

CHAPTER 13

Conclusions and Recommendations

The purpose of this chapter is to: 1) summarize major conclusions from the five-year (2006-2010) evaluation of Threshold Standards and indicators, 2) summarize findings from the assessment of policies, ordinances, and programs implemented over the course of the *Regional Plan*, and 3) highlight the more noteworthy recommendations identified in individual Indicator Summaries for TRPA and its partners to consider—as they continue to pursue the maintenance and improvement of the Tahoe Region’s environmental quality, consistent with the *Bi-State Compact* and its broad suite of environmental goals. The recommendations included here are suggestions for policy and management actions intended to sustain or improve indicator trends that are short of attainment compared to existing standards, or address deficiencies identified through the *Regional Plan* review. The recommendations should not be construed as commitments, requirements, or specific directives. However, the recommendations reflect approaches that may be considered by policy makers and stakeholders in the development of specific actions considered appropriate to remedy an identified issue.

Overall, the results from this Threshold Evaluation and applied research, together suggest environmental conditions in the Tahoe Region have largely been sustained or improved over the period of *Regional Plan* implementation (1987-2010). Under the *Regional Plan*, TRPA has implemented a number of regulatory control measures and has facilitated on-the-ground restoration and redevelopment projects. The information and findings from this Threshold Evaluation suggest TRPA policies, ordinances and programs have contributed positively to Threshold Standard attainment and maintenance. Notwithstanding this apparent progress, this evaluation found that some indicators within Air Quality, Water Quality, Noise, Wildlife, Fisheries, Vegetation, and Soil Conservation Threshold Categories fell short of attaining some standards, or the indicator current status was unknown. Factors contributing to a “non-attainment” determination for different standards varied, but it was found that issues associated with land uses and urban development preceding the *Regional Plan* were most commonly responsible. It was also noted that the basis for some of the adopted standards needs to be reviewed and potentially revised or clarified because some standards may not be achievable as currently articulated. In addition, some standards lack the basis to determine condition, or new research and information since Resolution 82-11 and the *Regional Plan* suggests different standards may be more appropriate to protect environmental or resource conditions.

The recommended strategies and specific actions for achieving and maintaining Threshold Standards address a wide range of categories, and include a commensurately wide range of actions and program improvements where the report finds that an indicator is not meeting the adopted standard. The scope of the recommendations varies. In some cases, recommendations are relatively narrow and

focused (e.g., phasing out phosphorous fertilizer). In other instances, recommendations propose broader changes to improve a whole system or program approach (e.g., a package of changes to the policies, ordinances, and zoning system to incentivize the removal of impervious cover from sensitive lands and environmental redevelopment in order to achieve numerous, and sometimes synergistic benefits across multiple threshold categories).

The following summarizes conclusions, and more notable policy and management action priorities. Recommendations for individual Threshold Standards and the associated indicator can be found in the "*Recommendation for Additional Actions*" section at the bottom of each Indicator Summary, located within Threshold Category specific chapters. Recommendations presented here are grouped among three categories: 1) Regional Policies and Ordinances, 2) Environmental Improvement Program, and 3) Science and Monitoring Program. The Regional Policies and Ordinances section addresses conclusions and recommendations primarily related to more significant land use policies and priority *Regional Plan* amendments. The Environmental Improvement Program (EIP) section addresses conclusions and recommendations related to the EIP administration and project prioritization. The Science and Monitoring Program section addresses conclusions and recommendations related to currently adopted Threshold Standards, monitoring program directives, (i.e., Chapter 16 *Code of Ordinances*) and priority science and monitoring needs. Beyond recommendations listed here and those listed within each Indicator Summary, it is recommended that existing policies and actions be continued as future Regional Plan elements and allowed to be adjusted as appropriate when new information warrants such actions.

Regional Policies and Ordinances

The implementation of the *Regional Plan* and its associated regulations has significantly reduced the rate of urban development and has virtually halted new urban development on sensitive lands in the Tahoe Region (Raumann and Cablk 2008). In a number of cases, projects approved by TRPA under the *Regional Plan* have resulted in a net gain of open space, and reduced the dependency on the private automobile, consistent with the directives of the *Bi-State Compact*. The Embassy Suites project at Highway 50 and Ski Run Boulevard reclaimed natural stormwater treatment capacity through the removal of derelict hotels and the creation of artificial wetland habitat that also serves to treat stormwater. The Heavenly Gondola/Stateline Redevelopment project removed antiquated infrastructure, incorporated state-of-the-art stormwater treatment facilities, and has created a vibrant and pedestrian-friendly setting in an area that receives a large visitor base.

While the agency can point to these and other success stories, more can be done to facilitate the needed shifts in the land use pattern, which were expected to occur more quickly and effectively from the land use policies and zoning system established in 1987. The following policy and ordinance recommendations are forwarded to make more feasible or expedite Threshold Standard attainment.

- **Revise policies, ordinances, and zoning to further incentivize the reclamation and restoration of sensitive open space and the implementation of beneficial environmental projects as part of planned redevelopment of the existing built environment.** This evaluation found that some indicators related to water quality, scenic quality, air quality, noise, and sensitive lands have not yet reached full attainment with adopted Threshold Standards. For the Scenic Quality Threshold Category (specifically, scenic roadway units), it was found that scenic quality improvements only occurred on roadway units associated with redevelopment. In addition, it was noted that existing programs designed to transfer and retire impervious cover from sensitive lands had limited effect; only about 40 acres has been transferred or retired and restored as a result of

excess coverage mitigation and transfer policies since the adoption of the *Regional Plan*. These findings suggest existing policies, ordinances, and/or zoning governing development, redevelopment or development transfers, and commodities can be made more effective at moving the Region toward achieving these Threshold Standards.

Results from the review of the *Regional Plan*, in concert with the Threshold Evaluation findings, revealed that currently adopted coverage reduction incentive policies and programs could be more effective in correcting pre-1987 land use issues, encouraging the retirement of and transfers of development out of sensitive lands, and expediting the revitalization of Tahoe's dilapidated and environmentally-deleterious built landscape. Stagnation of redevelopment is reducing opportunities to improve environmental quality—specifically, opportunities to remove coverage from sensitive lands, increase capacity to control erosion and treat polluted urban stormwater, increase the area of sensitive open space, enhance scenic quality, and improve air quality through reduced dependency on the private automobile. This, along with the fact that only 10 percent of the Region remains available for new development, calls for the agency to seize opportunities to revise land use policies to reshape development patterns, as one of the tools to achieve environmental goals. Consequently, it is recommended that the agency consider amending the *Regional Plan* as a component of the 2012 *Regional Plan* Update to include alternative policies and ordinances that more effectively and efficiently facilitate the movement of current and potential land cover and disturbance from sensitive lands, to more appropriately zoned areas, in order to benefit conditions spanning multiple Threshold Categories.

- **Modify policies to reduce dependency on the private automobile by creating accessible, frequent, and safe alternative modes of transit, such as policies to promote bicycle- and pedestrian-friendly town centers.** Well-connected bicycle trail infrastructure and the provision of pedestrian facilities (i.e., sidewalks) have been demonstrated to reduce vehicle miles traveled with concomitant reduction in air pollutant emissions (Alta Planning and Design and LSC Transportation Consultants 2009). Although actions through the *Regional Plan* have been implemented and correlate well in time with reductions in traffic volume and vehicle miles traveled, more can be done to aid the maintenance or attainment of air quality standards and other related traffic volume Threshold Standards. People will be willing to limit car trips only if there are convenient, frequent, and safe alternatives. It is recommended that the agency revise policies and ordinances in order to further promote multiple alternative travel modes. It is also recommended to further incentivize bike trail construction located near community amenities or to link existing bike trail networks consistent with the Regional Bicycle and Pedestrian Plan (2006). In the same light, it is recommended that the agency adopt “complete streets”¹ and mixed-use smart growth policies to facilitate the walkability of town centers with a corresponding relocation of development out of sensitive lands. Recommendation of these policies is intended to create more open space in sensitive areas and less dependency on the private automobile, and thus contribute to improved stormwater treatment capacity, added wildlife habitat area, reduced tail-pipe emissions, and improved scenic quality. These recommendations should be addressed as a component of the 2012 *Regional Plan* Update.
- **Develop ordinances that phase out the use of phosphorus fertilizers.** Some indicators for Lake Tahoe water quality (e.g., annual average Secchi depth, phytoplankton primary productivity) showed declining trends relative to standards, in part as a result of excess nutrients entering Lake

¹ See also National Complete Streets Coalition website - <http://www.completestreets.org/>

Tahoe. In addition, there is growing public and scientific sentiment that Lake Tahoe's nearshore conditions are in decline because of the more frequent observations of attached algae on submerged shoreline rocks. It is suspected that nutrient enrichment from the urban interface is at least in part driving frequent observations of attached algae in Lake Tahoe's nearshore (pers. comm., Scott H. Hackley, UC Davis-Tahoe Environmental Research Center, see also UC Davis – *State of the Lake Report* 2012). Research in support of the Tahoe TMDL and water transparency concluded that while fine sediments constitute the primary cause of clarity decline, nutrient loading to Lake Tahoe should not be overlooked because of its effect on both the nearshore and deep-water environments of Lake Tahoe. While research and additional analysis is ongoing to identify the exact sources of nutrients and their respective runoff concentrations, it is well established that phosphorus loading to surface water is primarily coming from upland sources, as opposed to nitrogen load which is primarily deposited in the Lake from atmospheric sources (Lahontan and NDEP 2011). Fertilizers are predominantly used on manicured lawn surfaces, and the import and application of phosphorus-containing fertilizers represents an unnatural net increase in nutrient loading to Lake Tahoe's surface waters that can be controlled through regulatory actions and/or education, outreach, or disincentive programs. Consequently, it is recommended that the agency adopt a policy as a component of the 2012 *Regional Plan* Update that results in the phase out of the use of phosphorus-containing fertilizers in the Region (see also Appendix CR-1). Any phase out policy would need to be supported with public outreach and awareness efforts. The phase out of phosphorus-containing fertilizers has been demonstrated to be effective at improving water quality in other regions of the United States.²

- **Review and potentially revise policies that hamper land managers' ability to restore vegetation communities.** This evaluation and others³ have noted that fire suppression efforts over the past 100 years in the Region have interrupted natural processes critical for sustaining natural vegetation community composition and structure. Specifically noted in this evaluation is the fact that conifers have invaded and are converting riparian vegetation communities, due to the interruption of natural disturbance processes or the disruption of natural hydrologic regimes. Recognizing the potential impacts to people and property of allowing natural disturbance back into Tahoe's forested landscape, active vegetation management is needed to mimic natural disturbance processes. Land managers often comment that sensitive lands are typically not addressed in timber management plans because existing policies and ordinances limit cost-effective options they can use to restore natural vegetation communities and manage unnatural fuel loads in riparian areas. It is recommended that the agency work with partners to review and potentially revise vegetation management policies as appropriate to facilitate well-intended riparian vegetation restoration projects.
- **Find solutions to address noise standard exceedances** – This Threshold Evaluation found that the Region has exceeded adopted standards for noise; specifically standards tied to highways, the South Lake Tahoe Airport, and motorized watercraft. It is recommended that the agency actively engage with the City of South Lake Tahoe to update the 1986 Airport Master Plan and 1992 Airport settlement agreement, and make necessary adjustments to resolve noise standard exceedance issues. The feasibility of achieving the existing "no exceedances allowed" interpretation of existing airport noise standards should be reviewed and assessed by technical experts to determine if it is reasonably feasible to achieve such standards given the diversity of aircraft using the airport (e.g., private jets and military aircraft). For highways and associated

² See also <http://www.lakeaccess.org/lakedata/lawnfertilizer/mainlawn.htm>

³ See Van De Water, K. and M. North. 2010. www.fs.fed.us/psw/publications/north/psw_2010_north003.pdf

transportation corridors, resolution is needed to address whether the use of low-noise pavement in Lake Tahoe Region is a viable noise reduction solution. Noise standard exceedances measured for this evaluation and related to transportation corridors were more directly tied to certain types of motorcycle exhaust systems and large truck “jake braking” than to overall tire-on-pavement noise. To address these sources of noise, local and state highway law enforcement agencies are encouraged to enforce existing tail-pipe noise standards as TRPA has little enforcement authority to reduce these sources of noise.

Overall, the feasibility of meeting currently adopted Single Event and Cumulative Noise Events (CNEL) noise standards (maximum allowable ambient noise levels) should be evaluated and standards adjusted to levels that are protective, but realistically achievable. Furthermore, the method of determining noise threshold attainment should be reconsidered. In previous Threshold Evaluations, as in this one, if one noise exceedance was observed, it was concluded that the Region was in “non-attainment” for that land use category of single event type. Allowances for statistical significance or a certain percent of noise exceedances may be more appropriate given the transitory nature of noise and the feasibility of regulating driver behaviors or the types of vehicles entering the Region. For motorized watercraft, various noise reduction strategies could be considered. For example, 1) providing additional education and outreach materials to boaters to improve their awareness of existing ordinances that restrict the types of motorized watercraft allowed onto Lake Tahoe to those that can meet a minimum allowable noise standard, 2) adjusting maximum allowable noise levels to a level that can be realistically achieved, and/or 3) work with partner agencies to increase multi-jurisdictional enforcement within the no-wake zone. This recommendation should be addressed as a component of future revisions to the shorezone ordinances after pending litigation is resolved, and after the adoption of the 2012 *Regional Plan Update*.

Environmental Improvement Program

In 1997, the agency incorporated the Environmental Improvement Program (EIP) into the *Regional Plan* (Chapter 15 *Code of Ordinances*). The implementation of programs and projects under the EIP could be considered one of TRPA’s and other agencies’ most significant accomplishments in terms of addressing legacy resource impacts and moving the Region toward Threshold Standard attainment. Funding provided through federal, state, local, and private sources has facilitated the implementation of a broad suite of environmentally and socially beneficial projects that TRPA regulations alone could not address.

This evaluation found that some indicators for air quality, water quality, noise, wildlife, fisheries, vegetation, and soil conservation were out of attainment with adopted standards. This conclusion suggests that the EIP should consider prioritizing and focusing available resources on the following programs and associated projects related to these Threshold Categories, in order to make progress on Threshold Standard achievement.

- **Administration of TRPA Controlled Mitigation Fee Programs** - Currently more than \$16 million in unobligated mitigation fees that could potentially be more effectively applied to improve soil, air, and water quality. Under the current TRPA mitigation fee release system, project proponents need only demonstrate that a project is consistent with the EIP list, with little internal assessment of whether the project will meet the highest priority need. It is recommended that the agency lead a cooperative partnership effort to identify project selection criteria (e.g., leveraging of funding, multiple resource benefits, threshold attainment

status) and prioritize the EIP five-year project list based on determining which projects will result in the greatest environmental benefit per dollar and/or address the highest priority threshold restoration need. Prioritization criteria would give an advantage to the most important projects that address the Tahoe Region's highest priorities for environmental threshold attainment.

- **Stormwater Management Program** – Although indicators for tributary pollutant loading are stable or showing improvement, several indicators for deep-water Lake Tahoe water quality continue to show declining trends. Research has demonstrated that stormwater runoff from the urbanized landscape is the primary factor responsible for impaired water quality (Lahontan and NDEP 2011). It is recommended that the EIP prioritize the implementation and maintenance of enhanced urban stormwater treatment facilities, including:
 - Projects that disconnect impervious surfaces (e.g. roads, parking areas) and direct stormwater flow into infiltration basins or other appropriately designed stormwater treatment facility to avoid polluted stormwater from running directly into surface waters (i.e., streams and lakes); priority should be given to projects that focus on roads and impervious surfaces in close proximity or connected to surface waters
 - Incentivize the use of pervious pavement
 - The purchase, operation, and maintenance of high-efficiency street sweepers in combination with high frequency sweeping especially after the application of road traction material (e.g., sand and cinders)
 - The design, implementation, and maintenance of area-wide (subdivision scale and larger) stormwater treatment facilities and infrastructure would achieve treatment of private property runoff more comprehensively, quickly, and efficiently, than the past parcel-by-parcel approach has allowed
 - Support the creation of Stormwater Treatment Districts operated by local jurisdictions or utility districts and funded by a property tax or fee similar to those collected for provision of sewer and water. Funds generated through such a program could be used to implement erosion control, stormwater treatment and maintenance projects and programs.

- **Watershed Management Program** – Indicators for vegetation and soil conservation were determined to be out of attainment with adopted Threshold Standards related to stream environment zones. Recent research and agency field inventories have confirmed localized impacts to the quality of stream habitats, especially in areas that interface with urban environments. It is recommended that the EIP prioritize projects that address legacy impacts to stream environment zones, including facilitating projects that:
 - Remove and restore impervious coverage in sensitive lands
 - Remove conifers from wetlands, meadows, and deciduous riparian hardwood stands as appropriate
 - Restore natural hydrological and geomorphic structure to stream zones.
 - Remove man-made impoundments and movement barriers typical of road crossings to benefit aquatic organisms
 - Control and reduce the influence of aquatic invasive species, noxious weeds, and other undesirable non-native species

- **Invasive Species Program** – Invasive species are an emerging threat to water quality, aquatic biological integrity, and uncommon plant communities. Projects that prevent new invasive

species introductions and control existing noxious weeds and aquatic invasive species are recommended as follows:

- Conduct spatial analysis to characterize the current distribution and extent of aquatic invasive species in Lake Tahoe and in waters other than Lake Tahoe—include other lakes, wetlands, and streams
 - Continue to support boat inspections and other AIS prevention efforts
 - Continue to support aquatic and terrestrial invasive species control efforts
- **Forest Ecosystem and Hazardous Fuels Reduction Program** – This evaluation found that the Region was not meeting management targets for meadows and wetlands, deciduous riparian hardwood stands, old forest ecosystems, and small diameter red fir and yellow pine vegetation types. This shortfall was attributed, in part, to Comstock-era logging activities, subsequent fire suppression policies, and “limited entry” management policies. The following recommendations are intended to address shortfalls in meeting established management targets:
 - Promote projects that restore forest structure and composition consistent with desired forest conditions, and reduce wildfire hazards surrounding urban areas
 - Promote projects that create small openings in the overstory canopy to facilitate development of small diameter yellow pine and red fir vegetation types
 - Promote projects that remove encroaching conifers from deciduous riparian hardwood stands, meadows, and wetlands
- **Scenic Program** – Overall scenic quality in the Region was determined to be improving. However, some scenic evaluation units remain short of adopted targets. It is recommended that the EIP Scenic Program focus on improvement to units determined to be out of attainment, specifically:
 - Support environmental redevelopment in town centers where appropriate to reduce visual clutter and enhance view corridors through the reconfiguration of mass and architectural form
 - Re-vegetate disturbed lands or create vegetative buffers around unsightly settings
 - Continue to support restoration of sensitive lands
 - Move utilities underground
 - Reduce “sign clutter” in urbanized areas
- **Air Quality and Transportation Program** – Although most air quality indicators are in attainment with adopted standards, more can be done to ensure indicators remain in compliance. As noted above for noise, several indicators show that the Region is falling short of fully attaining standards. It is recommended that the EIP focus on the implementation of projects that reduce air pollutant emissions and reduce sources of noise pollution.
 - Implement bike trail projects that are consistent with the Tahoe Regional Bicycle and Pedestrian Plan (TMPO 2006) and can demonstrate a reduction in private automobile use (i.e. trails are connected and adjacent to urban amenities, connected to existing bike trail network)
 - Continue support for public transit operations and the purchase of low emission vehicles
 - Support the use of low-noise pavement on roads with high traffic volumes and test its effectiveness in reducing vehicle traffic associated noise

- Work with local air quality management districts to explore the feasibility of implementing a buy-out/incentive program for non-EPA compliant wood-stoves
- **Threatened, Endangered and Sensitive Species Program** - It was found that habitat quality within some wildlife disturbance (free) zones (notably waterfowl and northern goshawk) continues to be adversely affected by excessive road density and associated recreational activities. It was also determined that progress is being made in the restoration of other sensitive species populations (e.g., Lahontan cutthroat trout and Tahoe yellow cress) and that efforts should be sustained. The following are project areas that the EIP should focus on to address evaluation findings:
 - Reduce forest road and trail densities in areas designated for the protection of sensitive species to the extent feasible, especially for northern goshawk and waterfowl
 - Create a signage program to alert the public of sensitive wildlife areas where appropriate
 - Review, revise, renew, and continue implementation of the Conservation Strategy for Tahoe Yellow Cress
 - Continue support for the reintroduction of Lahontan cutthroat trout into the Region

Science and Monitoring Program

One issue that has hampered the agency's ability to clearly communicate the status of "thresholds" to the public and decision makers is the terminology used for thresholds in past evaluations. Past Threshold Evaluations have represented Threshold Standards as 36 "threshold indicators" and perhaps unintentionally have represented the attainment of "threshold indicators" as surrogates for the attainment of Threshold Standards. In reality, there are more than 150 adopted Threshold Standards, as well as state and federal air and water quality standards that apply to the Region, that the agency has attempted to monitor, evaluate, and report on over several decades, with varying degrees of success.

The system of standards, measurement, and monitoring designed and implemented nearly a quarter century ago is, in practice, unworkable due to the breadth of monitoring requirements. When considering all of the monitoring and evaluation requirements set forth in the *Code of Ordinances*, Chapter 16, which includes implementation monitoring, effectiveness monitoring for each compliance measure, and status and trend monitoring for all threshold standard related indicators, a minimum cost estimate to deliver such a program would exceed \$10 million per year—far in excess of the agency's total bi-state appropriated budgets at any time in its 40-year history. An internal finance analysis evaluated the cost of an updated status and trend monitoring program (which finds efficiencies through the reorganization and integration of Threshold Standards and associated indicators), and estimated that for only the status and trend monitoring element (i.e., threshold monitoring), the cost is approximately \$3 million annually (with a one-time investment of \$4 million to update the monitoring program's infrastructure). Rather than continue the practice of struggling to satisfy the demands of a monitoring program that, from the outset, was cost-prohibitive within shrinking and increasingly constrained funding levels, this Report makes recommendations to take incremental steps toward revamping the TRPA monitoring program scope into something that is more practical, achievable, and affordable, while still scientifically legitimate, meaningful, and compliant with the *Bi-State Compact* requirements.

As a first step, this evaluation clarifies terminology and carries it forward consistently by clearly representing the organizational hierarchy of Threshold Standards as represented in Resolution 82-11 and applying the intent of the *Bi-State Compact* and *Code of Ordinances*. The *Code of Ordinances*, Section 16.4.1.A, states that the agency “...shall identify sufficient indicators for each threshold [standard] and [state and federal] standard so that, evaluated separately or in combination, the indicators will accurately measure, on a continuing basis, the status of attainment or maintenance of that threshold [standard] or [state and federal] standard...” Accordingly, it is recommended that future evaluations build on the structure presented in this evaluation where Threshold Standards are not conflated with “threshold indicators.”

The results of this evaluation are similar to results from previous evaluations in that the agency is challenged to consistently collect quality data needed to address the status and trend of the full breadth of adopted Threshold Standards, and evaluate the effectiveness of each compliance measure implemented by the agency. This finding suggests there are several items that the agency needs to pursue in order to be successful in fulfilling the intent of the *Bi-State Compact* and *Regional Plan*, as well as achieve the fundamental purpose of providing meaningful and credible information that can be used to inform policy and management decisions.

Update Threshold Standards

According to Resolution 82-11, “*Threshold Standards are to be reviewed at least every five years by the most appropriate means. After such review, the pertinent Threshold Standards shall be amended where the scientific evidence and technical information indicate.*” The need to update Threshold Standards was first acknowledged in the 2001 Threshold Evaluation and forwarded again in the 2006 Threshold Evaluation. Other efforts such as the technical review of Threshold Standards and indicators (Pathway Planning 2005) and recently released research (e.g., Taylor et al. 2004, Lahontan and NDEP 2010) also revealed opportunities to improve the suite of standards and indicators used to judge environmental conditions in the Lake Tahoe Region. Only seven Threshold Standards have been amended over the last 24 years. In no instance did amendments result in the removal of a standard or an organizational change to standards. A review of adopted Threshold Standards indicated that each standard, with a few exceptions, needs some level of clean-up, clarification, or revision to reflect best available science, incorporate emerging issues and improve the agency’s ability to more efficiently and objectively characterize attainment status. The following conclusions and recommendations are forwarded to address the most pressing Threshold Standard update needs; TRPA anticipates amendments will occur over time to allow for the synthesis of available technical and scientific information and has structure recommendations to reflect the anticipated timing of Threshold Standard amendments. Appendix CR-2 provides a generalized list of recommended Threshold Standard amendments.

- **Threshold Standard Amendment Priorities** –The list of Threshold Standard clarifications and amendments is long and will require time to move through each needed change (Appendix CR-2). Consequently, it is recommended that the agency prioritize those amendments for which scientific evidence is complete and/or public concern compels action. As a first priority and as a component of the 2012 *Regional Plan Update*, it is recommended that the agency consider the following Threshold Standards:
 - **Pelagic Lake Tahoe Transparency Standard** – Change from a winter average to an annual average pelagic lake transparency standard to improve consistency with state standard and the state and federal TMDL target. This change would not limit the agency’s

- ability to continue to report out on the seasonal status of Lake transparency (e.g., winter vs. summer).
- **Aquatic Invasive Species** - Adopt an interim management standard to address the threat of aquatic invasive species. Adoption of this standard would set in motion the necessary mandate to continue prevention and control efforts in the Region. It is, however, recommended that this standard be translated into a Numerical Standard at a later date such that the status of aquatic invasive species can be objectively evaluated.
 - **Nearshore Attached Algae** – Monitoring conducted by UC Davis-TERC suggests that the abundance and distribution of periphyton (attached) algae is increasing (TERC 2011a) and factors responsible for increases should be addressed. Currently, TRPA does not have a Threshold Standard that directly addresses the distribution and abundance of nearshore periphyton algae. It is recommended that TRPA adopt an interim non-degradation management standard to set in motion the necessary directives to implement policy and management actions to control factors known to contribute to the distribution and abundance of periphyton algae (e.g., nutrient enrichment). It is, however, recommended that this standard be translated into a Numerical Standard at a later date such that the status of nearshore periphyton algae can be objectively evaluated.
 - **Carbon Monoxide 8-hour Concentration Standard** - A technical cleanup of the 8-hour Carbon Monoxide standard is needed to improve its consistency with state standards. The currently adopted Threshold Standard targets a 9 ppm 8-hour concentration, while California and Nevada have adopted standards for 8-hour CO at 6 ppm.
 - **Northern Goshawk** – The current disturbance zone buffer related to Northern Goshawk protection has been identified as insufficient when placed in the context of current best management practices for the species. It is recommended that Northern Goshawk disturbance zone be revised to protect the most suitable 500 acres of habitat surrounding known nest sites rather than a simple circular buffer.
 - **Wood Smoke and Suspended Soil Particles** – A review of the report that established Threshold Standards indicated that a standard for particulate matter concentration was originally recommended. However, the translation of the original recommendation reflected achieving goals related to wood smoke and suspended soil particles. Past evaluations have noted the difficulty in measuring the attainment status of these two standards. It is recommended that the agency replace wood smoke and suspended soil particle standards with applicable state standards for particulate matter concentrations.
 - **Language Clarification** – Some Threshold Standards make reference to specific mapped information that is no longer consistent with best available scientific information. Some minor amendments are needed for these standards to clarify that the agency will use best available spatial data to guide Threshold Standard evaluations.
- As a second priority, it is recommended that the agency bring forward Threshold Standard amendments to reflect new issues and current scientific findings. The following threshold amendments should be addressed after the adoption of the 2012 *Regional Plan* Update, but prior to the next Threshold Evaluation.
 - **Lake Tahoe's Nearshore** – There are currently several Threshold Standards related to Lake Tahoe's nearshore that need to be updated to better reflect emerging issues and best available science. For example, Taylor et al. (2004) noted that if the nearshore water clarity was held constant near the current adopted turbidity Threshold Standard, conditions would reflect degradation when compared to clarity measurements recorded in their

study. A synthesis of historical and contemporary research is nearing completion and should be used to inform recommendations for a revised suite of indicators and Threshold Standards for Lake Tahoe's nearshore.

- **Pollutant Loading into Lake Tahoe** – The currently adopted Threshold Standards related to pollutant loading into Lake Tahoe are inconsistent with contemporary research findings (Lahontan and NDEP 2010). For example, research found that very fine sediment (<16 microns) loads are a primary driver responsible for the decline of lake transparency, yet TRPA's adopted Threshold Standard relates to total suspended sediment load. Further, results in this evaluation clearly show that variability in pollutant loads over time is highly influenced by the amount of precipitation and subsequent runoff. More thoughtful indicators could help clarify how anthropogenic activities and actions are affecting pollutant loads. It is recommended that TRPA work with state agencies and the science community to appropriately revise pollutant loading Threshold Standards to better reflect pollutants known to impact Lake transparency.
- **Oxides of Nitrogen** – The indicator associated with the currently adopted oxide of nitrogen (NO_x) emission standard relies on modeled estimates of NO_x based on traffic count data. The standard could be improved if it were replaced with state standards for Nitrogen Dioxide (NO₂) and/or NO_x concentrations, because the status of air quality related to NO_x would not be limited to vehicle sources of this pollutant. Measures of NO₂ concentrations would provide a better overall indicator of ambient NO_x conditions in the Region.
- **Visibility** – The current regional visibility standards (50 percent and 90 percent values) were established in the 1980s when visibility was poorer than today. The federal Clean Air Visibility Rule (1999 and finalized in 2005) requires that natural areas (such as the Lake Tahoe Basin) demonstrate reasonable progress toward natural visibility conditions by 2065. This means that using baseline conditions established for the Lake Tahoe Basin between 2000 and 2004, the Region will need to continually demonstrate improvement in visibility over time rather than demonstrate compliance with a static standard value as is reflected in the current Threshold Standard. It is recommended that the agency amend the regional visibility Threshold Standard to improve consistency with the federal Clean Air Visibility Rule.
- **Instream Flows** – This evaluation found that instream flows were sufficiently protected through existing *Regional Plan* ordinances and that to establish minimum instream flow standards for each stream would be extremely costly with little, if any, benefit to the fisheries resource. It is recommended that the Policy Statement and Management Standard currently adopted in Resolution 82-11 be removed or revised to remove the requirement to establish minimum flow standards for each stream, as sufficient protection of instream flows is already provided by existing ordinances in the *Regional Plan*, as well as state regulations governing water diversions.
- **Stream Habitat** – Indicators used to judge the attainment status of stream habitat conditions were found to be inadequate because they are poorly documented, are based on subjective criteria, and are biased toward non-native game fishes. Recent bioassessment monitoring efforts conducted by TRPA and partner agencies are underway using standardized, state-approved methods that can be used to objectively characterize the biological integrity of Lake Tahoe's streams as well as provide a good surrogate measure of the surrounding stream environment. It is recommended that TRPA work with appropriate state agencies and the science community to replace the currently adopted

- stream habitat Threshold Standard with standards based on biological criteria (objectives) that are currently undergoing review by the State of California.
- **Odor** – A Policy Statement to reduce odor associated with diesel engines was adopted in Resolution 82-11 to address an issue of common concern in the early 1980s. This evaluation found that federal and state agencies have implemented a suite of regulatory tail-pipe and fuel mixture regulations to substantially reduce odor resulting from diesel engines. TRPA has also included controls within the context of the *Regional Plan* that address diesel engine idling at the project scale. Consequently, because this issue has been sufficiently addressed through regional, state and federal regulatory controls, it is recommended that this Policy Statement be removed from the list of Threshold Standards that TRPA is required to address. Alternatively, reference to other existing and related ambient air pollution concentration standards could be forwarded.
 - **Special Interest Species: Wildlife** – The Pathway Planning Process identified several opportunities to clarify and update Threshold Standards related to TRPA-listed special interest wildlife species. Included in the Pathway findings was that the terminology used in the threshold language was ambiguous in terms of attainment determinations, and that the list of species currently maintained by TRPA was not necessarily representative of species that are currently in need of protection. It is recommended that agencies work together with the science community and the public to revise standards related to special interest species to clarify targets, attainment determinations, and to better incorporate the current understanding of listed species habitat occupancy dynamics.
- Lastly, it is recommended that the agency bring forward Threshold Standard amendments noted as priority “3” in Appendix CR-2, as scientific findings are made available. Ideally, recommended Threshold Standard amendments would be addressed no later than six years after the adoption of the 2012 *Regional Plan Update*. In addition to Threshold Standard amendments, the following global adjustments are recommended to improve the agency’s ability to clearly communicate Regional goals associated with Threshold Standards.
 - **Restructure Threshold Categories and Threshold Standards represented in Resolution 82-11 to integrate monitoring and reduce redundancy and cross-referencing.** Currently, Threshold Standards are organized around nine major resource and socioeconomic categories known as Threshold Categories. This organizational structure lends itself to redundancy and confusing cross-referencing, and does not advance opportunities to integrate monitoring efforts. For example, there are nine Threshold Standards articulated across five different Threshold Categories that relate to stream environment zones. Reorganizing Threshold Categories around major landscape features (e.g., stream zones, Lake Tahoe’s nearshore, and upland forests) and issues (e.g., air pollutants, urban stormwater, and recreation experience) would improve the assimilation of field measurements and provide for a more integrated and multidisciplinary reporting of conditions. Additional indicator classification is needed to clarify whether indicators measure system stress, desired conditions, or institutional responses. Recommended changes would improve the efficiency of Threshold Evaluations and the public’s understanding of the status of Regional conditions. The Tahoe Status and Trend Monitoring and Evaluation Program has developed well-reasoned concepts for restructuring the categorization of Threshold Standards in Resolution 82-11 that should be used as a starting point for reframing Threshold Categories. With time, the scope of Threshold Standards would be more focused on measuring the most meaningful

indicators and organized in a way to foster communication and understanding. Ultimately, the scope of the threshold monitoring program needs to be adjusted to better conform to funding and resource constraints, yet still meet the mandate and intent of the *Bi-State Compact*.

As part of this reorganization, the agency should work with partner agencies and the science community to reframe the scope and scale of water quality monitoring efforts to fit available funding and to better integrate information necessary for accurately reporting pollutant load reduction progress, nearshore conditions, and deep water lake transparency. With the adoption of the Tahoe TMDL, the source categories represented in Resolution 82-11 are no longer relevant to characterize the status of load reduction targets and other water quality outcomes. Instead, the TMDL as implemented by the two states, requires that data should be generated around source categories identified in the Tahoe TMDL, including stream channel, atmospheric, urban upland stormwater and forested upland, as well as outcome/end point variables related to deep water transparency and nearshore water quality. Data collected by source category would more appropriately scale investigations and improve our ability to characterize what sources of pollutant loading are driving the status of indicators of high public and decision-maker interest (i.e., nearshore conditions and Lake Tahoe transparency).

- **Convert Threshold Standards that are in the form of subjective Management Standards and Policy Statements into goal and policy statements in the *Regional Plan*; consider replacement of Management Standard and Policy Statements, as needed, with appropriate numerical threshold standards.** Evaluation of adopted “Management Standards” and “Policy Statements” is problematic because attainment status determinations are qualitative and subject to change depending on who is conducting the evaluation and the suite of information that is used. It is recommended that Threshold Standards that are labeled as a “Management Standard” or “Policy Statement” are either removed from Resolution 82-11 after making the determination that they have been sufficiently incorporated into the *Regional Plan* (as originally intended) and applied at the project scale or revised to reflect regionally-scaled and meaningful numeric objectives. Incorporating these types of standards into the *Regional Plan* will ensure that the intent of adopted Management Standards and Policy Statements is directly applied during the permit process. By adopting Numerical Standards the Agency will be better able to objectively characterize conditions in the Region and more directly characterize Threshold Standard attainment status.
- **Document procedures for updating Threshold Standards.** Threshold Standard amendment guidelines are needed to better direct staff and engage the public. It is recommended that proposed amendments to Threshold Standards be accompanied with: 1) a scientific or other technical basis for the Threshold Standard amendment, 2) a monitoring and evaluation plan that can be used to guide data collection, assessment and status determinations of associated indicators for the standard, 3) a listing of policy and management actions already existing or needed to attain and maintain the standard, and 4) the appropriate level of environmental documentation to disclose potential beneficial or negative impacts resulting from adopting the changed standard. Recommended steps in the process should include: 1) administrative review by partner agencies, 2) technical peer-review, and 3) TRPA Governing Board hearing and approval.

- **Eliminate Threshold Standards where TRPA lacks authority to enforce.** Through the review of Threshold Standards it was found that several have been adopted for which TRPA has no enforcement or data collection authority. For example, TRPA has no regulatory authority to enforce mitigating measures for an adopted air quality standard that relates to the transport of pollutants from outside of the Region. In another example, in order to evaluate compliance with some noise Threshold Standards related to watercraft, TRPA would need additional police powers or criminal authority to “temporarily arrest” an individual in order to administer the appropriate noise test. It is recommended that TRPA eliminate such standards and only retain standards and associated indicators which it has the authority and capacity to affect and measure.

Overarching Applied Science and Monitoring Program Recommendations

The following recommendations are forwarded to better utilize current research findings and to improve the feasibility of implementing TRPA's monitoring mandate.

- **Continue to update monitoring and evaluation program** – A review of the Lake Tahoe Status and Trend Monitoring and Evaluation program found that progress is being made to document and standardize procedures for collecting, analyzing, and reporting regionally-scaled status and trend data. However, more is needed to build out various aspects of the status and trend program. In addition, there is a need to better coordinate and integrate the effectiveness and accomplishments monitoring and reporting for the EIP capital improvement and restoration programs, with the status and trend monitoring program. The following conclusion and recommendations are provided:
 - **Continue to support development and implementation of monitoring and evaluation plans for the status and trends monitoring program.** The agency's ability to determine trends for a number of indicators with high confidence was hampered in this evaluation by the fact that data have been collected in different ways over time. In the last three years, the agency has been working to correct this inconsistency through documentation of monitoring and evaluations plans that provide specific details on the procedures for collecting, evaluating, and reporting regionally-scaled status and trend data. To date, the Lake Tahoe Status and Trend Monitoring and Evaluation Program has drafted, or is nearing the completion of drafting, eight monitoring and evaluation plans. The program needs to move incrementally to develop and pilot-implement an estimated 17 more monitoring and evaluation plans to fully build out the program. It is recommended that efforts to document monitoring procedures in a standardized way be continued, as this will result in a well-documented, repeatable, and scientifically defensible status and trend (threshold) monitoring effort.
 - **Develop and implement programmatic approaches for effectiveness monitoring of EIP's stormwater management program, stream restoration program, forest health, and invasive species program.** At the core of the implementation of an adaptive management system is the generation and evaluation of data for policy decision-makers that can be used to inform whether actions taken are effective at

achieving desired outcomes. Since 1997, the Region has seen significant investment in the installation of stormwater treatment infrastructure, forest treatments, aquatic invasive species control and prevention, and stream zone restoration. Effectiveness monitoring, however, has been conducted on only a handful of these projects and the methodology used for each project does not necessarily provide for a regionally-scaled program effectiveness evaluation. Recent efforts have been initiated to document the operational details of a Region-scale effectiveness monitoring program, known as the Regional Stormwater Monitoring Program (RSWMP, Heyvaert and Reuter 2010), and other efforts have summarized project effectiveness reports⁴ have provided a framework for measuring the effectiveness of stream restoration efforts (2ndNature et al. 2010). Additional collaboration is needed among regulatory and management agencies and the science community to move effectiveness monitoring programs for stormwater and stream restoration to the implementation stage. It is recommended that TRPA play a leadership role in coordinating cost-feasible programmatic effectiveness monitoring forward, starting with the implementation of urban stormwater treatment effectiveness monitoring.

- **Address compliance measure effectiveness monitoring requirements** - Measuring the effectiveness of each compliance measure, and the identification of target attainment dates for Threshold Standards and interim targets for indicators based on the incremental contribution of each compliance measure, is problematic. First, there are greater than 200 compliance measures listed by TRPA (Appendix IE-1), each with the potential to directly or indirectly influence the trend of a Threshold Standard-related indicator. The ability to undertake such a monitoring endeavor is cost-prohibitive and would not likely result in any conclusive results due to synergistic effects of multiple compliance measures. Secondly, the effectiveness of many of the compliance measures, especially those related to the implementation rate of capital improvements, are inherently tied to available funding, which is difficult to predict. At best, given the agency's funding constraints, an evaluation of the effectiveness of the *Regional Plan* as a whole can be reported, as was done for this Threshold Evaluation. It is recommended that Chapter 16 amendments be considered independently from the 2012 *Regional Plan* Update to address compliance measure effectiveness monitoring requirements, including revisions that provide specific directions on appropriate methods for determining target attainment dates and interim targets, including methods for characterizing uncertainty associated with projected indicator values or dates.
- **Improve understanding and reporting of social and economic condition in the Region** - Information related to the Region's social well-being and issues affecting the economic sustainability of the Region are relevant to the *Bi-State Compact* mandate, and for informing decisions related to land use planning, that is—to protect environmental quality while maintaining a balance with social and economic systems (i.e., the human environment). Further it is recognized that the processes underlying environmental degradation, as well as their conservation and recovery, are fundamentally based on human decision making (Kauneckis and Halsing 2010). This Evaluation was not able to present a comprehensive review

⁴ 2nd Nature, LLC. 2006. http://www.2ndnaturellc.com/wp-content/uploads/2011/09/FinalReport_BMPSynthesis.pdf

of social and economic indicators for the Region (see Appendix A) or to characterize relationships between socioeconomic indicators and environmental condition. It is recommended that the agency develop partnerships with appropriate private and governmental entities and the science community to establish a common framework for the collection, exchange, and reporting of relevant social and economic information. In addition, applied research is needed to address fundamental information gaps and uncertainties (see Kauneckis and Halsing 2010). For example, focused research is needed to answer questions, such as: What beneficial and negative impacts have TRPA policies had on social and economic systems in the Region? What is the relationship between key socioeconomic indicators and environmental indicators? And what are the social and economic implications of implementing the Lake Tahoe TMDL?

- **Promote the publication of a *Synthesis of Findings* report similar to the 2000 Lake Tahoe Watershed Assessment to update knowledge resulting from Southern Nevada Public Lands Management Act and Nevada Division of State Lands License Plate Program grant investments in applied research.** From 2006 through 2012, about \$3.5 million has been invested annually in applied research, funding about 14 research projects per year. Topics investigated are diverse, and there are no current plans to comprehensively synthesize the results of these projects in a way that can target policy and management actions. Considering that a comprehensive synthesis of applied research has not been completed since the Lake Tahoe Watershed Assessment (USDA 2000) followed by an update for several topic areas in Hymanson and Collopy (2010), it is recommended that TRPA work with the Tahoe Science Consortium and other partner agencies to seek funding that can be used to complete an updated Lake Tahoe watershed assessment. Additional goals of this endeavor would include: 1) a comprehensive review of existing land use and regulatory policies to reveal opportunities to refine or better focus actions for achieving environmental goals, and 2) a refinement or update to the list of research questions presented in Hymanson and Collopy (2010).