phosphorus, and total iron found in surface runoff. Analysis of runoff data for the threshold study shows frequent violations of the regional runoff standards from developed and partially developed areas. Natural and semi-natural areas appear, in general, to meet the standards.

The recommended threshold, therefore, for surface runoff quality is the existing regional runoff standards. Adoption of this threshold is recommended on an interim basis, pending further study of the relationship of surface runoff to the Lake's nutrient budget. Also recommended, as part of the interim threshold, is development of a runoff standard for suspended sediment, which does not currently exist. The threshold study identifies no feasible alternative to the recommended surface runoff threshold. For more discussion of surface runoff thresholds, see the study report.

Groundwater. As mentioned in Chapter II, the data on groundwater quality in the Tahoe Basin are limited. However, sub-surface flows may carry nutrients to the Lake on the same order of magnitude as surface flows, having a significant impact on algae growth, especially in the littoral zone. For these reasons, the recommended threshold for groundwater quality is:

> (1) Protection of drinking water supplies through protection of groundwater quality, (2) protection of vegetation and wildlife by maintaining groundwater elevations in sensitive areas, (3) prevention of biostimulation of surface waters from sub-surface flows where linkages between surface and sub-surface flows are known, and (4) increased monitoring and study of groundwater quality, quantity, and movement, especially for nitrogen, phosphorus, and iron.

The threshold study does not identify any feasible alternatives to this recommended groundwater threshold.

Other Lakes. As with groundwater, data on the quality of the other, smaller lakes in the Tahoe Basin are limited. Some of the lakes that border developed areas may be vulnerable to pollution from surface and sub-surface inflows. Other lakes at remote locations in the higher elevations may be virtually undisturbed. However, one must assume that degradation of the smaller lakes will eventually have an impact of Lake Tahoe's water quality, since these sub-components are connected hydrologically. For these reasons, the recommended threshold for the other lakes in the Tahoe Basin is:

(1) Protection of existing water quality in the other lakes and (2) increased monitoring and study of the other lakes to better define their role in Lake Tahoe's water quality.

The threshold study does not identify a feasible alternative threshold for the other lakes.

2. Water Quantity: The environmental threshold for water quantity should set a level of total water use within the Lake Tahoe Basin. Instream flow thresholds should be based on the beneficial use requirements of the stream. Streams that have resident fisheries and flows altered by diversions will be discussed under Fisheries in this chapter. Instream flow levels for the other streams should be maintained to approximate natural flow regimes.

Water Use. The recommended threshold for water use is based on the limitations established for surface and ground water allocations by the California-Nevada Interstate Compact. The recommended threshold is:

> The annual gross diversions of water for use in the Lake Tahoe Basin from all natural sources including ground water shall not exceed 34,000 acre-feet annually, of which 23,000 acre-feet annually may be used in California and 11,000 acre-feet annually may be used in Nevada. For purposes of this environmental threshold, total gross diversions for use shall not include diversions for nonconsumptive purposes, including but not limited to flood control, recreation, fishery and wildlife maintenance and enhancement, and hydroelectric power generation, to the extent that such uses do not result in any discernable depletion of water.

The recommended threshold is not intended to affect the allocation of interstate waters other than the gross diversion permitted by the Compact. If the States of California and Nevada elect to change the allocation, this threshold should be amended accordingly.

Any alternative allocation of water volumes for total use which exceed the levels set by the Interstate Compact would be contrary to the Compact. Implications associated with violating or changing the Compact are significant and generally eliminate any viable alternatives. The no action alternative would perpetuate the existing allocations and consumptive use.

Instream Flows. The recommended threshold for instream flows is based on preserving the natural flow regime and determination of instream flow requirements for fisheries. The recommended threshold for instream flows for fisheries will be covered under Section 8, Fisheries. The recommended threshold for instream flows is as follows:

> Natural instream flows should be maintained or attained to prevent changes in total volume of runoff. Instream flow levels should approximate the peak and base flow duration associated with natural flow regimes.

Instream flows requirements could be set for all streams within the Lake Tahoe Basin. The existing methodology for determination of instream flow requirements is only developed for fisheries as the beneficial use and therefore would not be applicable to all streams. Generally instream flow requirements are easier to attain when existing diversions can be altered to meet the folow requirements.

It is not practical or feasible to develop instream flow requirements for all streams. The no action alternative does not address instream flows and would perpetuate the existing level of instream flows.

3. Soil Conservation: Environmental thresholds for soil have been recommended for two subcomponents while policy statements will be recommended for the others. Impervious coverage and soil productivity will have threshold values.

Impervious Coverage. The recommended threshold for impervious coverage is:

> The limits for impervious coverage as outlined in the Lake Capability Classification of the Lake Tahoe Basin, Bailey, 1974, shall be adopted as the environmental threshold while recognizing impervious coverage also accounts for additional surface disturbance associated with development.

Presently, no alternative systems have sufficient data or applicability to the Lake Tahoe Basin except the Agency coverage standards that limit coverage on a lot-by-lot basis (see Appendix C). The lack of data and feasibility studies to develop new or modified systems to determine allowable impervious coverage is not available. Future efforts may develop other systems and should be considered, provided supporting data is available.

Soil Productivity. The recommended threshold for protection of soil productivity is as follows:

> The Soil Conservation Service "T" factor for acceptable soil loss by soil type in the Lake Tahoe Basin sets the allowable amount of soil loss from an area or watershed without impacting the productivity of the soil.

Alternative values for acceptable soil loss could be determined specifically for the Lake Tahoe Basin. To date, sufficient data has not been collected to provide this type of analysis. Another approach to determining soil loss values could be based on vegetative communities. Research in this area indicates the values for soil loss are less than the SCS "T" factor values. The sediment yield values for soil loss to the streams and Lake could be adopted as the acceptable soil loss standard. Sediment yeild values are lower than the SCS "T" factor values.

The no action alternative would not provide any standard for acceptable soil loss except where the land use would be subject to the thresholds developed for sediment delivery under Water Quality.

Surface Disturbance. The recommended threshold for surface disturbance regarding compliance with existing land use regulations and practices is as follows:

> All surface disturbance whether temporary or long-term shall be minimized to maintain or protect the natural surface conditions and the natural hydrologic regime of the Basin's watersheds.

Alternatives would include setting specific limits on allowable surface disturbance. One such alternative could limit surface disturbance to the land capability standard of impervious coverage plus 10 percent. Enforcement and evaluation of such limits would be extremely complex and subjective. There is no

conclusive data to support what would be an acceptable limit for the extent of allowable surface disturbance associated with protection of the soil.

Stream Environment Zones are defined in the Soil section of Chapter II as the total environment in and adjacent to streams, small lakes, and ponds. It is a close association of water, soil, and vegetation that is one of the most critical, natural components of the Basin. Stream environment zones (SEZ's) are currently protected by Agency ordinance and policy. The recommended threshold for SEZ's is to continue that protection. The proposed threshold is:

> Prohibit, restrict and/or regulate development and use, including transitory use such as hiking, grazing, and off-road vehicle use, within all stream environment zones in the Lake Tahoe Basin to insure maintenance of the areas in a natural condition. Improve and restore the stream environment zone whenever and wherever possible to their prior existing natural character.

Alternatives to the recommended threshold would be variations of the recommendation. They are feasible but would not significantly change the intent. The no action alternative would perpetuate continuation of existing policy.

4. Air Quality: Environmental thresholds for air quality are being proposed for carbon monoxide, subregional visibility, and odor as site specific air contaminants; ozone, acid deposition, and regional visibility as Basin-wide contaminants. As mentioned in the previous Chapter, there are other pollutants for which state and federal air quality standards have been adopted. These standards are not expected to be exceeded in the Basin, therefore, they will not be addressed in the threshold study. Since a threshold is not recommended, the more restrictive of the federal or state adopted air quality standard for the other pollutants will continue to apply.

Carbon Monoxide: Thresholds will be described as parts of CO per million units of air (ppm) based on an 8 hour average. Alternative thresholds are the federal standard, 9 ppm, and the State of California and Nevada standards at 6 ppm. In addition to the 6 ppm and 9 ppm values averaged over 8 hours, there are other alternatives such as 7 and 8 ppm that could be considered. In addition, thresholds less than 6 ppm could also be established.

The more restrictive state standard was adopted by California and Nevada because it was felt carbon monoxide posed a greater health risk to visitors at Tahoe. The scientific community concurs with this supposition but there is no consensus to warrant a high altitude standard or concurrence with what the standard should be. It has been pointed out that there was a mistake made and an inconsistency in the information used to support adoption of the 6 ppm standard. Also, harmful effects of the combination of altitude and carbon monoxide are likely to change fairly rapidly as visitors become acclimated to the Basin.

The recommended threshold for carbon monoxide is 6 ppm averaged over 8 hours. This recommendation is made based upon consensus within the scientific community that the federal standard of 9 ppm may not be sufficient to protect public health at higher elevations. Adopting the lower standard (6 ppm) will also be less disruptive to the continuation of this planning process as the regional plan is required to meet the more restrictive standards applied to the Basin. The recommendation is made based upon the commitment of both California and Nevada to review the standard jointly with the TRPA by December 1, 1982 to resolve the

issues related to this standard. Any changes resulting from this review process will then become a revised carbon monoxide threshold and ultimately incorporated into the regional plan.

Thresholds more restrictive than 6 ppm are not considered viable in this evaluation because concentration less than the 6 ppm level would not have any additional beneficial health related results. Alternatives between the 6 and 9 ppm are not viable as they would not achieve the current state standard. It will continue to be the goal of the Tahoe Regional Planning Agency to not only achieve the threshold standard, but also to strive to maintain current air quality in areas that meet the standard.

Ozone: Thresholds will be described as parts per million based on a one hour average. Alternative thresholds are the federal standard at 0.12 ppm, State of California and Nevada standards, both at 0.10 ppm and lower standards. A review of current research indicates vegetation damage occurs at levels below the adopted State and Federal standards. Concentrations of ozone cause injury to the plant's leaf tissues which in turn reduce photosynthesis in the plant. The injury is more serious in conifers as the needles are retained longer than leaves and must continue the process of photosynthesis for longer periods of time. Jeffrey pine is the most susceptible plant species in the Basin. Based on research, it is staff's recommendation that an environmental threshold for ozone be set at 0.08 ppm averaged over one hour. This standard would reduce ozone concentrations injurious to vegetation averaged for 24 hour periods as well as lowering the average concentrations experienced over the growing season. Loading rates that must be attained to achieve this threshold is 9.4 tons of oxides of nitrogen per average summer day.

Alternatives to the proposed standard are 0.10 ppm, the California and Nevada standard, and 0.12 ppm, the federal standard. These alternative thresholds are not recommended, for either level would perpetuate concentrations of ozone harmful to vegetation. Any standard higher than 0.12 ppm is also unacceptable. Establishing a threshold for ozone at less than the recommended 0.08 parts per million is not required from the standpoint of reducing vegetation damage.

Acid Deposition is commonly referred to as "acid rain." As discussed in Chapter II, it is not a problem in the Basin with the exception of nutrient loading of nitrate directly into the Lake. This results from dry deposition of nitrates falling from the atmosphere and nitric acid and nitrates being absorbed by rain water. Both are formed from oxides of nitrogen. The atmospheric chemical conversion and/or removal process involving nitrates are not fully understood. The source is probably from both inside and outside the Basin. For these reasons, it is not possible to develop a threshold at this time. A study is currently underway to determine the atmospheric sources of the pollutant. However, a policy should be adopted by the TRPA to coordinate with others to reduce the transport of nitrates into the Basin and reduce oxides of nitrogen produced in the Basin.

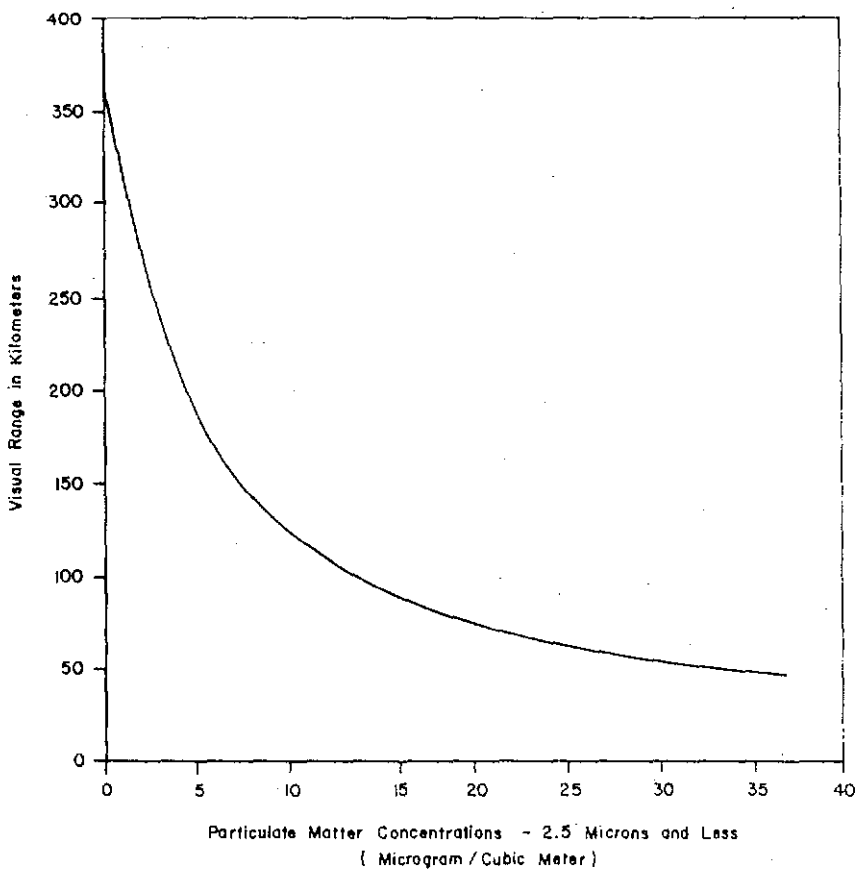
The Regional Visibility threshold will be described as the number of kilometers an object can be seen 50 percent and 90 percent of the time. The distance one can clearly see is dependent upon the concentration and type of particulate matter less than 2.5 microns in diameter suspended in the atmosphere. Because sulfates degrade visibility more than other particulates, fewer particles can play a larger role in visibility degradation. A model was developed to show

this relationship of sulfates to other particles using sampling obtained at Sugar Pine Point. The following table shows the approximate contribution of various particulate matter sources to visual degradation as a percent of the total.

Source	Overall	Summer	Winter
Soil	4	6	3
Sulfate	40	34	43
Automobile	2	1	2
Wood Smoke	about 25	about 20	about 30
Pine Trees	about 25	about 40	about 15
Other	less than 1	less than 1	less than 1

Soil components are generated by a number of sources both from within and outside the Basin. Sulfates are primarily transported into the Basin from adjacent urban and industrial areas. Automobile particulates originate within the Basin as does wood smoke from residential use and prescribed burning. (Note - periods of major forest fires and other burning were not included in the above data and should not be considered in determining if thresholds are being met.) Particulate matter from pine trees is a result of terpenes being emitted and forming particles in the atmosphere. By looking at the data and each source, internal control can only be exercised for less than 30% of the problem (automobiles and wood smoke) as the rest (sulfate and/or pine trees) are either primarily imported into or natural components of the Basin.

As particulate matter less than 2.5 microns in diameter and the concentration of sulfates increases, visibility decreases. The accompanying graph shows visual range in kilometers anticipated when particulate matter concentrations increase.



Visibility within the Lake Tahoe Basin was measured during the Visibility Study conducted between June and December of last year. The number of times viewers could see specific distances varied, depending on the amount of particulate matter and sulfate in the air. The following table indicates the visual range in kilometers and miles that would be experienced as a percentage or frequency of the number of times measured. In other words, one would expect to see at least 215 kilometers only 20 percent of the time while one could see 121 kilometers 80 percent of the time.

Frequency - Percent of Views	Range in Kilometers	Range in Miles
10	239	143.4
20	215	129.0
30	195	117.0
40	180	108.0
50	166	99.6
60	152	91.2
70	138	82.8
80	121	72.6
90	94	65.4

Environmental thresholds are expressed in terms of kilometers of visibility to be obtained throughout the year. Looking at the above table, maintaining the current level of visibility would result if a threshold of 166 kilometers was selected as this is the average experienced in the Basin. Alternatives to improve visibility would result if a threshold was established above 166 kilometers. Visibility would generally be degraded if a threshold below 166 kilometers was established. Achievement of any one of these thresholds is dependent on maintaining or reducing concentrations of particulate matter and sulfates that directly affect visibility. Based on these considerations plus a perception of human values, staff recommends an environmental threshold for visibility be established at 171 kilometers or 103 miles 50 percent of the time. A minimal threshold is also recommended that would maintain visibility at no less than 97 kilometers 90 percent of the time. This recommendation requires maintenance of ambient concentrations of particulate matter less than 2.5 microns in diameter and the ratio of sulfates to non-sulfates necessary to achieve the threshold. It will also require a 15 percent reduction in wood smoke emissions to achieve the visibility threshold.

The Subregional Visibility. The subregional visibility threshold will also be described as the number of kilometers an object can be seen 50 and 90 percent of the time in the developed areas of the Basin. Visibility in these areas is less because the particulate matter concentrations are higher. The subregional visibility problem, or layer of haze, is dependent upon the concentration and type of particulate matter less than 15 microns in diameter suspended in the atmosphere.

The subregional visibility problem is caused primarily by dust being suspended in the atmosphere by automobiles and by wood smoke. In the summer, the major source of particulate matter is from automobile traffic on unpaved and paved roads. In the winter, the major source is from sanding material from U.S. 50 being ground up and suspended in the air and from wood smoke.

The following table indicates the subregional visual range in kilometers and miles that would be experienced as a percentage or frequency of the number of times measured.

Frequency - Percent of views	Range in Kilometers	Range in Miles
10	163	101
20	126	78
30	103	64
40	83	52
50	70	43
60	57	35
70	45	28
80	35	22
90	24	15

Based on the above table, maintaining the current level of visibility would result if a threshold of 70 kilometers was selected as the average. Alternatives are selecting either a lower or higher value. Achievement of the subregional threshold is dependent on maintaining or reducing concentrations of coarse particulate matter suspended by traffic and wood smoke. The recommendation is that a subregional threshold be established at 87 kilometers or 54 miles 50 percent of the time. A threshold is also recommended that would maintain visibility at no less than 26 kilometers or 16 miles 90 percent of the time. The emission reduction target to achieve the subregional visibility threshold requires a 15 percent reduction in wood smoke emissions and a 30 percent reduction in soil particulate.

Odors: With an increase in elevation, more fumes and odors are produced from diesel engines. There are three things that can be done to reduce these fumes. The first would be to run the buses on propane rather than diesel. This is a fairly inexpensive conversion. The second would be to add fuel additives, also fairly inexpensive. The third would be to have the exhaust gases released from a raised tail pipe above the level of traffic.

It is not possible to develop a meaningful ambient standard to deal with diesel fumes. Therefore, the following threshold is recommended:

Reduce the impact or odor of fumes from diesel buses to the extent feasible.

5. Noise: Environmental thresholds for noise are proposed for single events related to specific activities and for cumulative impacts (CNEL) of repeated noise events in specific land use categories. Existing standards were identified in Chapter II of this document, primarily for single noise events. In addition, there are acceptable noise levels for cumulative impacts of repeated noise events. The acceptable levels are indicated in the following table provided by the California Office of Noise Control. The "normally" acceptable range may result in a few complaints, "conditionally" would result in complaints, and "unacceptable" should be reason enough for no development or use within those areas. The CNEL range is measured in dbA.

Land Use Category	Clearly Acceptable	Normally Acceptable	Conditionally Acceptable	Unacceptable
High Density Residential	40-55	56-65	66-75	75+
Low Density Residential	40-50	51-60	61-70	70+
Hotel/Motel	40-50	51-60	61-70	70+
Commercial	45-65	66-75	76-85	85+
Urban Outdoor Recreation	45-55	56-65	66-75	75+
Rural Outdoor Recreation	45-50	---	---	50+

Thresholds are proposed for cumulative impacts (CNEL) based upon the clearly acceptable range in the above table. It was determined normally and conditionally acceptable ranges usually applied to highly urbanized areas, did not pertain to the Lake Tahoe Basin.

Single Noise Events. Environmental thresholds for each of the following sources are recommended as the proposed action. They are the same as adopted standards and are expressed in dbA.

Source	Overall	Less Than 35 MPH	Greater Than 35 MPH
Aircraft	80	--	--
Boats	82	--	--
Motor Vehicles Less Than 6,000 GVW	--	76	86
Motorcycles	--	82	86
Off Road Vehicles	--	72	86
Snowmobiles	--	82	--

Monitoring guidelines for aircraft are at positions 6,500 meters from the start of takeoff roll and 2,000 meters from the runway threshold approach. Boats on the open waters of Lake Tahoe are measured at 50 feet with the engine running at 3,000 r.p.m. This standard is being reduced from 86 dbA to 82 dbA in California for newer boats. The thresholds for motorized vehicles are based on a distance of 50 feet from the center lane of travel and apply to any condition of grade, load, acceleration, and deceleration.

Alternative thresholds are available and for the most part would need to be lower than those identified above as they are at the level of existing standards. No other alternatives have been proposed.

Cumulative Impacts of Repeated Noise Events. Environmental thresholds for each of the following land uses are recommended as the proposed action in the impact statement. The standards are decibels permitted using the community noise equivalent level (CNEL) averaged over 24 hours.

Land Use Category	Threshold-CNEL (dbA)
High Density Residential	55
Low Density Residential	50
Hotel/Motel	50
Commercial	65
Urban Outdoor Recreation	55
Rural Outdoor Recreation	50

Alternatives to the recommended threshold exist, as the standards proposed above are the high values of the clearly acceptable range according to land use types identified. The alternatives could be toward the lower end (40) of the clearly acceptable range or towards the upper end (61-75) of the normally acceptable range.

In addition to the CNEL thresholds measured in decibels identified above, it is appropriate to recommend nondegradation policies for both wilderness and roadless areas and critical wildlife habitats. The recommended threshold is:

> It is the policy of the Tahoe Regional Planning Agency to encourage maintenance or improvement of noise levels appropriate to both the anticipated wilderness and backcountry experience and to the critical habitat needs of the Basin's wildlife.

6. Vegetation Preservation: The technical evaluation of vegetation is described in the Threshold Study Report. The analysis was basically structured around existing inventory information, the Cal-Veg Mapping System, and the findings of the other component studies. Detailed analysis dealt with (1) common vegetation, (2) uncommon plant communities, and (3) sensitive plant species.

Common Vegetation. This subcomponent refers to plant communities that are readily viewed by the public. The dominant landscape feature is conifer vegetation but also included in this category are the open canopy and wetland associations. The threshold evaluation process for common vegetation incorporated considerations of such attributes as scarcity and value as related to recreation, aesthethics, wildlife, and water quality. The understanding of vegetation value was built from the threshold studies pertaining to these particular environmental components.

The relative abundance of different plant communities is shown as acres of various vegetation types in the following table. Since this summary is based on ground coverage estimates of vegetation, it is somewhat misleading, especially with regard to the prevalence of shrub vegetation. Shrubs contribute to the ground cover of sparse forest stands but extensive stands of shrubs are relatively uncommon. Conifers invade these open areas, effectively eliminating dense and expansive stands of shrub vegetation. Shrubs are totally "squeezed-out" in situations of dense conifer coverage. The coverage of wet meadows, wetlands, perennial grass, and deciduous riparian vegetation is a more realistic estimate of "riparian" abundance since these communities rarely occur as understory vegetation. Riparian vegetation comprises only 7% of the total plant acreage. Conifers are the most widely distributed vegetation-type and are only absent on high mountain peaks, wetland, and dense urban areas. In the absence of fire and other forms of disturbance, conifers will eventually replace the open community areas, as well.

Vegetation	LAND USE				
	Undisturbed	Industrial	High Density	Low To Moderate Density	Commercial Services
Wet Meadows	48	---	---	---	---
Wetlands	3,441	---	---	---	---
Mule Ears	1,270	---	---	36	---
Perennial Grass	4,143	---	---	---	---
Alpine Scrub	6,254	---	---	---	---
Montane Shrub	57,933	---	---	---	---
Mahogany	187	---	---	---	---
Sagebrush	19,928	---	---	---	---
Bitterbrush	7,230	---	---	---	---
Dec. Riparian	4,845	---	---	---	---
Lodgepole Pine	6,144	---	7	3,609	---
Subalpine	1,215	---	---	---	---
Red Fir	8,503	---	---	---	---
Jeffrey Pine	309	---	---	178	---
Mixed Conifer	51,994	---	12	8,137	119
Non-Forest		5	4,714	---	3,527

Thresholds pertaining to common vegetation address several basic concerns. The first deals with the "condition" of the conifer vegetation. The conifer forests tend to be of an even-age (mature) with stands becoming increasingly dense. This situation is unfavorable in terms of forest health, plant diversity, and structural diversity. An appropriate threshold to address this situation is recommended as follows:

> Provide for increased plant and structural diversity in the forest communities through management practices that are appropriate to the silvicultural requirements of the species and to water quality, visual quality, and other requirements of the Basin. Also, successional stages of plant communities that are out of balance with other stages, such as seedlings and old growth conifers, shall be protected until greater diversity is achieved through management.

The intent of this threshold is to provide opportunities to encourage revegetation of selected sites with younger aged conifers or riparian-type vegetation and to protect against the loss of less common successional stages. Some of the strategies to achieve a more diverse plant community include revegetating sites that have been cut-over or burned. Forest management practices of patch cutting, controlled burns, and thinning should not be discouraged if revegetation is proposed to help improve the diversity or health of the forest community.

A second concern deals with the relative importance of vegetation. All vegetation plays a variety of roles in a natural ecosystem but it was generally found that wetlands, meadows, and other riparian vegetation are the most critical or valuable plant communities in the Basin. As indicated earlier, riparian vegetation is also very scarce relative to the other plant communities. An appropriate threshold is:

> Increase the total amount of meadow, wetland, and other riparian vegetation.

A threshold is also proposed to address the functional role of vegetation as related to soil stabilization and water quality. For sites that have been altered due to construction or other land disturbing activities, the following is proposed:

> Native vegetation shall not be removed from any site except where impervious coverage or forestry practices are authorized. The objective and ultimate goal of revegetation shall be to reestablish native vegetation.

Alternatives to the proposed thresholds are very limited. Wording changes in the statements are possible but the no action alternative cannot be considered due to Compact requirements to establish a threshold for vegetation preservation. An alternative that can also be considered, because of the scarcity and past loss of riparian vegetation, would be to strengthen the riparian threshold by requiring the removal of structures from riparian areas.

Uncommon Plant Communities. For plant communities that are uncommon to the Basin or have exceptional scientific, ecological, or aesthetic value, the following threshold is recommended:

> Provide for the conservation/management for any plant community that is uncommon to the Basin and of exceptional scientific or aesthetic value.

This threshold shall apply but not be limited to the following known sites:

1. Grass Lake
2. Osgood Swamp
3. Freel Peak Cushion Plant Community
4. Lake Tahoe Deep Water Plants

Alternatives to the recommended threshold are again limited. One alternative would be to add scarce plant communities such as aspen and old growth conifers to the uncommon category. A conservation threshold would then be applied to these communities.

Sensitive Plant Species. Plant species considered vulnerable to extinction fall within this subcomponent. The recommended environmental threshold is to maintain a minimum number of population sites for each of the sensitive plant species. The sites are keyed to the mapped locations shown in Chapter II.

Species	Number of Population Sites
Carex paucifructus	1
Lewisia pygmaea longipetala	2
Draba asterophora v. *macrocarpa*	2
Draba asterophora v. *asterophora*	5
Rorippa subumbellata	26

The sites will be identified as essential habitat where activities such as grading, trampling, grazing, and habitat modification will be controlled. The threshold would protect each of the identified species and sites plus any additional sites found in the future.

An alternative to the proposed threshold would maintain all of the identified sites plus provide for recovery of the species on private land. Recovery of species on private land, in this case Rorippa subumbellata, would do more than simply preserve existing population sites. It would seek to reintroduce the species into other suitable sites in an effort to increase the population of the plant. This alternative would also seek the cooperation of state and federal agencies in efforts to increase the populations of all other species.

7. Wildlife: Environmental thresholds for wildlife species are designated in part for only a few that stand out as unique or special among the several hundred species occurring within the Lake Tahoe Basin. To be effective, the standards must apply both to the populations known to exist and to those yet to be discovered. Standards must be flexible to account for new or overlooked populations. Environmental thresholds are recommended for general protection of each of the following species:

Goshawk. There are a minimum of twelve goshawk nest sites in the Lake Tahoe Basin but not all nests are active since the birds alternate sites from year to year. The recommended threshold is to retain all 12 sites if the current goshawk production level is to be maintained. This threshold establishes a zone of 1/2 mile around each active nest site that must remain free from disturbance. Certain forest practices and other temporary disturbances are acceptable if they occur during the non-nesting season and if they have no adverse impacts on the cover, food, and water requirements of the birds.

Osprey. Ospreys have nested at four locations within the Lake Tahoe Basin. Each site is near the Lake shoreline, far from urban disturbance. The recommended threshold is to retain the viability of all four sites by restricting disturbing activities and habitat modifications to areas outside a 1/4 mile radius of each nest site.

Bald Eagle. Winter populations of bald eagles range from 6 to 12 birds concentrated primarily along Taylor Creek and the Upper Truckee Marsh (Barton Meadows). The sites are adjacent to the Lake and provide favorable perching trees and foraging habitat for their preferred food items of fish and waterfowl. The recommended threshold is to retain the two habitat areas as mapped and control human activity and habitat modification within the areas to protect against further declines in the wintering populations.

A pair of bald eagles historically nested at Eagle Point in Emerald Bay but abandoned the nest site in 1971. The Lake Tahoe Basin Management Unit of the Forest Service is considering a reintroduction plan for bald eagles that would manage sites close to water with sufficient numbers of large trees suitable for nesting and perching. The recommended environmental threshold is to protect each of the reintroduction sites by providing a 1/2 mile buffer around the nest. Forest practices in the vicinity would be limited to those activities that enhance the habitat and no disturbance would be permitted during the nesting season.

Golden Eagle. Four golden eagle nest site locations have been identified in the Basin near Round Lake, Mt. Pluto, Angora Peak, and Martis Peak. Martis Peak is not a confirmed site and past accounts also speak of nests on the cliffs of Glen Alpine Canyon, Mt. Tallac, and in the mountains southeast of Bijou. Since golden eagles have a large home range of about 20 to 60 square

miles, it is not unusual to see vagrants from outside the Basin. The recommended threshold for the golden eagle is to protect the four nest sites by establishing a non-disturbance buffer of at least 1/4 mile around each.

Peregrine Falcon. Peregrine falcons historically nested at Cave Rock and Echo Summit but no active nests have been recorded since the 1940's. The Forest Service has identified two possible reintroduction sites with an Agency goal of re-establishing at least one nesting pair. The sites near Round Lake and Dardanelles Lake will be managed to exclude adverse impacts of habitat modification and human disturbance. The recommended threshold is to maintain the two sites and prohibit most activities within a 1/4 mile radius of the sites.

Waterfowl. For purposes of simplification, the term waterfowl includes species of ducks, geese, shorebirds, loons, grebes, mergansers, herons, rails, gulls, and terns. They are dependant upon the wetland areas for essential feeding and nesting habitat. As the extent of wetland habitat has declined over the past 40 years, the number and variety of nesting species has also declined. The remaining locations for waterfowl habitat are found at 18 sites, totaling approximately 1,640 acres. The recommended threshold for waterfowl species is to protect all 18 sites and prevent further deterioration of this habitat. This threshold will also apply to sites later identified as waterfowl use areas.

Deer. Open forest areas such as meadows, shrublands, and aspen communities provide critical fawning and feeding habitat for deer. There is no practical way of determining how much area is necessary for the well-being of the species but it is clearly understood that habitat degradation has contributed significantly to the decline of regional deer populations. The recommended threshold is to adopt the mapped deer use areas, encourage interagency cooperation involving deer management, and to insure that better informed land use decisions are made affecting the species. In addition, the threshold would offer protection of meadows from unnecessary modification and seeks to limit encroachment by unfavorable disturbances such as noise and domestic animals.

The following table summarizes the recommended thresholds for each of the identified wildlife species. It first lists the species for which thresholds are proposed, identifies a minimum number of population sites, and states a disturbance free zone and secondary influence zone in terms of miles from the site. Each population site is mapped on USGS quad maps and are available for inspection at the TRPA office. The threshold applies not only to the number of known population sites, but will also apply the disturbance and influence zone "buffers" to sites found in the future.

Species	Population Sites	Disturbance Zone	Influence Zone
Goshawk	12	0.50	3.5
Osprey	4	0.25	0.6
Bald Eagle (winter)	2	Mapped Areas	Mapped Areas
Bald Eagle (nesting)	1	0.50	Variable
Golden Eagle	4	0.25	9.0
Peregrine Falcon	2	0.25	7.6
Waterfowl	18	Mapped Areas	Mapped Areas
Deer	-	Meadows	Mapped Areas

The influence zone is included for purposes of describing the foraging or territorial range of the species. It is not intended to act as a deterrent to most types of development. The critical area where most disturbance must be closely monitored and controlled is within the disturbance zone. Neither zone will be enforced in cases where the species moves to the disturbance. In other words, an ongoing activity would not be in violation of the threshold if a special interest species built a nest adjacent to or within the activity area.

Alternatives to the recommended thresholds are very limited as those proposed represent tested and verified information. Options that were considered include changing the number of special interest species to include more, the number of population sites, and size of the disturbance and influence zone. Each is discussed below as an alternative to the proposed action.

Species identified in the recommended threshold are those considered to be especially vulnerable to loss. Species identified as sensitive by the Forest Service also include wolverine, Sierra red fox, marten, fisher, mountain lion, prairie falcon, spotted owl, flammulated owl, and pileated woodpecker. This alternative would include these species along with the recommended threshold and support Forest Service efforts to recover them.

Alternatives to the number of population sites presented in the recommended threshold are not realistic since those proposed represent actual nest sites and the minimum number to be retained. Any reduction would likely produce a population decline while site specific identification of more is not appropriate, not knowing if and where the species might nest. There is, then no alternative.

Each proposed disturbance zone is a scientifically based estimate made by biologists on how close certain forms of disturbance can encroach upon population sites without causing harm to the species. The two zones - disturbance and influence - distinguish between the most critical and secondary zones. Adequate protection may be possible by simply managing the disturbance zone and ignoring the influence zone.

Habitats of Special Significance. This refers to the most important or productive wildlife habitat(s) in the Basin. Identification of the habitat-type was accomplished using a Wildlife Habitat Relationships (WHR) model. A Habitat Evaluation Procedures (HEP) model was then used to evaluate the existing quality of the habitat. Two general conclusions were made from the analyses:

1. Meadow, wetland, and deciduous riparian vegetation provide the best quality habitat for a majority of the wildlife species in the Basin; and

2. Too much riparian vegetation has already been lost due to natural and man-made modifications.

To provide for the needs of the common wildlife species, the recommended threshold is to "maintain the existing riparian vegetation (see glossary definition) and increase the total acreage wherever possible."

Alternatives to the recommended threshold for habitats of special significance are to maintain the existing riparian vegetation as stated in the recommended threshold and also to restore its quality. Specific recommendations include removing structures or other impervious surfaces from meadows, wetland areas, and areas supporting stands of deciduous vegetation such as aspen, alder, willow, and cottonwood. In addition, movement corridors are to be protected by removing all structures within 100 feet of stream channels not bordered by wetland, meadows, or deciduous trees.

The no action alternative perpetuates the status quo with no special protection provided for special interest and endangered species on private lands. For habitats of special significance, there would be no policy to increase the amount of riparian vegetation or protect vegetation not currently included in Agency ordinances.

8. Fisheries: The threshold evaluation process for fisheries was focused on habitat. Evaluation criteria used in the rankings of streams and Lake habitat were developed jointly by State fishery and Forest Service biologists in conjunction with TRPA staff. The criteria and detailed summary of the ranking process and study results are included in an appendix to the Environmental Threshold Carrying Capacity Study Report.

Stream Habitat. The recommended threshold for the 218 miles of streams containing essential fishery habitat is:

75 miles of excellent stream habitat will be maintained;
105 miles of good stream habitat will be maintained; and
38 miles of marginal stream habitat will be maintained.

The recommended threshold will require the upgrading of 51 miles of stream from the good to excellent category and 91 miles from marginal to good. It is based on the ranked miles of streams shown on the accompanying map with upgrading or changes in categories permitted only for those streams included the analysis. In addition, Blackwood Creek will be maintained as a "priority research stream" which provides for special prioritization of remedial work on 3.54 miles of migratory habitat and 4 miles of resident fish habitat.

It was generally found that the fishery potential of a stream was limited by a combination of three factors:

1. Excessive stream flow diversions;
2. Blockage that inhibit fish migration; and
3. Unstable stream banks and erosion and siltation problems.

The elimination of these types of problems will assist in improving the Tahoe fishery.

The alternative to the recommended threshold is maintenance of streams in their current condition with no upgrading anticipated. This alternative would prevent further degradation of stream habitat. The number of miles in each category, as described in Chapter II is as follows:

24 miles of excellent stream habitat;
65 miles of good stream habitat; and
129 miles of marginal stream habitat.

Blackwood Creek would again be designated as a priority research stream with improvement of the stream targeted.

The no action alternative would retain streams within their existing ranking in the short term but would not prevent further deterioration in the future. A priority research stream would not be identified and no streams would be targeted for maintenance or improvement.

Instream Flows. The maintenance of a prescribed level or flow of water in streams is critical to the biological and aesthetic qualities of a stream. Some streams in the Basin have natural low flows that people have little control over. In other circumstances, low but adequate flows are further reduced by diversions. Water is diverted from streams for reasons that include domestic consumption, irrigation, and snow making. The Board will be asked to establish instream flow standards at a future date for those streams that are susceptible to extreme low flow conditions due to water diversion. Adoption of the standards would help initiate efforts to transfer water diversions from the streams to the Lake.

The methodology of determining instream flow requirements is both complicated and time consuming. Should the Board decide to adopt instream flow standards, staff will initiate the appropriate studies and present the recommended flows to the Board within one year time as part of the regional plan.

Alternatives to establishing instream flow standards for many creeks is to do it for just a few creeks. Creeks under this alternative would be prioritized for review based on a critical need assessment. No action may result in excessive diversion of creek water, thereby reducing the fishery potential of the Tahoe fishery.

Lahontan Cutthroat Trout. Various agencies are currently exploring the potential for reintroduction of the native Lahontan cutthroat trout back into the Basin. The recommended threshold is "to support, in response to justifiable evidence, state and federal efforts to reintroduce the native Lahontan cutthroat trout." The only alternative is not to support their effort.

Lake Habitat. Approximately 5,948 acres of excellent spawning and feeding habitat occur along the shallow margins of Lake Tahoe. About 53 percent of this total area experiences moderate to heavy boat traffic effectively reducing 3,172 acres from the excellent to good category. The recommended threshold for Lake habitat is to restore all of the good habitat back to an excellent category by reducing the disturbances to an acceptable level. This would leave the excellent category at its full 5,948 acres and would retain 2,813 acres as marginal areas or areas suitable for intensive recreational activities. Mitigation would be required to again elevate the good category to excellent or the achievement of natural conditions.

The alternative to the recommended threshold is to maintain the existing quality of the Lake habitat. Further deterioration would be prohibited but none would be upgraded. The following depicts maintenance of existing conditions:

Ranking	Acres	Percent of Total
Excellent	2,776	32
Good	3,172	36
Marginal	2,813	32

Lake Tahoe Basin

Stream Fishery Quality

Potential

Resident

Excellent

Good

Marginal

Migratory

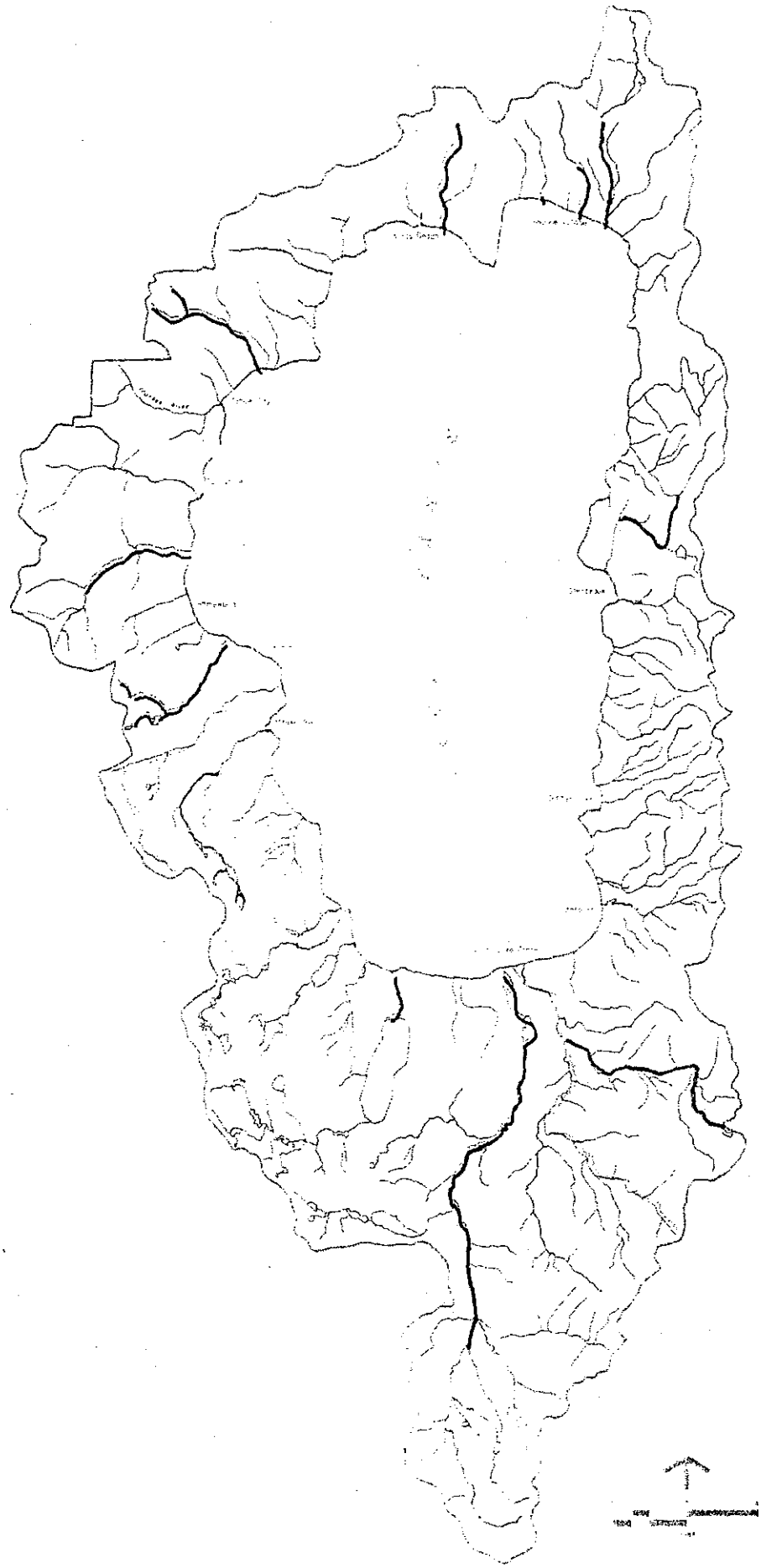
Excellent

Good

Marginal

Feeder Streams

NOTE: Truckee River drainage not considered in this analysis



A second alternative to the recommended threshold would be to choose a point within the range between the existing and natural acreage standards. Selection of this "in-between" point could be based on a distinction between so-called spawning habitat and prime fish habitat.

The no action alternative would permit continuation of current development and use patterns within Lake Tahoe and would allow further deterioration of the fish habitat.

9. Outdoor Recreation: The focus of environmental thresholds for the outdoor recreation resource is the protection and enhancement of opportunities unique to the Lake Tahoe Basin. Attainment of air, water, noise, vegetation, fish, wildlife, and visual thresholds are an essential part of and will support the recreation resource.

Recreation thresholds will be recommended for the undeveloped land resource, the shorezone resource, and land devoted to developed recreation. The undeveloped land resource includes the land area within ROS classifications of semi-primitive and roaded natural as identified and mapped in Chapter II. The shorezone resource is the beach area of the Lake described in Chapter II. The third sub-component of the recreation resource is the area of land devoted to developed recreation facilities such as campgrounds, ski areas, picnic grounds, and boat ramps, to name a few.

Undeveloped Land. The recommended threshold for the undeveloped land resource is:

> Preserve high quality undeveloped areas in their natural state and reserve the areas for low density recreation uses consistent with the high quality recreation experience.

High quality areas are identified by environmental features such as unique geological formations and vegetation, abundance and diversity of wildlife, outstanding scenic qualities, and opportunity for isolation. One such area is Desolation Wilderness. Other potential areas include inventoried roadless areas and adjacent lands. Thresholds will limit development and use inconsistent with each identified area. Identification of the areas will ultimately be made by the land managing agencies responsible for the areas in cooperation with the Tahoe Regional Planning Agency.

Alternatives to the recommended threshold include: 1) Allow development and use in high quality undeveloped areas; 2) preserve all undeveloped areas in a natural state; and 3) no action. The first alternative would permit loss of the high quality undeveloped land resource as it is known today in favor of facilities to accommodate camping, skiing, and other intensive uses. The second alternative would close the door to any further development in all undeveloped areas while the no action alternative would not address the issue. Land managing agencies would make their own decision, probably without overall Basin coordination.

Shorezone. The recommended threshold for the shorezone areas is:

> Preserve high quality undeveloped shorezone areas in their present natural state.

High quality undeveloped shorezones are identified by their distance from roads and existing development and by opportunities to enjoy the natural environment. Achieving the recommended threshold would limit improvements primarily to improving access while maintaining the characteristics that make the undeveloped shorezone area high quality. Direction would be to maintain the areas as permanent open space in the regional plan.

The only alternative considered, other than no action, is to allow development of the high quality, undeveloped shorezones. This alternative would permit development such as paved roads, parking, permanent structures, and piers. The no action alternative would allow decisions on use to be made by the individual agencies or entities responsible for the area.

Access, Density of Use, Capacity. To increase utilization of public recreational resources, the following threshold is recommended:

> Provide access to the high quality undeveloped areas and assure reasonable public access to the Lake-front.

Achieving this threshold requires identifying access locations to the areas and limiting development that interferes with access. This would need to be done in updating the regional plan.

The alternative to this threshold maintains existing access points. The no action alternative allows decisions on access to be made by individual agencies without policy direction from TRPA.

Developed Recreation. Two thresholds are recommended for land devoted to developed recreation. The first seeks to maintain or improve existing developed recreation areas and preserve their rural setting. The recommended threshold is:

> Maintain the recreational capacity of any developed facilities when implementing other threshold standards and preserve their rural setting.

The second recommended threshold is:

> Encourage expansion of all public recreational facilities throughout the Basin consistent with projected demand, the facilities and plans of other jurisdictions, the rural setting, and other threshold standards applicable to each specific area.

Implementing these thresholds will require the following actions in preparing the regional plan:

1. Designate land and shorezone areas for recreation facility development consistent with plans of other agencies.

2. Designate adequate land for public recreational facilities serving resident populations.

3. Do not allow recreation facilities that will exceed or contribute to exceeding other thresholds.

4. Reserve capacity of other basic facilities such as roads, sewer, and water for expected visitor demand at planned recreational facilities.

5. Reserve an adequate amount of land coverage and other limited environmental component capacities for planned public recreational facilities.

Alternatives to the recommended thresholds would allow capacity to be reduced, would prohibit expansion, or would leave the issue in the air with little Basin-wide coordination.

10. Scenic: Environmental thresholds for the scenic quality of the Lake Tahoe Basin will be assigned to each of the 46 roadway units and 33 shoreline units. The purpose is to establish a mechanism for protection and a means to monitor change to the resource.

The basic threshold is expressed in numeric terms, representing existing scenic quality and sensitivity to change in each roadway and shoreline unit. The scenic quality of each unit was rated on the basis of the four visual criteria (unity, vividness, variety and intactness). Each unit was assigned a number from 0 to 3+. A rating of 3 indicates high visual quality, 2 indicates moderate visual quality, 1 indicates low visual quality, and a rating of 0 indicates an absence of visual quality. A rating of 3+ is assigned to a unit with exceptionally high visual quality. The assignment of numbers to units is intended to express comparative ratings of value rather than absolute numerical measurement.

In addition to the scenic quality ratings, each unit is also assigned a sensitivity to change rating. This rating expresses the degree of vulnerability of the scenic resources within a given unit to change. A rating of 3 indicates a high degree of sensitivity to change, 2 indicates moderate sensitivity, and 1 indicates low sensitivity. The factors considered in determining this rating include the following:

1. Characteristics such as the elements within or the composition and arrangement of the resource subcomponents.

2. Location of the individual subcomponents and the likelihood that outside influences, such as land use changes, would alter the quality of the resource.

3. Conditions within the unit, such as erosion or vegetative removal, that may be expected to change or impair the scenic resources.

Roadway Units. The recommended threshold for each of the 46 roadway units is as follows:

Roadway Unit No.	Roadway Unit Name	Scenic Quality Rating	Sensitivity to Change Rating	Recommended Threshold	1982 Travel Route Rating
1	Tahoe Valley	3	2	5	11
2	Camp Richardson	2	1	3	20
3	Emerald Bay	3+	3	6+	26
4	Bliss State Park	3	1	4	21

Roadway Unit No.	Roadway Unit Name	Scenic Quality Rating	Sensitivity to Change Rating	Recommended Threshold	1982 Travel Route Rating
5	Rubicon Bay	2	2	4	17
6	Lonely Gulch	2	2	4	17
7	Meeks Bay	3	3	6	13
8	Sugar Pine Point	3	3	6	23
9	Tahoma	1	2	3	13
10	Quail Creek	2	2	4	14
11	Homewood	2	1	3	13
12	Tahoe Pines	3	2	5	17
13	Sunnyside	3	3	6	14
14	Tahoe Tavern	1	2	3	13
15	Tahoe City	1	2	3	12
16	Lake Forest	2	2	4	13
17	Cedar Flat	2	2	4	17
18	Carnelian Bay	2	2	4	14
19	Flick Point	2	2	4	14
20	Tahoe Vista	2	2	4	10
21	Stateline	2	3	5	20
22	Crystal Bay	1	2	3	12
23	Mt. Rose Highway	3	3	6	25
24	Tahoe Meadow	2	2	4	26
25	Ponderosa Area	1	2	3	12
26	Sand Harbor	3+	3	6+	26
27	Prey Meadow	3	2	5	27
28	Spooner Summit	2	2	4	16
29	Cave Rock	3	3	6	23
30	Zephyr Cove-Lincoln Park	3	2	5	18
31	Meadow	2	1	3	14
32	Casino Area	1	1	2	13
33	The Strip	1	1	2	6
34	El Dorado Beach	2	2	4	16
35	Al Tahoe	1	1	2	7
36	Airport Area	2	1	3	15
37	Echo Summit	3	2	5	26
38	Upper Truckee River	2	2	4	18
39	Alpine Summit	3+	3	6+	24
40	Brockway Cutoff	2	1	3	15
41	Brockway Summit	2	1	3	21
42	Outlet	3	2	5	10
43	Lower Truckee River	3	2	5	20
44	Kingsbury Grade	2	3	5	13
45	Pioneer Trail North	1	1	2	10
46	Pioneer Trail South	2	2	4	20

The recommended threshold numerical values expressed above will be maintained or improved. In addition, roadway units with a 1982 travel route rating of 15 or below should be targeted for scenic restoration. The mechanisms for maintenance and/or improvement will be developed during the regional plan updating process. Techniques will include an evaluation of human alterations, signing policies,

architectural review guidelines, and lighting policies. In addition, periodic updates of the scenic analysis must be undertaken to monitor visual conditions in the Basin.

Shoreline Units. The recommended threshold for each of the 33 shoreline units is as follows:

Shoreline Unit No.	Shoreline Unit Name	Scenic Quality Rating	Sensitivity to Change Rating	Recommended Threshold	1982 Travel Route Rating
1	Tahoe Keys	1	1	2	9
2	Pope Beach	2	2	4	8
3	Jameson Beach	3	1	4	8
4	Taylor Creek Meadow	3	3	6	13
5	Ebrite	2	3	5	9
6	Emerald Bay	3+	3+	6+	12
7	Bliss State Park	3+	3+	6+	12
8	Rubicon Point	3	2	5	12
9	Rubicon Bay	1	2	3	6
10	Meeks Bay	3	2	5	9
11	Sugar Pine Point	2	2	4	11
12	McKinney Bay	2	1	3	9
13	Eagle Rock	2	1	3	11
14	Ward Creek	2	1	3	10
15	Tahoe City	1	1	2	5
16	Lake Forest	2	2	4	5
17	Dollar Point	2	3	5	10
18	Cedar Flat	2	2	4	8
19	Carnelian Bay	2	2	4	5
20	Flick Point	2	2	4	8
21	Agate Bay	2	1	3	8
22	Brockway	2	3	5	10
23	Crystal Bay	2	3	5	11
24	Sand Harbor	3	3	6	12
25	Skunk Harbor	2	3	5	13
26	Cave Rock	2	2	4	10
27	Lincoln Park	1	2	3	8
28	Tahoe School	2	1	3	11
29	Zephyr Cove	2	2	4	9
30	Edgewood	2	2	4	11
31	Bijou	2	1	3	9
32	Al Tahoe	1	1	2	9
33	Truckee Marsh	3	3	6	14

Again, the expressed numerical values will be maintained or improved using the techniques described with roadway units above. Shoreline units with a 1982 rating of below 7 will require restoration. Methods of restoration will be developed during updating of the regional plan.

Alternatives. There are three alternatives to the recommended threshold - maintenance of minimum scenic quality, maintenance of maximum scenic quality, and no action. As they apply equally to both roadway and shoreline units, they will be described for the total scenic resource.

The minimum scenic quality alternative represents a lower level of protection than the recommended threshold. This alternative proposes that all roadway and shoreline units with a scenic quality rating of 2 or better need only be set at 2, the moderate level. The existing scenic quality ranking of 1 would be maintained at its current level. No restoration would be required for any of the units. Units with high and exceptionally high ratings (3 or 3+) would be allowed to deteriorate to the moderate level.

The maximum scenic quality alternative represents a higher level of protection than the recommended threshold. This alternative proposes that scenic quality be improved in all roadway and shoreline units to achieve the high quality rating of 3. For example, units with a rating of 1 or 2 would have the threshold set at 3 with steps taken to achieve the 3 rating. Restoration would be required throughout the Basin to achieve the higher rating. Overall, the quality of the scenic resource would be improved.

The no action alternative would not specifically identify the scenic resource nor would it provide measures for its preservation or protection. Individual agencies would continue to manage with their current policy but there would probably not be uniform Basin-wide policies. The probable results would be gradual alteration of the scenic resource with an overall reduction in scenic quality.

D. Summary of Recommended Thresholds: This chapter has recommended thresholds for the various environmental components and subcomponents dealt with throughout the course of the study process. The proposed action in each case is a recommendation that staff and the consultant team feel best maintains scenic, recreational, educational, scientific, or natural values of the region and the public's health and welfare. If a threshold is not recommended for a specific component, existing state and federal standards will continue to apply. The physical, biological, social, and economic consequences of implementing the recommended thresholds and alternatives are described in the next chapter.

IV. Environmental Consequences

A. Overview: The environmental consequences of implementing the proposed action and alternatives to it are described in this chapter under individual component headings. In general, the physical and biological impacts will be identified as beneficial as the purpose of adopting environmental thresholds is to achieve a degree of environmental protection. Social and economic environmental consequences will also be explored but will, of necessity, lack the preciseness with which physical-biological impacts will be described.

Social-economic consequences can only be explored from a broad, generic sense as the establishment of environmental thresholds does not determine maximum population densities and/or permitted uses. These determinations will be explored as alternatives in updating the regional plan, an effort subsequent to the establishment of thresholds and for which an environmental impact statement will also be prepared. Many techniques for achieving environmental thresholds exist and are dependent upon the willingness to mitigate, restrict development, and/or alter the type and intensity of development. Since these factors are not known at this time, socio-economic consequences will be developed as comparisons to the existing situation. This will provide a degree of analysis but will lack specific determinations of impact.

For all environmental consequences, physical, biological, social, and economic, it is important to understand that time is a factor in any and all attempts to attain the thresholds. Continuous effort and long-term investments will be required to insure achievement and maintenance of the adopted environmental thresholds. As pointed out previously in this document, the amount of time and money will be more precisely stated in the subsequent regional planning effort. Because the techniques to achieve thresholds are so many and varied, the adopted thresholds will be subject to review and revision to comport with the purpose and policies of the Compact.

B. Water Quality:

The direct environmental impacts of the proposed water quality thresholds are positive. The other impacts, primarily social and economic, appear to be a mixture of positive and negative, but will depend to a large extent on the content and implementation of the revised general plan for the Tahoe Basin. the following discussion of environmental consequences focuses mainly on the recommended threshold for nitrogen loading to the pelagic zone, since it is the most-easily understood and evaluated threshold. As a group, the recommended water quality thresholds reinforce each other in an attempt to preserve the values discussed in the first chapter of this EIS.

If the Tahoe Basin is to meet the ambient water quality thresholds for the various sub-components, or simply reduce the rate of decline in overall water quality, it will be necessary to meet the recommended reduction in nitrogen loading to the Lake. Without a precise nutrient budget, it is difficult to preduct how much of an improvement would result from achieving the recommended loading threshold; however, surface and sub-surface inflow represent less than half of the annual nitrate-nitrogen load to the Lake, with the balance coming primarily from atmospheric deposition on the Lake's surface. Surface and sub-surface inflow equal only about one percent of the accumulated nitrate load in the Lake. In a "best case" analysis, assuming the change in the accumulated

nitrate load is approximately 10 metric tons per year, the recommended threshold could -- in combination with controls on air pollution -- arrest the declining trends in water quality and, over many years, actually improve existing water quality. In a "worst case" analysis, assuming the annual increase in accumulated nitrate load is 25 metric tons or more, achieving the recommended loading threshold would only decrease the rate of degradation slightly.

In any case, implementation of the water quality thresholds should have beneficial impacts on recreation, wildlife, fish, vegetation, soils, and scenic resources, primarily though improved land management, enhancement of stream environment zones, and slowing or arresting the decline in the Lake's clarity.

The recommended water quality thresholds will be difficult to attain, and will probably require a combination of remedial measures of the following types: erosion and runoff controls, reclamation and restoration of SEZ's, rehabilitation or retrofit of existing development with best management practices, improved forest management, and possibly redevelopment in heavily developed areas. To reduce nitrogen loads to the Lake, the emphasis in these remedial programs should be on erosion control and revegetation, since vegetation holds the most promise of all possible control methods. To meet the loading threshold, it may also be necessary to augment remedial efforts with continuing land acquisition programs and controls on new development.

Remedial erosion and runoff controls will be necessary primarily in commercial and residential areas. (Improved forest management is discussed below.) To date, remedial efforts have focused on erosion control on public lands and rights-of-way through such measures as drainage and slope stabilization. These efforts aim primarily at controlling sediment but also achieve reductions in nitrogen loading if designs incorporate the use of vegetation. Remedial efforts may also have to be expanded to include improving the quality of runoff from impervious areas such as parking lots, streets, and intense commercial development. While runoff from these areas is normally low in sediment, it is often high in nitrogen content resulting from both human activities and atmospheric fallout. The Lahontan Regional Water Quality Control Board is currently studying the impacts of management practices applied to urban runoff. One promising management practice is improved cleaning of parking lots and streets to remove nitrogen-laden materials before they can reach the Lake.

Enhancement of stream environment zones, including possible reclamation and restoration, could be a cost-effective method for reducing nitrogen loads to the Lake. SEZ enhancement is also a common theme for all the threshold study components. Since 1950, development of the Basin has eliminated 3,100 acres (1,400 hectares) of natural stream zones, or 12 percent of the total. This development pattern has reduced the capacity of the Basin's ecosystem to remove nutrients from runoff and has added to nutrient loads. It may be most cost-effective to restore certain stream zones, even considering the cost of land acquisition, than to attempt more capital-intensive solutions to solve nutrient loading problems. One reason for this is that stream zones, once reclaimed, would have a very low cost of maintenance, and would have many benefits beside water quality.

With respect to rehabilitation and retrofit of existing development, most of the Basin's development occurred before the state and regional agencies imposed BMP (Best Management Practices) requirements on new development. Therefore, while

persons building new structures must provide on-site and off-site mitigation, most existing development is subject to no pollution-control requirements. (California SWRCB does issue waste discharge permits to selected properties, primarily commercial.) The concept of rehabilitation and retrofit with BMP's might also include improved management of existing properties, including revegetation, less fertilizer use, better parking management, litter control, sweeping and cleaning of impervious areas, and a reduction in lawn watering-- all of which would reduce nutrient loads from developed areas. The runoff and water quality data indicate that the extent of land disturbance, including impervious surface, is the major determinant of runoff water quality.

In some heavily-developed areas, redevelopment may be a desirable method for reducing nitrogen loads to Lake Tahoe. Although redevelopment may be difficult politically, socially, and financially, it presents the possibility of replacing older, highly-impervious development with more modern, better-designed buildings including more natural landscaping, facilities to detain and infiltrate runoff, and vegetation to strip out nutrients. Redevelopment would be a good companion program to SEZ enhancement.

Since 80 percent of the Tahoe Basin is forested, forest management programs can help reduce nitrogen loads to Lake Tahoe also. Such programs would have to cover both public and private forest land, as well as semi-natural areas such as golf courses, stables, and ski areas. Less fertilizer use, better erosion control, improved management of vegetation, road maintenance and closure, and SEZ protection could all be aspects of a forest management effort. Golf courses have been shown to be the major source of nitrogen leached from fertilizer in the Basin (TRPA, 1981).

Continuing controls on new development may also be necessary to insure that the Basin meets the nitrate-nitrogen loading threshold for the Lake. Until monitoring shows that the combined remedial measures, above, can succeed in meeting the threshold, it would be wise to regulate development to ensure it does not increase nitrate loads. Fill-in development in certain high-capability area may not increase nutrient loads, but development of fragile lands or further subdivision almost certainly would. (Under existing regional programs, new development does generate mitigation funds for erosion control, however.) Land acquisition programs by public agencies can help reduce nutrient loads to the Lake also. Programs such as the Santini-Burton program could return key natural treatment areas or high erosion-hazard lands to natural or better-managed conditions. Land acquisition is also a key part of the financial mitigation which may be necessary to implement the water quality thresholds. (See discussion of economic impacts, below.)

Social and Economic Impacts: It is impossible at this time to quantify the social and economic impacts of adopting the recommended water quality thresholds. Many of these impacts will depend on how the community implements the thresholds through the general plan. However, certain social and economic impacts will inevitably accompany adoption of the thresholds. The destination resort character and seasonal economic base introduce several socio-economic problems to the Basin, such as transient population, high unemployment, high welfare and benefit payments, and crime (WFRC, 1979). It is unlikely that the environmental thresholds for water quality will have a significant impact on these effects, with the possible exception of unemployment.

The major social concern that water quality thresholds could affect is the cost and availability of housing. A serious shortage of housing and support services already exists in the Basin for low and moderate income families (WFRC, 1979). Through continuing controls on new development, the water quality thresholds could worsen this situation, along with the associated problem of spillover impacts on nearby areas such as the Carson Valley. However, if local governments pursue redevelopment as a means of meeting the water quality thresholds, the thresholds could help alleviate the housing problem though better neighborhood design. Although it would not affect the housing supply, a rehabilitation and retrofit program for existing development would probably increase the quality of life and housing in the Basin, although it could also add to the cost.

Potential economic impacts of adopting the water quality thresholds may occur in the areas of tourism, employment, public revenues, and ownership of developed and undeveloped lots. With respect to tourism, the Tahoe Basin has probably reached the point of market saturation, and faces a decline in the growth rate of tourism regardless of actions on environmental thresholds (EPA, 1976). One study showed that a number of persons have already reduced their visitation to the Tahoe area, citing an adverse reaction to present levels of development (EPA, 1976). Adopting the environmental thresholds for water quality should, therefore, have a positive impact on tourism by improving environmental quality in the long-run and enhancing the Basin's image as a destination resort area.

The employment of the Basin centers on gaming, retail trade, and construction. The water quality thresholds should have little or no effect on gaming employment, and should improve employment in the retail trades by enhancing tourism. The thresholds could have a positive or negative impact on construction employment. Further building restrictions could aggravate unemployment among construction workers, but mitigation measures may create construction jobs in the areas of erosion and runoff control, rehabilitation and retrofit, and redevelopment. The stability of the construction trades may be more important in the long-run than the number of jobs (CTRPA, 1980) and it may be that the Basin has already adjusted to the building restrictions which began in the late 1970's.

Public revenues may be the area most-affected by adoption of the water quality thresholds. Local governments will be faced with additional costs for controlling nitrogen loads to the Lake, and they are already experiencing budget difficulties associated with unpredictable weather and snow removal costs, a lagging economy, and federal and state budget cut-backs. Also, local governments must bear the burden of coping with large numbers of tourists and visitors at peak times of the year. In addition, constitutional amendments in California in the late 1970's affected the ability of local governments to raise revenue through taxation and other means on the California side of the Basin.

It may be difficult or impossible for local governments to increase their outlays to meet environmental thresholds without additional sources of revenue. However, given existing trends toward increasing assessments for facilities and services, local governments and utilities may already have reached the limit for the majority of local residents. In addition, downzoning of some potential residential areas and the number of vacant lots that has resulted from regional restrictions on building add to the economic problems of public agencies by decreasing tax returns.

There are some possible ways to reduce the costs to public agencies of meeting the water quality thresholds. Some land acquisition programs, for example, can place lands under the control of state or federal agencies which were previously the responsibility of local government. Also, flexibility in development controls to allow some market incentives for development could both increase local tax rolls and generate mitigation funds. State and federal agencies can help defray the costs of meeting the thresholds, but -- given the federal budgetary picture and the state of the economy -- local agencies cannot expect other levels of government to replace the need for local financing of water quality programs. (The California SWRCB's Lake Tahoe Basin Water Quality Plan, 1980, includes a discussion of state and federal funding sources, and is incorporated by reference.)

The costs to public agencies of implementing the water quality thresholds will be at least as high as the cost of the remedial program set forth in the Lake Tahoe Basin Water Quality Management Plan (TRPA, 1981). The plan called for a $95 million (1979) remedial program over 20 years to reduce sediment loads to the Lake. Applying the Engineering News Record's inflation index to this figure results in a cost of $122 million (1982). Since these remedial efforts would constitute only a part of the program that may be needed to meet the water quality thresholds, the cost to public agencies will probably be higher than $122 million (1982). The environmental threshold study report will contain additional information on the costs of meeting the water quality thresholds.

Finally, adoption of the water quality thresholds may contribute to financial impacts on individual owners of both developed and undeveloped lots. Owners of existing homes or businesses may have to install retroactive best management practices (BMP's) at a cost of one to three percent of the value of their properties. Owners of undeveloped lots may experience financial impacts due to continuing controls on development which reduce the value of their lots or require them to make mortgage and other payments while they are unable to build. The existing regional plan encourages the use of direct land acquisition and transfer of development rights to help mitigate these adverse impacts. A limited transfer of development rights program is now in effect in California, and the Forest Service will make its first acquisition under the Santini-Burton Bill in 1982.

C. Water Quantity:

Consumptive Use. Adoption of the recommended threshold would not alter the present water allocations in the Lake Tahoe Basin. These allocation limits could restrict development within the Basin in the future based on the water rights of various service districts; however, this impact is based on present rate of consumption and increased occupancy rate. The threshold would provide for regulation of groundwater development in California by the TRPA to insure compliance with the Interstate Compact allocations. Presently, groundwater and riparian water uses are not regulated by permit under state law in California and could in the future, account for total water use in excess of the Interstate Compact allocations. The threshold would not impact water rights in Nevada.

Increased consumptive use, if permitted by an alternative threshold which would exceed the total use allocation of the Interstate Compact, would be in conflict with the Compact. The other impacts of increased consumptive use would be expanded sewage treatment requirements and increased export of effluent. There could be impacts to beneficial uses downstream if increased total use allocations were to reduce outflow volumes.

Consequences of the no action alternative would be similar to the recommended threshold, except groundwater and riparian water use would not be regulated in California. There would be no change in Nevada water allocations.

Instream Flows. The consequences of adopting the recommended policy threshold would tend to improve water quality and decrease flooding. Natural flow regimes would decrease the volume of peak flows from developed areas and should maintain base flow over a longer duration. Reduced peak flow volumes would decrease erosional capacity of runoff. Recreation and aethestics should have positive impacts associated with maintenance of base flow. Costs associated with implementation of the recommended threshold would not change appreciably from present since the threshold reinforces implementation of the existing 208 Plan and Best Management Practices.

The impacts associated with the alternative thresholds would be primarily incurred by the Agency. The costs and person-hours necessary to evaluate quantitative instream flow requirements for all streams would be significant based on present staff. The consequences that would result from the recommended threshold could also be expected with the alternative threshold.

Adoption of a no action alternative would result in continued alteration to the natural hydrologic regime which generally has increased peak flow volumes and reduced duration and level of base flow.

D. Soil:

Impervious Coverage: The threshold recommended for impervious coverage would insure new development be in compliance with the Bailey Land Classification System and provide for protection of the soil resource. The existing 208 Best Management Practices minimize the impact of impervious coverage but do not eliminate runoff and removal of vegetation resulting from such coverage. In many areas the threshold for coverage has been exceeded on a watershed or subdivision basis. Mitigation or retrofit is necessary to minimize those impacts created by large areas of impervious coverage. Coverage restrictions may impact some types of development on certain capability class soils. Generally, commercial development is impacted the most due to parking requirements. Coverage restrictions impact design options. Runoff is reduced and vegetative cover is maintained as impervious cover is reduced. This has positive impacts associated with water quality.

Any impervious coverage proposed by alternative thresholds would have consequences similar to the recommended threshold but would vary depending on the levels of allowable impervious coverage permitted. Adherence to Agency standards does not account for the impervious coverage of roads which increase the total impervious coverage throughout the Basin. Consequences of not adopting coverage thresholds would maintain the existing situation. Coverage overrides and variances have permitted more impervious coverage in many areas than can be mitigated naturally by the remaining areas not covered. Present Agency implementation of the coverage standards would have impacts on redevelopment plans and/or projects. Some areas within the Basin may have exceeded the allowable coverage on a watershed basis or at the Basin level. This has resulted in runoff increases and loss of productivity.

Soil Productivity: The threshold recommended for soil productivity would maintain the productivity of Basin soils. Preservation of productivity would provide adequate soil to support vegetation. The soils ability to support vegetation is the most important aspect of the soil resource as it affects and relates to all other environmental components. The national soil loss values may be higher than what would be acceptable for some sites in the Basin due to site variations and could result in soil loss resulting in loss of productivity. These values for soil loss do not account for amount of soil delivery into the streams and lake which has significant impacts on water quality. Water quality thresholds address sediment yield levels and describe the environmental consequences.

Data necessary to determine alternatives to current "T" factors specifically for the Lake Tahoe Basin is not available and the limited existing data is not conclusive. Acquisition of data necessary to develop alternative soil loss values would involve extensive field verification. An adoption of the values developed for sediment yield in water quality thresholds as the acceptable soil loss values would be more restrictive than the "T" factor values and would provide more than adequate protection of soil productivity. More stringent soil loss values would increase the costs of soil stabilization associated with development. The magnitude of the increase above costs associated with implementation of the recommended threshold is not known.

The no action alternative could permit soil loss on lands which would reduce productivity. Soil loss could impact adjacent lands due to off-site deposition. This could occur regardless of thresholds set for sediment yield since they deal only with deposition in streams and the Lake.

Surface Disturbance: Adoption of the surface disturbance policy would emphasize the commitment of the Agency to implementation of the existing land use ordinances and practices. Strict adherence to these practices would minimize impacts on the soil resource. These impacts would include compaction, increased runoff, removal of vegetation, and increased erosion. The economic impacts of compliance with the ordinances and practices should be minimal since compliance is presently required. This threshold would restrict some ancillary uses associated with development such as woodpiles, RV parking, boat storage, and indiscriminant outdoor storage of materials or equipment. Revegetation and preservation of native vegetation would occur if surface disturbance is reduced.

Specific surface disturbance alternatives could be inequitable, depending on the evaluation and enforcement, because of the subjective nature of such standards. There is presently no criteria to scientifically determine an adequate surface disturbance limit. Development of adequate data to determine specific surface disturbance limits would be time consuming and costly. The Agency would be impacted by a requirement to conduct such studies.

Stream Environment Zones: The recommended threshold for the stream environment zones would prevent loss of productivity, soil loss, and removal of vegetative cover. The threshold could impact transitory use of the SEZ. Proper use levels would be determined for transitory uses thereby insuring minimal impacts. Natural vegetation would be preserved and provide for nutrient uptake. This threshold could impact redevelopment and would support relocation of existing SEZ development. The economic impacts of SEZ protection are difficult to determine at this time.

E. Air Quality: The environmental thresholds recommended for air quality will lead to an improvement in the overall environmental quality of the Basin. The standards will protect public health, reduce vegetation damage, improve overall visibility, and tend to reduce the atmospheric loading rate of nitrates and nitric acid to Lake Tahoe. These are positive physical and biological consequences of implementing or adopting the recommended thresholds. Alternatives to the recommended threshold set would afford varying degrees of protection. They will be discussed further under each subcomponent heading.

Adopting threshold standards at the recommended level carries with it the potential for increased social and economic costs. The automobile is one of the prime contributors to air quality problems. It follows if air is to be improved, there needs to be a reduction in the amount of auto use. The impact is not quantified at this point, but it is known life styles would be altered and the cost of alternative transportation systems need to be borne. The specifics of these options will be evaluated in development of the regional plan.

The Carbon Monoxide threshold recommended at 6 ppm for an 8 hour concentration will protect public health. It carries with it substantial social and economic costs, for the most effective method for achieving the threshold is to reduce reliance on the automobile. The 1982 Air Quality Plan developed by the Tahoe Regional Planning Agency recognizes the problem and proposes development of an effective public transit system, mail delivery, inspection and maintenance of vehicles, and traffic flow improvements to reduce the carbon monoxide pollutant levels in South Lake Tahoe. The costs to achieve the recommended standard as described in that document range between about 49 million and 192 million dollars while social costs look at the loss of individual freedom and dependence upon privately owned vehicles. Implementation of measures necessary to achieve the recommended threshold have other benefits such as reducing traffic congestion, improving subregional visibility and lowering ozone levels.

The recommended threshold resulted from an intensive review of both the state standard at 6 ppm and the federal standard at 9 ppm. Scientific evidence indicates a need for a high altitude standard less than the current federal standard but does not specify what an appropriate standard should be. Adoption of the state 6 ppm standard will protect public health and welfare but will carry high social and economic costs. The recommended threshold will be less disruptive to the subsequent planning process as the Compact requires the regional plan to achieve the more restrictive of the state or federal standard.

Adoption of the recommended threshold at 6 ppm carries with it an obligation on the part of the States of California and Nevada to jointly review the existing standard in an attempt to resolve the current issues involved with the standard. The review must be completed by December 1, 1982. If the results of this review modify the standard to something less restrictive than 6 ppm, the threshold will be modified accordingly and the regional plan will meet the new standard.

The Ozone threshold can be achieved using some of the same techniques used to achieve the carbon monoxide threshold. The recommended ozone threshold of 0.08 parts per million is currently being met. Reducing sources of ozone pollution will continue to be required. This will require reducing oxides of nitrogen emissions within the Basin. Again, the automobile is the primary cause of this form of pollution. Achieving the recommended threshold has positive physical and biological consequences in terms of reducing vegetation damage,

probably reducing nitrate and nitric acid deposition into the Lake, and in improving regional visibility. It will generally improve overall environmental quality. The social and economic costs associated with the threshold would be similar to those discussed under carbon monoxide.

Alternatives to the recommended threshold, in other words, the state and federal standards, would not provide the degree of protection necessary for vegetation protection within the Basin. The alternative would, in all likelihood, be less of an impact in terms of dollar costs and social consequences but would degrade the visual environment by perpetuating dead and dying trees.

Acid Deposition is a subcomponent of air quality for which a threshold will not be recommended at this time. The policy to reduce transport of nitrates and reduce oxides of nitrogen as stated in the previous chapter is important in terms of improving water quality and visibility.

Visibility thresholds are described that will, through their range, improve visibility on the one hand and allow it to deteriorate on the other. The recommended threshold, however, will improve visibility above the level existing today. The physical and biological consequences will be beneficial but there may be social and economic costs involved. Since about 70 percent of the cause of regional visibility degradation is either natural or external to the Basin, the Agency has little effective control. The costs must be borne in mitigating the internal, man-caused pollutants. Reintrained soil and emissions from automobiles as a contributor to subregional visibility degradation can be reduced by limiting the amount of vehicular traffic. The consequences would basically be the same as those described for the establishment of the carbon monoxide threshold. Wood smoke as a contributor to visibility deterioration may require restrictions on use, type of wood, type of fireplace or heater used, and the number permitted within the Basin. Dollar costs would be high if more people were required to return to fuel, gas, or electricity for heat or if non-native wood was required. The social costs would be in terms of reducing fireplace use, a perceived lessening of the "Tahoe Experience."

An odor threshold dealing with fumes from diesel buses will provide a benefit to the Basin without any appreciable costs.

F. Noise: The environmental thresholds recommended for the noise component will maintain or improve current noise levels experienced within the Basin. The consequences of implementing the proposed standards are positive in terms of physical, biological, and in most cases, social factors. Alternatives to the recommended thresholds provide varying degrees of protection as discussed below.

Single Noise Event thresholds are recommended at a level sufficient to reduce or eliminate distressing, single event noise. The positive aspects of the proposed threshold may be considered negative by some as they may be required to reduce the noise produced by their motorized equipment. While the reduction will be applauded by most, a few will feel deprived of their "freedom" to operate loud vehicles both on and off established roadways. Economic costs are relatively minor in terms of equipping vehicles with proper mufflers. The economic benefits will in all likelihood far exceed the costs as the total recreation resource is enhanced.

The threshold recommended for aircraft will limit the various types of airplanes that can land and takeoff at the South Lake Tahoe Airport. The threshold was established using Advisory Circular 36-3B published by the Federal Aviation Administration on November 20, 1981. It lists various aircraft producing estimated dbA under given monitoring guidelines. Generally, the threshold would permit all propeller driven airplanes and smaller business type jets. Commercial sized jets would exceed the threshold. The physical and biological consequences are positive in terms of the noise level within the environment. Some may feel, however, a reduced social cost and actual economic loss if larger aircraft continue to be prohibited.

Alternatives to the single noise event thresholds would provide for further reduced noise levels if they are in fact lower than those recommended. Higher thresholds would not be permissible in most instances as existing standards would be exceeded. Lower thresholds would further restrict use and would probably have additional social and economic costs involved with their implementation.

Cumulative Noise thresholds are recommended to be established below the current CTRPA standard and would provide for community and neighborhood tranquility. Maintenance of the standards would reduce or eliminate distressing noise levels and would have positive physical, biological, and social consequences. Achievement of the recommended threshold would require some residents and visitors to reduce the cumulative noise levels they currently produce. The reduction can be achieved by prohibiting large trucks in specific areas, reducing the overall volume of traffic, and reducing the speed limit. There would only be minor economic costs associated with quieter equipment or reduced volumes but, as with single noise events, the economic returns would in all likelihood outweigh the costs.

Alternatives would achieve greater reductions of distressing noise levels if lower than the recommended threshold. Positive physical, biological, and social consequences would require higher economic costs than the proposal. If the alternative selected is higher than the recommended standard, the positive physical, biological, and social consequences would be less as would the potential economic cost to achieve the threshold.

The nondegradation policy for wilderness, roadless, and critical wildlife areas would help insure maintenance of an environment conducive to quality recreational experiences in undeveloped areas. It would help assure maintenance of critical wildlife habitats by maintaining or reducing noise levels. The consequences of implementing this policy would be positive from the physical and biological standpoint. Motorized vehicles would continue to be prohibited in these areas to assure, among other things, no further deterioration of existing noise levels. The Forest Service currently requests commercial air carriers not to fly at low elevations over Desolation Wilderness to keep the noise level reduced. This policy could be expanded to cover all areas identified above. Implementation of the nondegradation policy will require further cooperation with all aircraft operators to maintain or reduce noise levels in wilderness, roadless, and critical habitat areas.

G. Vegetation: The recommended environmental thresholds are positive steps designed to enhance and/or restore the vegetative diversity and forest health of the Lake Tahoe Basin. Adoption of these thresholds will provide protection for common types of vegetation, sensitive plant species, and uncommon

plant communities. It also promotes the use of management practices intended to increase the structural diversity of conifer forests. These results are positive physical and biological consequences. The visual, recreational, wildlife, and other environmental resources will also be favorably enhanced. This has positive social and economic spinoffs related to the tourist and recreational industries. Policies to reclaim or restore meadow, wetland, and other riparian vegetation may create some adverse socio-economic impacts if commercial or residential structures are required to move outside these zones. The reviewer is reminded the strategy of removing structures is not stressed by the proposed threshold. Instead, the focus is on forest manipulation to expand the acreage of riparian vegetation. Preventing additional construction in riparian zones is currently controlled by existing ordinances.

The alternative to the proposed action addresses the same issues with the difference between the two being a matter of stress or degree of importance placed on the alternative. For example, the alternative goes beyond the proposed action by planning to restore the endangered plant Rorippa subumbellata on private land and also proposes conservation thresholds for both uncommon and scarce plant communities. At this time, prohibition of certain activities on private lands only apply to implementation of the threshold pertaining to Rorippa. However, since this plant is primarily found on beaches adjoining Lake Tahoe, few construction related conflicts are expected. The alternative for increasing the structural diversity of conifer forests is the same as the proposed action except the important plant communities such as meadows, wetlands, and deciduous riparian vegetation would be expanded through elimination of all man-made structures within these areas. The positive physical and biological consequences and socio-economic spinoffs are similar to those of the proposed action except that additional positive environmental contributions are anticipated if all structures are indeed removed. Adverse social and economic impacts upon landowners can be expected if they are unable to sell or develop such properties. It can be speculated that the long term benefits of such an action in terms of improved water quality and less need for remedial erosion control efforts might outweigh the short term consequences.

Without implementation of the recommended or the alternative thresholds, early seral stages such as grass communities, shrublands, and young trees will all but disappear as the landscape will become dominated by a few species of conifers. Susceptibility of the vegetation to disease and insect infestation will increase as plant diversity in the forest ecosystem declines. Sensitive plant species would likely decline on private land as would uncommon and/or scarce plant communities. The scenic and recreational values of the Basin would be adversely affected, damaging the economic interests of tourism-related businesses.

H. Wildlife: The recommended environmental thresholds for wildlife propose protection for those species, with the exception of the peregrine falcon and bald eagle, already nesting in the Basin. The habitat sites for these species primarily occur on public lands with the Forest Service currently providing protection. The recommended threshold will protect special interest species on private land and help coordinate protection on public lands with other agencies. The recommended threshold will help maintain the existing populations and possibly allow some increases. Few adverse socio-economic impacts will occur since the Forest Service is already managing for these species on public land. The most severe impact anticipated would be prohibition of certain recreational, construction, or management activities within disturbance zones.

Maintaining or increasing the amount of riparian vegetation as proposed by the recommended alternative provides perpetuation of the single most important habitat type for the common wildlife species. The threshold will help insure the continued presence of all existing wildlife species and, if implemented, will help increase diversity and animal abundance in the future. Adverse effects are minimal as the methods for retaining and/or increasing riparian vegetation and other habitats include patch cutting and selective thinning of the timber. These efforts could provide monetary returns and public use of a renewable resource though timber or fuelwood sales. Total prohibition of construction activities in the riparian zone could be the most severe socio-economic consequence but it could be partially off-set through use of buyout programs such as the Santini-Burton program.

The alternative to the recommended threshold is identical to the preferred except that it provides for the additional protection of nine special interest species and includes actual removal of existing structures in the riparian zones. Establishing thresholds for the additional nine species would likely facilitate their recovery, a positive environmental consequence. Uncertainty as to their abundance and locations would likely create administrative problems and difficulty in coordinating implementation of recovery plans. Increased numbers of avoidance (disturbance) zones would also create additional hardships to private landowners.

The alternative to the recommended threshold proposes removing structures from riparian vegetation and from within a 100 foot zone adjacent to streams with no riparian vegetation. This action would have a positive impact upon wildlife. Wildlife movement would be facilitated and avoidance behavior would be less likely as disturbances would be reduced or eliminated. The diversity and/or abundance of wildlife near urban centers would likely increase, creating positive social and economic enjoyment for residents and recreational visitors. The adverse consequences are economic related as landowners in riparian areas could suffer economic loss as facilities are removed and/or prohibited.

The no action alternative would not afford any extra protection for special interest species and riparian vegetation. Existing ordinances protect stream environment zones but the degree of protection is not felt to be sufficient for maintenance of the existing wildlife species. Trends indicate the amount and "quality" of riparian vegetation will continue to decline if no action is taken. It is also likely that sensitive species will continue to decline on private and possibly on public lands unless coordination is facilitated. With no action, some species will ultimately be extirpated from the Basin and others will become less abundant. Few species are expected to increase with the possible exception of urban adapted birds such as Steller's jays and starlings. Many outdoor recreational activities are associated with opportunities to view wildlife. The enjoyment of the recreational experience will decline with no action to preserve the resource, resulting in a potential economic loss to the recreation oriented businesses.

I. Fisheries: Adopting "quality" thresholds for miles of streams or acres of Lake habitat has no impact upon the environment. Implementation of the standards, as streams are upgraded, will have a positive effect on the fisheries resource and both positive and negative effects upon the socio-economic environment. It is estimated that at least a 23 percent increase in fish biomass of resident streams will result with implementation of the recommended threshold. The fish biomass of migratory streams in the spring will likely increase since 65

percent of the migratory sections are upgraded under this alternative. Reduction of disturbances in Lake habitat zones is also expected to increase the spawning success of Lake fishes. The cumulative impact is beneficial to both the fish populations and fishermen.

Thresholds for instream flow would help maintain resident fish populations in streams subject to wide variations in flow. This would help improve the quality of both the Lake and stream fishery. No water rights would be forfeited by this alternative. Water right holders would be encouraged to move their legal point of diversion from the streams to the Lake, subject to state approval. The benefits of water right transfers to the Lake include the assurance of water withdrawals even in late summer when some streams have inadequate flows.

There are economic impacts associated with upgrading or maintaining fish habitat in streams and the Lake as provided by the recommended threshold. Various measures will be required including redesign and construction of some culverts and bridges and other impediments that block migratory fish passage. Some water rights in streams may have to be transferred to the Lake. Improvement of Lake habitat would require removal of some piers and buoys. The impact could be mitigated to a certain degree if only unauthorized facilities in the Lake were removed. Improving the access for "topliners" to the shallow Lake habitat would both enhance fishing opportunities and fishing success.

The alternative to the recommended threshold would retain the quality of fish habitat at the current level. Fishing success would be expected to remain at a low level or perhaps decline even further. Natural spawning success will likely decline requiring continued and expanded supplemental planting of fish. Additional pier and buoy replacement will be confined to the identified marginal areas. Economic costs relative to stream improvement would be minimal with this alternative.

The no action alternative provides for neither maintenance nor improvement of fish habitat. Current trends of habitat destruction would continue, creating adverse consequences to spawning and feeding habitat. Fishing, as a recreational resource with its inherent socio-economic impacts, would be adversely affected.

J. Outdoor Recreation: Adopting the thresholds recommended for the recreation resource will insure the maintenance of a recreation environment unique to the Lake Tahoe Basin. It is believed all environmental factors - physical, biological, social, and economic - will have positive impacts. The consequences of the proposed threshold and the alternatives to it are described below.

Undeveloped Land: The recommended threshold for the undeveloped land resource would retain the high quality areas in their present condition in perpetuity. High quality areas are identified by environmental features such as unique geologic formations and vegetation, abundance and diversity of wildlife, outstanding scenic qualities, and opportunity for isolation. One such area is the Desolation Wilderness. Other potential areas include inventoried roadless areas and adjacent lands. Naturally this would limit developed recreation to other existing areas, already served by roads and utilities, preserving an undeveloped resource within the Basin. Retaining the high quality lands in an undeveloped state would have positive benefits not only to the recreation resource, but would also contribute to maintaining air, water, vegetation, wildlife, fish, and scenic thresholds. There may be economic costs involved even though most

high quality lands are currently in public ownership. The spinoff benefit of the recommended threshold is that it would not require major capital outlays for construction of access roads and facilities. Developed activities and facilities would be confined to currently accessible sites with utilities. Expansion of existing facilities could take place in adjacent areas as long as it was not classified as high quality undeveloped lands. There could perhaps be some degree of overcrowding at existing facilities if demand for the use continues and opportunity for expansion or new development is restricted.

The alternative to the recommended threshold that would permit development in high quality, undeveloped areas could virtually eliminate the undeveloped or isolated recreation experiences currently enjoyed within the Basin. There would be more total environmental consequences with this option as more use and development would affect air and water quality. This alternative could also reduce wildlife habitat, modify vegetation, and alter the visual environment. It would in fact provide more opportunity for developed recreation in the high quality areas, therefore reducing crowding and congestion in existing facilities. Costs to develop facilities would be fairly high as roads, utilities, and structures would be required to serve the users. There could be potential economic gains to the local economy if the increased supply promotes increased use. The overall capacity and recreation experience of the Lake Tahoe Basin would be altered.

The second alternative of preserving all undeveloped areas in their natural state would prohibit all development in the inventoried areas. From the standpoint of overall environmental quality, nothing would change as no further development would take place in a large portion of the Basin. Recreation facilities would be limited to existing areas in the rural areas depicted on the map in Chapter II. This alternative would produce the least physical and biological consequences. Social and economic costs would be minimal if undeveloped, natural land is the preferred management technique and dollars do not need to be expended for facilities. Social and economic costs are high if skiing, camping, and other outdoor recreation opportunities can not be expanded to accommodate the visitors to Tahoe and the businesses that depend on those visitors.

The no action alternative would have no immediate environmental consequences as it allows planning and use of the areas to continue as at present. The longer term impacts would vary, depending on decisions of land use and development intensity that will be made. They could be in either direction as described above with either the first or second alternative.

Shorezone Area: The recommended threshold seeks to preserve the natural, undeveloped character that exists along portions of Lake Tahoe's shoreline. It would maintain the characteristics that make these areas of the shorezone high quality and in so doing, would provide positive physical and biological consequences. Air, water, fish, wildlife, and scenic components would benefit from this threshold. Likewise, individuals who prefer undeveloped and/or natural shorezone areas would be positively affected by the proposed action. There could be negative social consequences in terms of overcrowding on the more developed beaches without opportunity for expansion of the existing facilities. Economic consequences would be minor in terms of developing facilities but the local economy could suffer if facility supply could not meet the demand. Over-crowding and loss of recreation experience could reduce the ultimate number of people desirous of the Tahoe experience.

The alternative to the recommended threshold is to allow development of the high quality, undeveloped shorezone. This alternative increases the opportunity for outdoor recreation in the high quality areas but does so with a resultant loss in isolation and quality recreational experiences. It also has the greatest potential for detrimental consequences upon air, water, fish, and the visual environment. Capital expenditure would be required to provide access, utilities, and facilities at these sites as they are developed. The increased capacity of the shorezone area could increase visitor use and be beneficial to the tourist economy of the Basin. Social costs could be high though if the area turns into a crowded environment that reduces or eliminates certain types of recreational experiences.

The no action alternative would, in the short-term, retain the resource in its present condition. Change in the future could be uncoordinated and cover the full range of environmental consequences identified above.

Access: The threshold recommending increased access may alleviate crowding at existing areas as well as provide opportunities for use of additional areas. There will be a dollar cost with providing improved access that can only be quantified with plan or project proposals. Increased use may create environmental impacts and potential conflicts with property owners.

Developed Recreation Areas: The first recommended threshold seeks to maintain existing developed recreation areas and preserve their rural setting. This may have positive impacts by maintaining recreation opportunities and the type of environment in which recreation takes place. It will maintain impacts upon other environmental components such as air and water quality at its current level.

Alternatives that permit reduction of developed sites would decrease recreation opportunities with potential consequences on the tourist economy. The physical and biological environment would likely be enhanced with this alternative.

The second recommended threshold encourages expansion of developed recreation facilities and seeks to reserve capacity for future uses. This threshold would increase developed recreation opportunity and capacity, thereby reducing crowding at existing sites. The tourist economy may experience gains from the increased visitation. Physical and biological impacts may not be significant since the policy requires conformance to the other environmental threshold standards. Resident-serving recreation facilities such as parks and ball fields will be assured for future populations. Reserving capacity for developed recreation areas may preclude other uses that require the same facilities such as acres of land, access, power, water, and sewage.

Alternative thresholds would not identify or reserve land and capacity for future facilities. Additional developed recreation for both visitors and residents could be precluded by capacity constraints. Crowding at existing sites may occur with increased conflict between visitor and resident populations.

K. Scenic: Adopting thresholds for the scenic resource will provide for maintenance of the visual values within the Lake Tahoe Basin. The consequences of achieving the thresholds are similar for both roadway and shoreline units and will be discussed for the recommended thresholds and alternatives to them.

The recommended thresholds will ultimately affect siting and design of all development to be placed in the Basin. They may also affect location, type, and density of future development in order to achieve the scenic quality ratings assigned to each unit. Development is not prohibited but may have more rigid controls placed upon it to maintain scenic quality. Existing development would likewise be affected as the thresholds seek to improve scenic quality in roadway units rated below 15 and shoreline units below 7. In both cases, the regional plan will develop alternative land use and development strategies to maintain or improve scenic quality. Costs will vary depending on the types of measures to be implemented. Administrative costs may increase to monitor compliance with the recommended thresholds. The costs could be at all levels of government. Social consequences are primarily beneficial to the general public. Scenic thresholds will provide a better scenic environment for the visiting public and will protect the investments of those who live in the Basin. There may be specific instances when individuals may have to provide restoration measures and/or reduce development in order to achieve the scenic threshold. In addition, landscaping requirements, signing restrictions, and lighting levels permitted may need to be enforced to achieve the standard. Again, all these mitigation measures and review guidelines will need to be developed as alternatives in the regional planning effort.

The minimum scenic quality alternative will, as pointed out in Chapter III, permit deterioration of the scenic quality of the Basin. No restoration would be provided to improve or rehabilitate the visual resources. There would probably be no immediate economic costs as restrictions on design, location, type, and density of development would only be geared towards maintenance of moderate scenic quality. Social consequences would be minimal as there would probably be no perceptible change. Visitors to the Basin would continue to come even though preception of the Basin as a predominately natural environment may change. The mitigation measures necessary to achieve this alternative threshold would, in summary, probably be no greater than those in existence today.

The maximum scenic quality alternative would require wholesale upgrading of the scenic quality of the Basin. Future development and use would be strictly controlled to achieve the high quality rating for every roadway and shoreline unit. Current development would require a great deal of improvement to restore the visual quality of the urbanized areas. Signing, lighting, landscaping, quality of design, and location would all need to be controlled. This alternative would provide the most positive benefits to the visual environment but would carry with it higher social and economic costs.

The no action alternative would not regulate the scenic quality of the Basin. As development continues, the potential for further degradation of the visual resource remains high. The Forest Service would continue to manage and protect the visual resource on public lands but there is no assurance for protection of private lands. There would be no direct or immediate social and economic costs beyond those encountered today. If in the long-term, scenic quality was drastically reduced, the Tahoe Basin may no longer be an attractive area for recreational visitors. The loss of this resource could then affect employment and population dependent upon the tourist industry.

L. Mitigation Relationships: Each environmental threshold recommended for adoption and the feasible alternatives to it, require varying degrees of mitigation for their attainment. Methods or techniques available to achieve the thresholds are quite varied and will ultimately revolve around mitigation measures developed as a part of the regional plan updating process. Mitigation measures are not specifically proposed within this environmental impact statement but are generally discussed, through a range, to express the feasibility of attaining the thresholds. Specific mitigation measures will be explored as land use alternatives in the process of updating the regional plan.

It is known, however, that a threshold established for one component will be beneficial to others. For example, retention of deciduous riparian vegetation will have positive impacts on more than simply the vegetation component. This vegetative association is also important in maintenance of water quality, is a major factor for the wildlife and fish resources, and will enhance the visual and recreation resources. Mitigation to achieve the thresholds is not now quantifiable because the modification of land use or development that may be required is not known. The accompanying graph does indicate a relationship among components in a non-quantified manner. It shows a positive (+), negative (-), or no affect (=) of establishing thresholds upon the various resource components. For example, establishing a threshold for noise will have a positive impact on the wildlife and recreation resources.

RESOURCE IMPACTS

THRESHOLDS	Water Quality	Water Quantity	Soil	Air	Noise	Vegetation	Wildlife	Fisheries	Recreation	Visual
Water Quality	+	+	+	=	=	+	+	+	+	+
Water Quantity	+	+	+	=	=	+	+	+	+	+
Soil Conservation	+	+	+	+	=	+	+	+	+	+
Air Quality	+	=	=	+	=	+	+	=	+	+
Noise	=	=	=	=	+	=	+	=	+	=
Vegetation	+	+	+	+	+	+	+	+	+	+
Wildlife	+	=	+	=	=	+	+	=	+	+
Fisheries	=	+	=	=	=	=	=	+	+	=
Recreation	-	=	-	-	-	-	-	-	+	-
Visual	=	=	=	=	=	+	+	=	+	+

M. Physical, Biological, Social, and Economic Relationships: The development and adoption of environmental threshold carrying capacities is a planning process designed to achieve and maintain a high quality environment within the Lake Tahoe Basin. The Compact specifically states that standards will be adopted "to maintain a significant (emphasis added) scenic, recreational, educational, scientific, or natural value of the region or to maintain public health and safety within the region." As a result, the thresholds recommended for adoption in this environmental impact statement have positive physical and biological consequences. The thresholds are designed to protect these environmental characteristics.

The thresholds also have positive social benefits as they provide an environment that is more enjoyable from the standpoint of a place to live and an area in which to recreate. But they may also carry with their adoption the potential for negative social consequences as certain activities may be restricted. There are likewise both positive and negative economic impacts associated with adoption of thresholds. The following table summarizes the consequences of establishing thresholds for each component. The consequences are positive (+), negative (-), or both positive and negative (=).

	ENVIRONMENTAL CONSEQUENCES			
THRESHOLDS	Physical	Biological	Social	Economic
Water Quality	+	+	=	-
Water Quantity	+	+	+	=
Soil Conservation	+	+	=	-
Air Quality	+	+	=	-
Noise	+	+	+	=
Vegetation	+	+	=	=
Wildlife	+	+	+	=
Fisheries	+	+	+	=
Recreation	=	=	+	+
Visual	+	+	+	-

N. Adverse Impacts That Cannot Be Avoided: Potential adverse impacts resulting from the adoption of environmental thresholds have been broadly defined for each component and subcomponent in previous sections of this chapter. Refinement of the impacts will take place as land use alternatives are developed during the general planning phase to show attainment of the threshold. Specific adverse impacts that cannot be avoided are not now known.

Adverse impacts can be broadly stated if thresholds are not adopted. They generally would be further loss or deterioration of environmental values. The impacts could include degradation of air and water quality, loss of the scenic and recreational resources, potential loss of soil and vegetation, and deterioration of the wildlife and fish resources. Since the adoption of environmental thresholds is planned to preserve environmental integrity, there would be no adverse environmental impacts.

O. Short-term Use, Long-Term Productivity: The relationship between short-term uses of man's environment and the maintenance of long term productivity is enhanced by the adoption of environmental thresholds designed to maintain environmental quality. The thrust of the proposed action is to insure long-term productivity, better defined as mainentance of the Tahoe Basin's environment. The goal of the threshold adoption process is to set standards sufficient to maintain water quality, scenic and recreational values, air quality, and the unique ecological components that make Tahoe a national attraction for visitors and a unique place for its resident population.

Short-term use is not defined as a part of the threshold establishment process. Questions of population levels, permitted use, and levels of development will only be addressed in development of the general plan. Environmental thresholds

by themselves neither prohibit nor permit development. Therefore, the relationship between short-term use and long-term productivity can only be described in terms of planned, long-term maintenance of the environment.

P. Irreversible-Irretrievable Commitments: There is no irreversible or irretrievable commitment of resources in the adoption of environmental thresholds other than time and dollars that would be necessary to achieve the standards. The commitment of natural or physical-biological resources is not now required for development or use within the Basin is not proposed by the thresholds.

Commitment to environmental thresholds is reversible. Action taken by the Tahoe Regional Planning Agency now can be reversed at a later date. If threshold standards are not established, there is the potential for irretrievable environmental degradation as it becomes increasingly more difficult for environmental recovery to be accomplished as deterioration continues.

Q. Growth Inducing Impacts: There is no growth including impact associated with the establishment of environmental thresholds. If there is an impact that could be identified, it may well be the reverse and could perhaps limit growth. Future growth and development within the Lake Tahoe Basin will be addressed in the environmental impact statement to be prepared in updating the regional plan.

V. Consultation With Others:

Publication of this environmental impact statement is the culmination of a staff planning effort involving assistance, coordination, and consultation with a variety of agencies, firms, and individuals. The Long Range Planning Staff of the Tahoe Regional Planning Agency has relied upon and been greatly assisted by a consultant team headed by Brown and Caldwell, a consulting engineering firm in Sacramento. Each staff member and consultant has dealt with a specific environmental component(s) or work task throughout the course of the threshold establishment process. These individuals are listed in Chapter VI of this document.

Coordination of the process to establish environmental thresholds has involved numerous individuals representing federal, state, regional, and local agencies. The primary vehicle for this cooperation has been through development and use of a Technical Resource Team. The Team's role has been one of data sharing, technical input, and advising the Agency on matters within their respective areas of expertise. The Technical Team includes the Agency's Advisory Planning Commission, which represents all local and some state planning agencies, and individuals from other agencies not represented by the APC. This core group of resource people has worked with both the Steering Committee for Establishment of Thresholds and the Governing Body throughout the course of the study. Technical Resource Team members are listed in the following chapter of this document.

The Tahoe Regional Planning Agency also consulted with federal, state, and local agencies having jurisdiction by law within the Lake Tahoe Basin or special environmental expertise prior to preparation of this EIS. This scoping process is similar to that required by federal and state laws governing environmental impact statements. We requested the various agencies to identify significant issues within their areas of expertise that should be addressed in the environmental impact statement. The following agencies were contacted by letter of February 2, 1982. An asterik (*) indicates response to the "scoping" letter.

Federal

- Bureau of Land Management*
- Bureau of Mines*
- Bureau of Reclamation*
- Coast Guard
- Corps of Engineers*
- Dept. of Health and Human Services
- Dept. of Housing and Urban Development*
- Dept. of the Interior
- Environmental Protection Agency*
- Federal Aviation Administration*
- Federal Energy Administration
- Federal Highway Administration*
- Federal Power Commission
- Fish and Wildlife Service
- Forest Service
- Geological Survey
- National Park Service
- National Weather Service*
- Soil Conservation Service*

California

- Air Resources Board
- California Energy Commission
- Calif. Tahoe Regional Planning Agency
- Dept. of Fish and Game*
- Dept. of Parks and Recreation
- Dept. of Transportation
- Dept. of Water Resources
- Native American Heritage Commission*
- Office of Planning and Research
- Resources Agency*
- State Board of Forestry
- State Clearinghouse*
- State Historic Preservation Officer
- State Lands Commission*
- State Water Resources Control Board*

Nevada

Dept. of Environmental Protection*
Dept. of Transportation*
Dept. of Wildlife*
Division of State Parks*
State Forester
State Historic Preservation Officer*
State Planning Officer

Regional and Local

Carson City Supervisors
City of South Lake Tahoe*
Douglas County, Nevada
El Dorado County, California
Lahontan Regional Water Quality Control Board*
Placer County, California
Washoe County, Nevada

Comment received as a result of this scoping process fell within one of two categories - those items applicable to the establishment of an environmental threshold and those more appropriately considered in land use alternatives as part of the regional plan development process. The comment received will be used in both processes. Generally, response to the first category related to the identification of existing resources, changes within the components over time, and the need to establish thresholds that meet federal, state, and local standards. Issues that should be raised with the regional plan dealt with the need for mitigation, probable development levels and facilities required, and identification of specific activities or uses that may degrade the environment. The letters received in response to the Agency's request for input are available for review at the TRPA office.

In addition to the scoping letter sent to federal, state, and local agencies, a Notice of Intent to prepare an environmental impact statement was published in the Federal Register. It was printed January 27, 1982 in Volume 47 of the Federal Register, page 3904.

Opportunity for public awareness and input into the process for establishment of environmental thresholds has also been provided throughout the course of the study. Public meetings were conducted in South Lake Tahoe on December 16, 1981 with 26 individuals at the afternoon meeting and 23 attending in the evening. Meetings were held the next day on the north shore at Granlibakken with 26 afternoon and 13 evening attendees. The purpose of these meetings was to inform the public of the process and to provide opportunities for input. The public has also been invited to attend and participate in all Governing Board and Advisory Planning Commission meetings when the environmental threshold study is discussed. Also, meetings of the Board's Steering Committee have been open to the public.

Beginning in February of 1982, the Governing Body set aside a large block of time to discuss the threshold project and to provide opportunity for the public to comment. The February meeting had almost 135 people in attendance with 25 electing to address the Board. The March meeting likewise set aside the afternoon of the 24th and morning of the 25th to consider thresholds. Over 75 people attended the March meeting.

The Agency team has carried on an extensive campaign to achieve media coverage of the threshold study. Periodic news releases have been sent to local, regional, and national radio, television, and newspapers. The Agency has a mailing list of approximately 700 that receive a monthly newsletter containing notices of meetings with publishing beginning in January, 1982.

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The remaining consultation phase is to receive input on this environmental impact statement. A 60 day review period is being provided. The cover sheet provides the inclusive dates. During the review period, the Governing Board and Advisory Planning Commission will open their meetings to receive additional input. Hearings are scheduled before the APC on May 12 and June 9. The Governing Board meetings in May and June will also provide opportunity for public input. Upon completion of this review process, the Governing Body will review the input, make changes to the EIS if necessary, and then certify the document. The Governing Board will adopt environmental thresholds at their July, 1982 meeting.

VI. List of Preparers

A. Agency Staff: The following lists Agency staff involved in both the conduct of the environmental threshold study and the preparation of this environmental impact statement. A brief description of the individual's involvement is also provided.

Philip A. Overeynder, Executive Director, TRPA
Phil provided overall guidance and coordination of the effort as a direct link between staff and the Governing Body.

Randall C. Sheffield, Chief Long Range Planning Division, TRPA
Randy had overall responsibility for development of the study program, management of staff and the consultant team, and environmental impact statement preparation.

Gordon A. Barrett, Senior Land Use Planner, TRPA
Gabby assisted in the conduct of the study with primary responsibility for coordinating development of the data base and inventorying current land uses.

D. Keith Maki, Senior Transportation Planner, TRPA
Keith had responsibility for coordinating transportation elements of the threshold study with the consultant team members working with that element. He also provided traffic analyses and input into the air component.

Dale W. Neiman, Senior Air Quality Planner, TRPA
Dale was responsible for threshold development for both the air and noise thresholds. He coordinated the visibility study with EPA and also carried responsibility for the 1982 Air Quality Plan.

Gary S. Shellhorn, Senior Water Quality Planner, TRPA
Gary shared responsibility in coordinating the water and soil threshold with the consultant team responsible for that element. He also worked with the delineation of stream environment zones.

David S. Ziegler, Senior Water Quality Planner, TRPA
Dave shared responsibility with Gary for coordinating Brown and Caldwell's work on the water and soil threshold. He also shared program management and data base development responsibility.

David M. Greer, Associate Planner (Biologist), TRPA
David had overall responsibility for the vegetation, wildlife, and fisheries components in the threshold study and the task of coordinating federal and state agencies in these areas.

Steven W. Chilton, Environmental Investigator, TRPA
Steve assisted David by delineating vegetative communities from 1941 and 1966 aerial photographs.

Kenneth W. Small, Planning Assistant, TRPA
Ken assisted in identifying stream environment zones using soil resource inventories, aerial photographs, and other base maps.

Cynthia A. Janik, Biologist (Temporary), TRPA
Cynthia assisted David Greer with development of wildlife habitat suitability index models.

Lorinda J. MacManiman, Cartographer, TRPA
Lindy was responsible for drafting the overlays to the base maps, preparing and editing the threshold data base, and in graphic preparation for this environmental impact statement.

Paul M. Knott, Planner (Temporary) TRPA
Paul assisted with the data base and inventorying of current land uses.

Russell A. Carr, Draftsman, TRPA
Russ assisted Lindy in drafting and data base preparation.

Victoria L. Raucci, Zoning Clerk, TRPA
Vicky assisted with map measurement, interpretations, and general assistance in the threshold effort.

Mary A. Dailey, Secretary II, TRPA
Mary was responsible for numerous stacks of correspondence, general assistance, and in typing the EIS.

Sharon A. Fick, Secretary II, TRPA
Sharon is in charge of the word processing unit and has compiled and typed this EIS.

B. Consultant Team: The following lists consultant team members and their responsibility in the environmental threshold study. Reports and documents produced by the team members along with their specific input have been used extensively in preparation of the environmental impact statement.

James A. Yost, Principal Engineer, Brown and Caldwell
Jim served as project manager for the consultant team and had responsibility for program development, the water and soil components, and team coordination.

Elaine M. Archibald, Project Scientist, Brown and Caldwell
Elaine was responsible for data analyses and modeling of the water quality, quantity, and soil components.

Charles Lockwood, Computer Specialists, Brown and Caldwell
Charlie was responsible for integrating the geographic data base into required modeling efforts.

Al Wolfenden, Soil Scientist, Brown and Caldwell
Al was responsible for the soil conservation threshold.

Dr. Charles R. Goldman, Project Director, Ecological Research Associates
Dr. Goldman provided data analysis, interpretation, and general limnological consulting assistance for the water quality component.

Dr. Robert Leonard and Dr. S. Loeb, Limnological Consultants
Drs. Leonard and Loeb assisted with the evaluation of limnological studies conducted to analyze relationships between watershed discharge and water quality.

Dr. R. P. Axler, Project Manager, Ecological Research Associates
Dr. Axler worked up water quality monitoring data, completed the 1981 data summaries, and analyzed and interpreted the data to provide relationships between watershed disturbance and water quality.

J. R. Reuter, Senior Research Scientists, Ecological Research Associates
Mr. Reuter worked with the other consultants to provide data analysis, interpretation, and other assistance in the area of water quality.

Sheila Brady, Partner in the firm of Wagstaff and Brady
Sheila was responsible for the analysis and interpretation of the visual component and the public information and participation program.

Timothy Miller, Senior Planner, Wagstaff and Brady
Tim was responsible for development of newsletters, press releases, and other media and public coordination, and also assisting with the visual component.

Walter F. Kieser, Associate, McDonald and Associates
Walt was responsible for socio-economic interpretation and analysis for the EIS, the recreation component, and structuring the data base.

Richard L. Berkson, Planner, McDonald and Associates
Richard assisted with gathering of socio-economic data and analysis of the recreation component.

Martin R. Inouye, Transportation Planner, OMNI-MEANS, Ltd.
Marty was responsible for analysis of traffic data and modeling of systems for transportation planning.

Randy Bowling, Civil Engineer, OMNI-MEANS, Ltd.
Randy provided input in the analysis of traffic data, roadway capacities, and trip generation studies.

C. Technical Resource Team: The Technical Resource Team consists of all members of the Tahoe Regional Planning Agency Advisory Planning Commission and other agency representatives who have an interest or level of involvement in the Basin not represented by the APC. Other agencies were queried by a November 10, 1981 letter to determine interest and identification of a representative. The Technical Resource Team met with the Steering Committee initially and then with the entire Governing Body to provide technical input into the threshold establishment process. The following list begins with APC members or alternates normally attending meetings and is followed by the other agency representatives.

Advisory Planning Commission

Ken Milam	El Dorado County, California
Ann Bogush	City of South Lake Tahoe, California
Bill Combs	Placer County, California

Advisory Planning Commission (Continued)

John Renz	Douglas County, Nevada
Michael Harper	Washoe County, Nevada
John Hoole	Carson City, Nevada
Stan Randolph	Air Resources Board, California
John Meder	Division of State Parks, Nevada
Lynne Smith	Lahontan Board Member, California
Lewis Dodgion & Wendell McCurry	Nevada Division of Environmental Protection
Glenn Smith	Forest Service, U.S.D.A.
Dick Pyle	Soil Conservation Service, U.S.D.A.
Germaine McMorris	Lay Member, Nevada
Maury Bidart	Lay Member, Nevada
Stan Hansen	Lay Member, California
Dennis Schlumpf	Lay Member, California
Lois Shellhammer	Lay Member, California

Federal Agencies

Kenneth Cox	Federal Highway Administration
Art Champ	Corps of Engineers
Harry Ball	Environmental Protection Agency
Marc Sylvester	Geological Survey
Dale James	Housing and Urban Development

Nevada Agencies

Jim Mallery	Department of Transportation
Larry Reynolds	Division of Water Resources
Dick Serdoz	Department of Environmental Protection
Ted Frantz	Department of Wildlife

California Agencies

Jim Burns	Resources Agency
Mary Shallenberger	Office of Planning and Research
Randall Moory	State Lands Commission
Jerry Mensch	Department of Fish and Game
Andrew Sawyer	Water Resources Control Board
Burton Brockett	Department of Transportation
Dennis Winslow	Calif. Tahoe Regional Planning Agency
George Thomas	Commission for Economic Development
Robert Macomber	Department of Parks and Recreation
Jan McFarland	Department of Conservation

Regional Agencies

Charles White	Lahontan Region, CRWQCB
Dick Milbrodt	Tahoe Transportation District
Earl Withycombe	Tahoe Basin Coordinating Council

D. Technical Support: Numerous individuals representing various state and federal agencies, in addition to those listed previously, provided technical support in the process of developing environmental thresholds. Those individuals are listed here with a note of thanks from the Tahoe Regional Planning Agency.

John Rogers, Soil Conservation Service, Sacramento
John coordinated with Al Wolfenden of Brown and Caldwell on the soil threshold.

Wayne Sheldon, Soil Conservation Service, Sacramento
Wayne, like John, provided input into the soil threshold analysis.

Mark Pitchford, Environmental Protection Agency, Las Vegas
Mark had overall responsibility for conducting the visibility study in the Basin.

Dr. Thomas A. Cahill, University of California, Davis
Dr. Cahill provided assistance in understanding visibility within the Basin.

Russel B. DuPree, Office of Noise Control, San Francisco
Russ was a valuable asset in providing the Agency with an understanding of the noise component.

California Tahoe Regional Planning Agency
The CTRPA provided noise monitoring data for 1977 and again in 1982 in addition to providing valuable assistance in many other areas.

Bill Johnson, Forest Service, USDA, South Lake Tahoe
Bill provided assistance with the water and soil components.

Ted Frantz, Nevada Department of Wildlife
Ted worked closely with David Greer on the stream survey work.

Russ Wickwire, California Department of Fish and Game
Russ worked closely with David Greer on the stream survey work.

Dan Hinz, California Department of Fish and Game
Dan provided habitat information on wildlife species.

Dick Wagner, California Department of Fish and Game
Dick provided habitat information on wildlife species.

Gary Herron, Nevada Department of Wildlife
Gary provided habitat information on non-game species.

Fred Smith, Nevada Department of Wildlife
Fred provided deer habitat information.

Rick Morat, U. S. Fish and Wildlife Service
Rick provided technical information on the HEP model.

Bob McDowell, Forest Service, USDA, South Lake Tahoe
Bob provided input and guidance on the vegetation component.

Sherry Reed, Forest Service, USDA, South Lake Tahoe
Sherry coordinated with David Greer on the vegetation, wildlife, and fisheries resources.

Jon Hoefer, Forest Service, USDA, South Lake Tahoe
Jon provided assistance throughout the process.

Frank Magary, Forest Service, USDA, South Lake Tahoe
Mac provided assistance with the visual component.

Bill Laudenslayer, Forest Service, USDA, Nevada City
Bill provided technical assistance with the WHR (wildlife) model.

APPENDIX A

GLOSSARY OF TERMS

A

acre-foot
A water measurement term, equal to the amount of water that would cover an area of one acre to a depth of one foot (43,560 cubic feet).

affected environment
The natural and physical environment and the relationship of people to that environment that will or may be changed by actions proposed.

Agency
The Tahoe Regional Planning Agency or TRPA.

ambient
Background, external conditions that refer to the quality of a specific environmental factor such as ambient air pollution levels or ambient water quality.

aphotic zone
The non-illuminated, deep portion of a lake.

appropriative water rights
The right of persons to divert water from a body or natural flow of water to a specific point of use. Continuous beneficial use of the appropriated water must be made to maintain the right.

aspect
The compass direction that the slope of a land surface faces toward.

B

backcountry
An undeveloped area where the management objectives stress dispersed, off-road recreation, e.g., hiking, trail bike riding, hunting, fishing. Generally describes semiprimitive motorized and semiprimitive nonmotorized recreation opportunities.

Board
The Governing Body of the Tahoe Regional Planning Agency.

buffer
A restrictive zone along or around a specified area.

C

canopy
The more or less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

climax community
The last or late stage in plant succession.

commercial timber sales
The selling of timber from lands for the economic gain of the party removing and marketing the trees.

Compact
The Tahoe Regional Planning Compact amended by the States of California and Nevada, ratified by Congress, and signed as Public Law 96-551 on December 19, 1980 by President Carter.

conifer
A cone-bearing tree with needle-type leaves.

cushion plant community
Plants that are specially adapted to tundra-like conditions of high winds, frigid temperatures, shallow soils, and short growing seasons.

D

deciduous riparian vegetation
Broad-leaved trees such as willows, aspen, alder, and cottonwood.

developed recreation site
Relatively small, distinctly defined area where facilities are provided for concentrated public use, e.g., campgrounds, picnic area, swimming areas.

dispersed recreation
That portion of outdoor recreation use which occurs outside of developed sites.

disturbance zone
Zone around a nest site or animal use area where animals are highly vulnerable to disturbance.

E

early forest succession
The biotic community that develops immediately following the removal or destruction of vegetation in an area.

emergent vegetation
Vascular plants that grow in shallow water areas.

endangered species
Any species which is in danger of extinction throughout all or a significant portion of its range as defined under the provisions of the Endangered Species Act of 1973.

environmental threshold carrying capacity
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. The terms enviornmental threshold or thresholds mean the same as enviornmental threshold carrying capacity.

euphotic zone
The illuminated stratum of the littoral and pelagic zones.

eutrophication
The process by which waterbodies become enriched or over fertilized with nutrients, resulting in increased algal productivity.

even-aged vegetation
The combination of actions that results in the creation of stands in which trees of essentially the same age grow together.

extirpate
To cause the removal or elimination of a species.

F

fisheries habitat
Streams, lakes, and reservoirs that are capable of supporting fishes.

foraging habitat
The area or type of environment in which an animal searches for food.

fuelwood
Wood -- round, split or sawn, and generally otherwise refuse material -- cut into short lengths for burning.

G

game species
Any species of wildlife or fish for which seasons and bag limits have been prescribed, and which are normally harvested by hunters, trappers, and fishermen under state or federal laws, codes, and regulations.

geomorphic units
An area or division of land in which the pattern of topographic elements are characteristic throughout and as such distinguish it from other areas with different sets of topographic elements.

goal statement
A concise statement of the state or condition that a plan is designed to achieve. A goal is usually not quantifiable and may not have a specific date for completion.

Governing Body
The Board that governs the Tahoe Regional Planning Agency.

grass/forb
An early forest successional stage where [illegible] vegetation.

groundwater
Water in a saturated zone or a geologic stratum.

growing season
The months of the year a species of vegetation grows.

H

I

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influence zone
Zone around a nest site or animal use area where animals forage for food or defend a territory.

inholdings
Lands within the proclaimed boundaries of a National Forest that are owned and/or managed by some agency, organization, or individual other than the Forest Service.

institutional arrangements
Organizations and government institutions that serve people. These would include areas of health, education, law enforcement, fire protection, transportation, environment, and energy.

instream flow
The amount of water passing a given point at a given time.

instream cover
Materials in streams that provide shelter to fish and invertebrate populations.

intermittent stream
A stream which flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas.

invertebrates
Generally refers to aquatic and terrestrial insects and other oganisms without backbones.

J

K

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L

late forest succession
A stage of forest succession where the majority of trees are mature or overmature.

leaching
The removal of materials in solution from the soil.

littoral
The nearshore zone of a waterbody.

liverworts
Water adapted plants that lack specialized vascular tissues and supporting structures.

M

mass movement
Downslope unit movement of a portion of the land's surface, i.e., a single landslide or the gradual simultaneous downhill movement of the whole mass of loose earth material on a slope face.

mature timber
Trees that have attained full development, particularly height, and are in full seed production.

mean
The arthmetic average.

micron
A unit of length equal to one-millionth of a meter.

migratory stream
Referenced relative to fish use -- a stream that provides spawning habitat to lake fish populations.

mineral soil
Weathered rock materials without any vegetative cover.

minimum stream flows
A specified level of flow through a channel that must be maintained by the users of the stream for biological, physical, or other purposes.

mooring
A place at which a boat can be secured by cables, anchors, etc.

moraine
Any rock material deposited chiefly by direct glacial action.

N

National Forest System land
National Forests, National Grasslands, and other related lands for which the Forest Service is assigned administrative responsibility.

National Wilderness Preservation System
All lands covered by the Wilderness Act and subsequent wilderness designations, irrespective of the department or agency having jurisdiction.

no action alternative
The most likely condition expected to exist in the future if current direction would continue unchanged.

nursery habitat
Areas in lakes or streams that provide the necessary requirements for survival of young fish.

nutrient
A substance that nourishes or promotes growth.

O

objective
A clear and specific statement of planned results to be achieved within a stated time period. The results indicated in the statement of objectives are those which are designed to achieve the desired state or process represented by the goal.

off-road vehicle use
Use of vehicles off developed roads.

old growth
Forested areas where trees have attained full development, particularly in height.

oligotrophic
Deficient in plant nutrients or unfertile.

P

patch cutting
Harvest of timber from areas of 5 acres or less.

pelagic
The open waters or off-shore areas.

perching trees
Trees used for resting or sitting by raptors such as eagles, hawks, and ospreys.

periphyton
Algae that are attached to a substrate such as piers or the bottom of a lake.

physiographic surface
A land surface created by geologic processes of intrusion, deposition, erosion, or structural movement.

phytoplankton
Algae that are free floating.

pole/sapling
A forest successional stage in which trees between five and seven inch diameter are the dominant vegetation.

preferred alternative
The alternative recommended for implementation based on the evaluation completed in the planning process.

prescribed fire
Introduction of fire under controlled conditions to dispose of slash or fuels, control unwanted vegetation, or stimulate grasses, forbs, shrubs or trees for range, wildlife, recreation, or timber management purposes.

primary productivity
Algae take up carbon and release oxygen through photosythesis. The rate at which carbon is taken up is called primary productivity. It is a measure of algal growth rate.

project
An activity undertaken that may substantially affect the land, water, air, space, or any other natural resource of the region.

proposed action
In terms of an environmental impact statement, the project, activity, or decision an agency intends to undertake and is the subject of the EIS.

Q

quad maps
Standard U.S. Geological Survey quadrangle maps.

quaking bogs
A waterlogged area with marsh-type vegetation, containing high quantities of peat. The bog 'quakes' when walked upon.

R

recreation residences
Houses or cabins on National Forest land that are not the primary residence of the owner.

recreation visitor day (RVD)
A unit for measuring recreation activities that aggregates 12 visitor hours. May consist of one person for 12 hours, 12 persons for one hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups.

reforestation
The setting out of seedlings (sometimes includes wildlings), transplants, tree seeds, or for certain species, cuttings for the establishment of a forest stand or tree cover.

region
The region includes Lake Tahoe, the adjacent parts of Douglas and Washoe Counties and Carson City lying within the Basin in Nevada, and the adjacent parts of Placer and El Dorado Counties lying within the Basin in California, and an additional portion of Placer County lying outside but adjacent to the Basin.

reintrained dust
Particulate matter relased into ambient air by natural, mechanical, or chemical forces or processes.

riparian areas
Land bordering a stream, lake, or spring water.

riparian vegetation
Plants associated with or in close proximity to water. Associated plant communities include, but are not limited to, vegetation of meadows, wetlands, and stream zones.

riparian water rights
The right the owner of land has to make beneficial use and share the natural flow of water which traverses or borders his land.

resident stream
Referenced relative to fish use -- a stream that provides suitable year-round habitat for populations of fish.

S

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salvage
The exploitation of trees that are dead, dying, or deteriorating (e.g., because overmature or materially damaged by fire, wind, insects, fungi, or other injurious agencies) before their timber becomes worthless.

sanitation
The removal of dead, damaged, or susceptible trees, essentially to prevent the spread of pests or pathogens and so promote forest hygiene.

sawtimber
Trees suitable in size and quality for producing logs that can be processed into lumber.

Secchi depth
A measure of the clarity of the water with a white 8 inch disk. It is lowered into the water until it disappears and is then brought back up until it reappears. The Secchi depth is the average between the depth of disappearance and reappearance.

second home
A residence that is not occupied year-round and whose owner has a permanent residence somewhere else.

sedimentation
The deposition of fragmental material transported by or suspended in water.

seedling/sapling
A forest successional stage in which trees less than five inches in diameter are the predominant vegetation.

selective thinning
A method of harvest used to increase the structural diversity of an ever-aged stand of timber.

sensitive species
Plants that are extremely scarce and considered vulnerable to extinction.

seral ecological condition
The unique characteristics of a biotic community which is in transitory stage of an orderly ecologic development that involves changes in species, structure, and community processes with time.

seral stage
A stage of plant succession

shrub/seedling
A forest successional stage in which shrubs and seedling trees are the dominant vegetation.

sink
An area that traps nutrients, making them unavailable for use by green plants. In Lake Tahoe, this area is close to the bottom where a stratification of dense, cold water traps the nutrients in the aphotic zone.

slash
The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning.

slope slump
a slide or earthflow of a soil mass.

snag
A standing dead tree from which the leaves and most of the branches have fallen.

soil productivity
The capacity of soil to produce a specific crop such as fiber, forage, etc., under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.

spawning habitat
Bottom material of lakes and streams that is suitable for egg deposition and incubation.

special interest species
Animal species that are of "special interest" in the Basin due to a variety of reasons including scarcity, aesthetics, vulnerability, and special management needs.

stagnation
A condition where plant growth is markedly reduced or even arrested through, e.g., competition, state of the soil, or disease.

stand
An aggregation of trees or other growth occupying a specific area and sufficiently uniform in composition (species), age, arrangement, and other conditions as to be distinguishable from the forest or other growth of other land cover on adjoining areas.

standard
Performance criterion indicating acceptable norms, specifications, or quality that actions must meet. A principle requiring a specific level or attainment, a rule to measure against.

standard deviation
A measure of the amount of variability in a set of numbers. A small standard deviation indicates most values are near the average value, whereas a large deviation indicates the values are scattered throughout a broad range.

Stonewort
Green algae of the genus Chara.

structural diversity
Refers to the vertical distribution of plants as measured by canopy coverage.

subdivisions
Areas of previously undeveloped land divided into individual home sites and/or blocks of lots with streets or roads and open spaces.

successional stage
A phase in the gradual supplanting of one community of plants by another.

T

"T" factor
The amount of soil that can be lost due to displacement or delivery without the loss of soil productivity.

threatened species
Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range and which has been designated in the Federal Register by the Secretary of Interior as a threatened species. (See also endangered species.)

thresholds
See environmental threshold carrying capacity.

type conversion
The conversion of the dominant vegetation in an area from forested to nonforested or one tree species to another.

U

understory
The trees and other woody species growing under a more or less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth.

V

value statement
See goal statement.

W

water rights
Rights to divert and use water or to use it in place.

wilderness
An area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain.

wildlife diversity
The species composition and abundance of animals within a specific area.

wildlife habitat
An area that provides one or more of an animal's essential needs.

APPENDIX B
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APPENDIX C

ADOPTED STANDARDS

This Appendix lists adopted standards for various environmental components described in Chapter II. It expands upon the standards listed in the body of the environmental impact statement.

Water Quality: The following water quality objectives/standards have been adopted at the federal level and by the States of California and Nevada.

FEDERAL

Federal regulations (40 CFR, 35.1550) require that states review existing standards and adopt revisions as appropriate every three years to assure consistency of federal requirements. Specifically, federal regulations require the following antidegradation policy.

1. Existing in-stream water uses shall be maintained and protected.

2. Existing high-quality waters which exceed those necessary to support full beneficial uses shall be maintained and protected unless the state chooses, after full public participation, to allow lower water quality as a result of necessary and justifiable economic or social development. No degradation, though, shall be allowed in high-quality waters which constitute an outstanding national resource such as waters of national and state parks, wildlife refuges, and waters of exceptional recreational or ecological significance.

(EPA approved California's designation of Lake Tahoe as an outstanding water resource in April 1981.)

CALIFORNIA

Nitrogen, Phosphorus, and Iron Water Quality Objectives for Waters in California, mg/l[a]

	Total Nitrogen		Total Phosphorus		Total Iron	
	Annual[b]	90th[c]	Annual[b]	90th[c]	Annual[b]	90th[c]
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	--	0.15	--
Blackwood Creek	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	--
Carnelian Creek	0.19	--	0.015	--	0.03	--

a 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 proper are clarified. In addition, water quality objectives limiting the nutrient content of tributary streams have been reviewed, and, in some cases, revised. Revised stream standards are based on data contained in Table B-1 of the Tahoe Regional Planning Agency draft 208 plan (1977), which classifies tributary streams as draining disturbed or undisturbed watersheds and provides a summary of measured water quality characteristics derived from a number of different monitoring programs. Data for total nitrogen, total phosphorus, and iron have been examined for the purpose of updating water quality objectives. A weighted mean concentration (weighted on the basis of the number of samples reported for the different monitoring programs) was first determined for each of the three nutrient constituents for each tributary stream. For a stream draining an undisturbed watershed, the revised water quality objectives represent the weighted mean concentrations determined for that specific stream. For streams draining disturbed watersheds,

revised water quality objectives are based on the overall mean nutrient concentration for all streams draining undisturbed watersheds.

b Annual average.

c 90th percentile; values not to be exceeded more than 10 percent of the time during any sampling period.

Statements of Water Quality Objectives for Lake Tahoe:

Algal Growth Potential: Mean annual algal growth potential at any point in the Lake shall not be greater than twice the mean annual algal growth potential at the limnetic reference station.

Plankton Count: The mean seasonal concentration of plankton organisms shall not be greater than 100 per ml and the maximum concentration shall not be greater than 500 per ml at any point in the Lake.

Clarity: The vertical extinction coefficient shall be less than 0.08 per meter when measured below the first meter. The turbidity shall not exceed 3 JTU at any location in the Lake too shallow to determine a reliable extinction coefficient. In addition, turbidity shall not exceed 1 JTU in shallow waters of the Lake not directly influenced by stream discharges. Secchi disk transparency shall not be decreased below levels recorded in 1967-71 based on a comparison of seasonal and annual mean values.

Electrical Conductivity: The mean annual electrical conductivity shall not exceed 95 umhos/cm at 25°C, and the 90 percentile value shall not exceed 100 umhos/cm at 25°C at any location in the Lake.

Additional Biological Indicators: Algal productivity and the biomass of phytoplankton, zooplankton, and periphyton shall not be increased beyond levels recorded in 1967-71, based on a statistical comparison of seasonal and annual mean values.

Nondegradation: Lake Tahoe Water Quality Control Policy (1966) requires maintenance of waters of Lake Tahoe in their present natural state of crystal clarity and pristine purity and protection of all beneficial uses of the lake waters. Statewide Nondegradation Policy (1968) requires continued maintenance of existing high quality waters (as of October 1968) and provides for changes only when: (1) It is consistent with maximum benefit to the people of the state; (2) it will not unreasonably affect present and anticipated beneficial uses of water; and (3) it will not result in water quality less than prescribed in water quality control plans or policies.

NEVADA

The criteria in the following table apply to all waters and are not to exceed the average annual mean measured as mg/l.

	Soluble Phosphorus	Total Inorganic Nitrogen
All Waters	0.007	0.025

Statements of Water Quality Objectives for Lake Tahoe:

Temperature °C: Permissible temperature increase above natural receiving water temperature - none.

Algal Growth Potential: Mean annual algal growth potential at any point in the lake shall not be greater than twice the mean annual algal growth potential at the limnetic reference station.

Plankton Count: Number per ml:
Average (June through September).....Not to exceed 100
Single Value.....Not to exceed 500

Turbidity: In order to minimize turbidity levels in the Lake and tributary streams and control erosion:

1. The discharge of solid or liquid waste materials, including soil, silt, clay, sand, and other organic and earthen materials to Lake Tahoe or any tributary thereto, is prohibited.

2. The discharge of solid or liquid waste materials, including soil, silt, clay, sand, and other organic and earthen materials to lands below the high water rim of Lake Tahoe or along any tributary to Lake Tahoe in a manner which will cause the discharge of such waste materials to Lake Tahoe or any tributary thereto, is prohibited.

3. The placement of man-made disturbance of material below the high water rim of Lake Tahoe or along any tributaries to Lake Tahoe, in a manner which will cause the discharge of solid or liquid waste materials, including soil, silt, clay, sand, and other organic and earthen materials to Lake Tahoe or any tributary thereto, is prohibited.

Nondegradation: Interstate Water Quality Standards and Plan of Implementation (1967) states that to enhance water quality (1) waters affected by pollution shall be upgraded and protected, and (2) the quality of waters that are presently of high or suitable quality shall be perpetually maintained at that quality. Nevada Revised Statutes (1979), Chapter 445.253 requires nondegradation of any surface waters whose quality is higher than the applicable standard for water quality as of the date and standard becomes effective.

- 02647

Uniform Regional Runoff Quality Guidelines:

The following guidelines were defined in the Lake Tahoe Basin Water Quality Plan (California State Water Resources Control Board, 1980) to establish limits on the quality of runoff from land development in California. They shall apply in addition to any more stringent effluent limitations essential to achieve the water quality objectives. In addition, both California and Nevada issue requirements for allowable runoff discharge quality in issuing individual discharge permits.

Surface Discharges

Surface water runoff which directly enters Lake Tahoe or a tributary thereto should meet the following constituent levels:

Constituent	Maximum Concentration
Total Nitrogen as N	0.5 mg/l
Total Phosphate as P	0.1 mg/l
Total Iron	0.5 mg/l
Turbidity	20 JTU
Grease and Oil	2.0 mg/l

If the constituent levels of water entering a site from upstream areas are of a superior or equal quality to the above, those waters should meet the quality level listed above prior to discharge from the site.

If the constituent levels of waters entering a site do not meet the above, there should be no statistically significant increase (at a 90 percent confidence level) in the water discharge from the site.

Runoff Discharged to Groundwaters:

Waters infiltrated into soils should not contain excessive concentrations of nutrients which may not be effectively filtered out by soil vegetation.

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

Soil: The following standard for allowable percentage of impervious cover by individual soil types has been established for the Lake Tahoe Basin. It is a result of the Land Capability Classification System developed by Dr. Robert G. Bailey, Forest Service, USDA in cooperation with the Tahoe Regional Planning Agency in 1974. This table also includes the "T" factor for each soil type as defined by the Soil Conservation Service.

Soil Type	Capability Class	Allowable Percentage of Impervious Cover	"T" Factor Tons Per Acre Per Year	"T" Factor Metric Tons Per Hectare Per Year
Be	1b	1		
CaD	4	20	2	.73
CaE	2	1	2	.73
CaF	1a	1	2	.73
Co	1a	1	3	1.10
EbC	6	30	5	1.84
EbE	4	20	5	1.84
EcE	4	20	5	1.84
EfB	7	30	5	1.84
Ev	1b	1	5	1.84
Fd	1b	1		
FuD	5	25	2	.73
FuE	3	5	2	.73
GeC	6	30	5	1.84
GeD	4	20	5	1.84
Gr	1b	1		
GsF	1a	1	3	1.10
IgB	5	25	5	1.84
IsC	6	30	5	1.84
IsD	4	20	5	1.84
IsE	4	20	5	1.84
JaC	5	25	3	1.10
JaD	3	5	3	1.10
JbD	3	5	2	.73
JeB	5	25		
JeD	3	5	1	.37
JgC	5	25	3	1.10
JhC	5	25	2	.73
JtD	6	30	3	1.10
JwD	6	30	5	1.84
JwE	4	20	3	1.10
JwF	2	1	3	1.10
Lo	1b	1		
Mh	1b	1		
MkB	5	25	3	1.10
MkD	3	5	3	1.10
MmB	5	25	3	1.10
MsG	1a	1	3	1.10
MtE	1a	1	3	1.10
MtG	1a	1	3	1.10
MxF	1c	1	1	.37

Soil Type	Capability Class	Allowable Percentage of Impervious Cover	"T" Factor Tons Per Acre Per Year	"T" Factor Metric Tons Per Hectare Per Year
MsF	1c	1		
Px	1c	1		
Ra	1c	1		
ReF	1a	1		
RcG	1a	1	2	.73
RtF	1a	1	1	.37
RtG	1a	1	1	.37
Rx	1c	1		
ShE	1a	1	3	1.10
SkF	1a	1	3	1.10
Sm	1c	1		
TaD	6	30	3	1.10
TbD	6	30	3	1.10
TcB	5	25	3	1.10
TeC	5	25		
TdD	5	25	3	1.10
TeE	3	5	3	1.10
TeG	1a	1	3	1.10
TkC	5	25	3	1.10
TmE	1a	1	2	.73
TmF	1a	1	2	.73
TrE	1a	1	1	.37
TrF	1a	1	1	.37
UmD	5	25	2	.73
UmE	3	5	2	.73
UmF	1a	1	2	.73
WaE	3	5	2	.73
WaF	1a	1		
WcE	3	5	2	.73
WcF	1a	1	2	.73

Air Quality: In addition to the standards listed in Chapter II for the selected subcomponents, other air quality standards apply to the Lake Tahoe Basin.

Pollutant	Averaging Time	California Standard	Nevada Standard	Federal Standard
Ozone	1 Hour	0.10 ppm(1)	0.10 ppm	0.12 ppm
Carbon Monoxide	12 Hour	10. ppm	----	----
	8 Hour	6. ppm	6. ppm	9. ppm
	1 Hour	40. ppm	6. ppm	15. ppm
Nitrogen Dioxide	Annual Arithmetic Mean	----	0.05 ppm	0.05 ppm
	1 Hour	0.25 ppm	----	----
Sulfur Dioxide	Annual Geometric Mean	----	0.03 ppm	0.03 ppm
	24 Hour	0.05 ppm	0.14 ppm	0.14 ppm
	3 Hour	----	0.5 ppm	0.5 ppm
	1 Hour	0.5 ppm	----	----
Particulate Matter	Annual Geometric Mean	60ug/m^3(2)	75ug/m^3	75/60ug/m^3
	24 Hour	100ug/m^3	150ug/m^3	260/150ug/m^3
Sulfates	24 Hour	25ug/m^3	----	----
Lead	30 Day Average	1.5ug/m^3	----	----
	3 Month Arithmetic Mean	----	1.5ug/m^3	1.5ug/m^3
Hydrogen Sulfide	1 Hour	0.03 ppm	----	----
Hydrocarbons	3 Hour 6-9 a.m.	----	0.24 ppm	0.24 ppm
Ethylene	8 Hour	0.1 ppm	----	----
	1 Hour	0.5 ppm	----	----
Visibility	Daily	30 miles at 70% humidity	30 miles at 70% humidity	----
Vinyl Chloride	24 Hour	0.010ppm	----	----

(1) Parts per million
(2) Micrograms per cubic meter