

September 28, 2016

*To All Who Share Our Passion For Lake Tahoe*

It is my privilege to present the 2015 Threshold Evaluation Report. More than 60 individuals from over 25 organizations including scientists from many disciplines contributed data, time, and analytic expertise. This is the sixth comprehensive report since the Regional Plan was adopted in 1987, and it would not have been possible without the support of partners. Thank you all.

In 1980, the states of California and Nevada had the foresight to revise and strengthen the Bi-State Compact to ensure that the "Tahoe experience" would not be lost for future generations. The findings of this report suggest that while there is still much to do, environmental conditions in the Region continue to improve in response to many decades of active management. At the same time, the report calls out areas for further focused work and some of the uncertainties we must face in the future in response to changing climatic conditions.

The 2015 report is the second consecutive threshold evaluation to be peer reviewed. Fifteen independent scientific experts examined the evidence, reviewed the analytic approach, and the conclusions reached and found that the report was technically sound. Like the peer reviewers of the 2011 evaluation, the 2015 science experts also noted many of the limitations of the current threshold standards and the need to continue to adapt and push our evaluation framework forward. In response to these peer review recommendations and the concerns of stakeholders, the TRPA Governing Board identified reviewing and updating the threshold standards, adopted more than 30 years ago, as a key strategic initiative for the agency. Today, we are actively working with the newly formed Tahoe Science Advisory Council to make that vision a reality.

The findings of this report highlight the areas where we have made the greatest strides. Progress is possible only with the partnership of myriad agencies and the coordinated implementation and investment from every sector – federal, state, local and private. Building on a foundation of scientific research, local, state and national agencies joined together to develop the Lake Tahoe Total Maximum Daily Load (TMDL) which charts a course of action to restore the historic clarity of the lake. Preventing new aquatic invasive species from entering the lake is another notable success that was only possible because of focused leadership and collective actions of a broad cross-sector collaborative partnership. Today, the partnership is focusing forward to address the Region's newly emerging challenges like forest health in a changing climate and delivering the transportation network of the future.

We are proud to present this information to residents, visitors, and others concerned with the Tahoe Region, and we look forward to working with all stakeholders to continue to protect and restore this spectacular place for generations to come.

Sincerely,



Joanne S. Marchetta, Executive Director, Tahoe Regional Planning Agency

# Executive Summary



**M**ore than 35 years ago, at the direction of the states of California and Nevada, the Tahoe Regional Planning Agency (TRPA) led partners in the Region through the process of establishing a shared set of goals. They reviewed the best available science, identified key values, and developed a shared vision for Lake Tahoe. The goals ranged from specific targets for air and water quality, to broad visions for maintaining scenic beauty and enhancing the recreational experience. The goals were often ambitious and aspirational, and were formally adopted as threshold standards by the TRPA Governing Board in 1982.

Every four years, TRPA leads the development of a threshold evaluation report that assesses ecosystem health relative to the adopted standards. The report documents the progress of the partners in the Region towards achieving those shared goals. The 2015 Threshold Evaluation Report is the sixth comprehensive report since the adoption of the 1987 Regional Plan. Following the precedent established in 2011, an independent scientific peer review ensures the methods used, conclusions reached, and recommendations made are consistent with the best scientific guidance in the field. The full comments of the panel of the 15 peer reviewers can be found in Appendix C.

The reporting process is a collaborative endeavor that draws on the monitoring work and analytic expertise of federal, state, and local agencies, academic institutions, local businesses, and private consultants. The report provides a comprehensive overview of the environmental health of the Region as indicated by the 178 threshold standards.

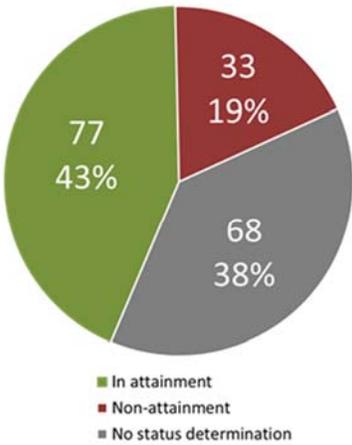
## **Threshold Standard Status**

This report considers conditions relative to 178 standards in nine threshold categories (Figure ES-1)<sup>1</sup>. (Resolution 82-11 (TRPA 2012). Status determinations relative to the standard were made for 110 (68 percent) standards. Of the 110, 70 percent (77) were found to be “at or better than target” or “considerably better than target.”

Evaluators qualitatively assessed the implementation status of 25 management standards and policy statements. Consistent with the findings of prior threshold evaluation reports, it was found that all had been implemented through TRPA, state, and/or federal regulatory controls and/or are addressed as a component of on-the-ground environmental improvement projects and programs.

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<sup>1</sup> Note: There are 869 separate scenic assessment units, each with a specific target standard in five separate scenic standard categories enumerated here. Because of the volume of standards associated with the scenic resource threshold category, the indicator results were aggregated for this summary.

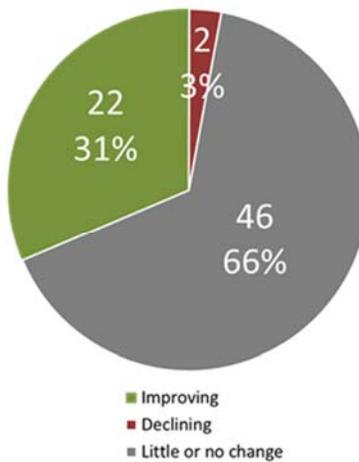


Category	Standards (#)	Status		
		Attainment	Non-attainment	No status determination
Air Quality	20	16	2	2
Water Quality	54	5	4	45
Soil Conservation	13	9	3	1
Vegetation	28	11	12	5
Fisheries	7	5	2	0
Wildlife	16	13	1	2
Scenic Resources	6	6	0	0
Noise	32	10	9	13
Recreation	2	2	0	0
<b>Total</b>	<b>178</b>	<b>77</b>	<b>33</b>	<b>68</b>

**Figure ES-1.** 2015 status determination summary by threshold category for the 178 threshold standards addressed in this report. Standards were placed into one of three categories: Attainment – where conditions are at or better than the standard; Non-attainment – where conditions are worse than the standard; and No status determination - where ambiguity in the standard, reference to an unknown historic baseline, or insufficient data precluded a determination of status.

### Threshold Indicator Trends

Trend determinations were possible for 70 of the 178 standards evaluated in this report, and the vast majority where trend could be assessed (68 or 97 percent) are either improving or show little or no change. Improving trends outnumbered declining trends by over 10 to one. Conditions were declining for only two standards (Figure ES-2). For the majority of standards where no trend determination was possible, reasons include feasibility, standard ambiguity, funding gaps, and data issues. These findings represent a small improvement, but are generally consistent, with the findings of the 2011 Threshold Evaluation Report.



Category	Standards (#)	Trend				
		Improving	Little or no change	Declining	No determination	N/A
Air Quality	20	10	6	0	2	2
Water Quality	54	2	8	1	42	1
Soil Conservation	13	3	9	0	1	0
Vegetation	28	1	10	1	11	5
Fisheries	7	0	0	0	4	3
Wildlife	16	3	2	0	2	9
Scenic Resources	6	2	3	0	0	1
Noise	32	1	8	0	22	1
Recreation	2	0	0	0	0	2
<b>Total</b>	<b>178</b>	<b>22</b>	<b>46</b>	<b>2</b>	<b>84</b>	<b>24</b>

**Figure ES-2.** A trend determination was made for 70 of the 178 indicators. Standards were placed into one of four trend categories: Improving – where status was improving relative to the trend; little or no change – where status change was less than 0.5 percent; declining – where status relative to trend increased by more than 0.5 percent; and no determination – where insufficient data exists to assess trend or where status determination was qualitative.

### Comparison 2011 to 2015

In general, compared to 2011, more standards showed improvement with attainment moving from 63 percent (58 standards) to 70 percent (77 standards). Status continued to improve for water clarity, air quality, scenic and soil conservation. Areas needing continued focus include removal of land coverage on sensitive lands, new threats to forest vegetation, deepwater plant communities, and the need for continued emphasis on water quality conditions (macroinvertebrates, periphyton (algae) and AIS control).

### Summary of Findings by Threshold Category

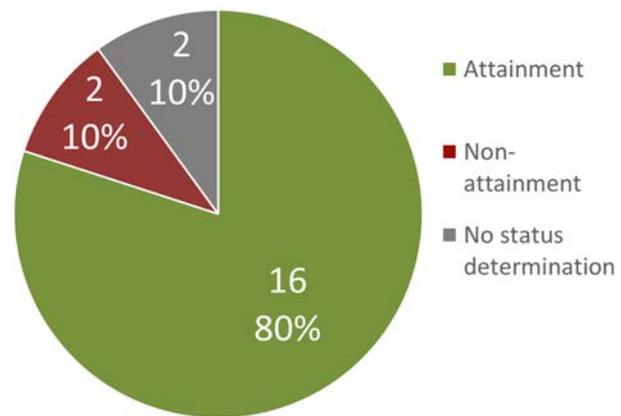
The following section summarizes the findings and conclusions of the 2015 Threshold Evaluation Report by each threshold category. It also provides an outlook section that summarizes recommendations or future actions.

### Air Quality

The Tahoe Region enjoys healthy air quality. Threshold standards are designed to ensure air quality in the Region continues to protect human health, scenic values, and environmental quality, and reduce nitrate deposition.

#### Findings and Conclusions: The

majority of air quality standards are in attainment and observed change suggests that conditions are improving or stable. These observations are consistent with past threshold evaluation reports. Actions implemented to improve air quality in the Lake Tahoe Region occur at the national, state, and regional scale. The U.S. Environmental Protection Agency and state agencies, such as the California Air Resources Board, have established vehicle tail-pipe emission standards and industrial air pollution standards. These actions have resulted in substantial reductions in the emissions of harmful pollutants at state-wide and national scales and likely have contributed to improvement in air quality at Lake Tahoe. At a regional scale, TRPA has established ordinances and policies to encourage alternative modes of transportation and to reduce vehicle idling by prohibiting the creation of new drive-through window establishments.



*Figure ES-3: Summary of the status of air quality standards*

**Outlook:** Since 2010, partners in the Region have built more than 30 miles of bicycles and pedestrian facilities, constructed 18 bus-shelters, revitalized street corridors, and created new public spaces. The 2012 Regional Plan incentives cluster population and employment in relatively compact town centers that are well served by transit and pedestrian and bicycle infrastructure. One hundred projects on the Regional Transportation Plan project list are designed to reduce vehicle miles travelled (VMT), improve air quality, and promote other threshold gains (TMPO & TRPA 2012). Thoughtful land-use planning is a central element of TRPA's growth management system and an important strategy to maintain and improve the Region's air quality. The Transfer of

Development Rights (TDR) program provides incentives to transfer development rights from sensitive lands and remote areas into less sensitive lands located in town centers. As part of the 2015 strategic initiative to review the development rights system and the TDR program, TRPA is working with stakeholders to improve the program and accelerate transfers and implementation of the Regional Plan.

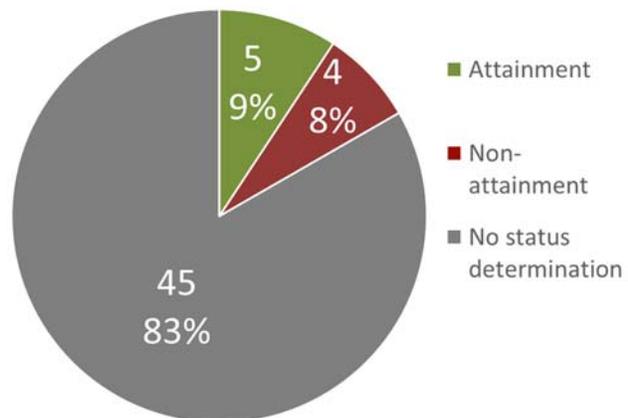
TRPA and partners continue to work to improve air quality monitoring in the Region. Working with the Placer County Air Pollution Control District (APCD), TRPA initiated monitoring on the North Shore in 2013 by contracting the APCD to monitor both ozone and particulate matter 2.5 (PM 2.5) at the district’s monitoring station in Tahoe City. In 2013, TRPA worked with the Lake Tahoe Community College to install an air quality monitor to collect information on meteorology (eg. temperature, relative humidity, wind speed, and wind direction), ozone, and particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>). Improved monitoring will enable more accurate assessment of current conditions to protect public and environmental health.

## Water Quality

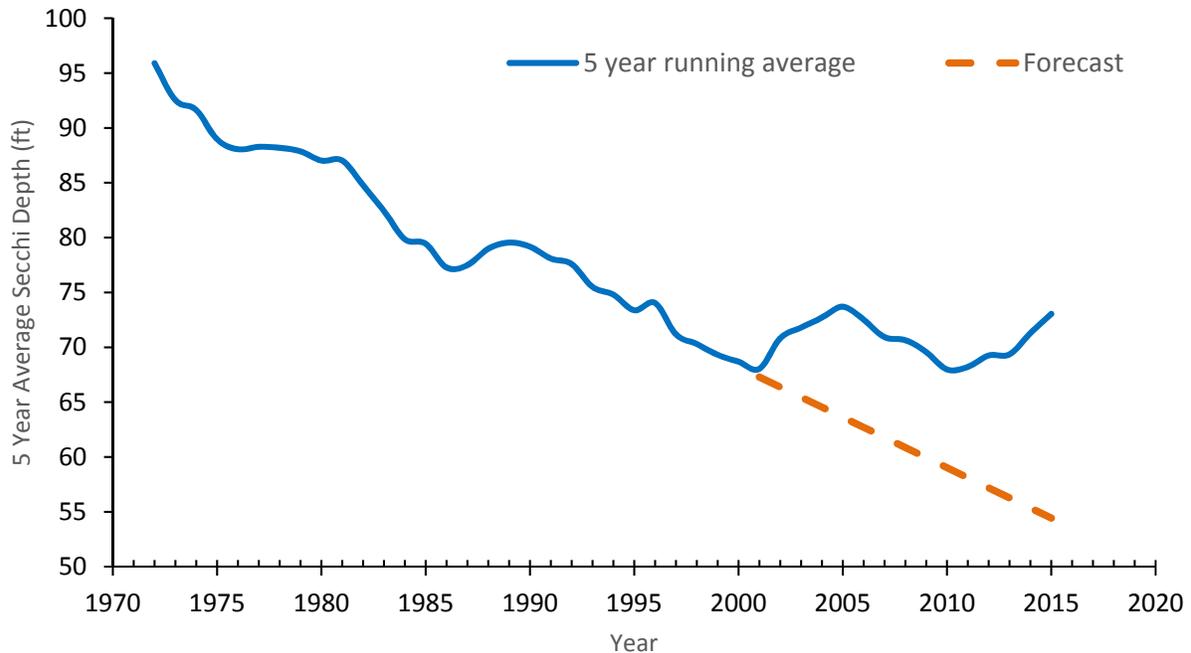
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Lake Tahoe’s extraordinary water clarity and quality are world-renowned. TRPA and state agencies have adopted strict water quality standards to protect and restore the lake for current and future generations.

**Findings and Conclusions:** Between 1968 and 2000, a third of the lake’s iconic clarity was lost. Had the trend continued, Secchi depth in 2015 would have reached a new low of 16 meters (52.6 feet). Instead today in 2015, the observed Secchi depth was 22.3 meters (73.2 feet). Annual clarity measurements typically vary widely, so we look to longer term trends, which are encouraging. The five-year running average from 2010 to 2015 was 22.3 meters (73.2 feet), 18 feet better than forecasted in 2000. The continued improvement is a strong indication that the actions of partners in the Region are contributing to improved clarity and helping TRPA attain one of its signature goals.



*Figure ES-4: Summary of the status of water quality standards*



**Figure ES-5.** Five-year average Secchi depth between 1970-2015. In 2000, forecasts based on observed trends between 1968 and 2000 suggested that by 2030 the lake’s clarity could drop to less than 40 feet (Murphy & Knopp 2000). Today, the 2015 five-year average Secchi Depth (73 feet) is 18 feet better than the year 2000 forecast.

The success of the aquatic invasive species (AIS) prevention program is another notable achievement. Thanks to the inspection of more than 200,000 watercraft prior to launch and the decontamination of more than 44,000 boats, no new AIS have been discovered in Lake Tahoe since the program’s inception in 2007.

Signals of improving environmental health are also visible in other water quality parameters. This report improves our knowledge about tributary runoff. It contains the first flow-weighted pollutant load analysis for Tahoe’s tributary streams and the results are encouraging. The amount of pollutants carried in tributaries (loads) are highly dependent on flow, or the amount of water in the streams. In wetter years, when streamflow is greater, heavy pollutant loads reach the lake. In drier years, fewer pollutants reach the lake via tributaries. A flow-weighted load analysis adjusts for annual wetness and explores whether the same atmospheric conditions deliver more or less nutrients to the lake. This report shows for the first time that pollutant loads from the non-urban uplands are likely decreasing as the watersheds recover from past disturbance.

Phytoplankton primary productivity in the deep waters of the lake continue to increase which is a concern because it could signal a shift away from the lake’s historic oligotrophic state. It was the lone indicator that worsened in both the 2011 and 2015 threshold evaluation reports. Understanding the drivers of increasing productivity remains a priority for partners in the Region.

**Outlook:** The 2015 Threshold Evaluation Report highlighted a disconnect between what the monitoring programs of scientific partners are documenting in the lake’s nearshore and the public’s perception. A UC Davis analysis of periphyton (attached algae) data collected between 1982 and 2015 found that that there had been little or no change in nearshore attached algae over the last 30 years. A Desert Research Institute analysis of nearshore water clarity measurements between 2001 and 2015 found similar results and concluded that clarity levels measured in 2015

were about the same as measured in 2001. These findings run counter to the anecdotal reports from visitors and residents about more slimy rocks. Targeted studies are looking at causes of variability and high incidence in some lakeshore areas, and an interagency working group is currently exploring monitoring protocols along with issues like how to better communicate research findings to the public.

The number of water quality standards for which no status determination could be reached relative to the standard is a cause for concern. Many of these standards when adopted in the 1980s lacked an established baseline or a defined target endpoint, which precludes status determination. As the initiative to review the threshold standards proceeds, addressing this issue will help clarify the full status of the Region’s water quality.

## Soil Conservation

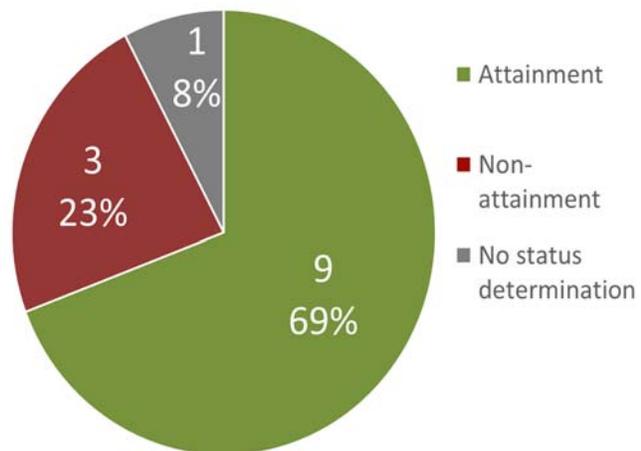
Soils support the Region’s vegetation and provide natural filtration that prevents pollutants from negatively impacting water quality. The threshold standards for soil conservation direct development towards less sensitive lands and establish restoration goals to reverse the impacts of legacy development in stream environment zones (wetlands).

### Findings and Conclusions:

There has been negligible change in the total impervious cover in the Region in the last five years.

Between August 2010 and July 2015, 19 acres of hard impervious cover were permitted through TRPA permit approvals. This represents a 0.2 percent change and brings the total impervious cover within the Region to 7,974 acres, or 3.9 percent of the Region. The permitting process of partners has been effective in focusing development on less sensitive lands and encouraging removal of impervious cover from sensitive areas. Since 2010, 10.4 acres of cover in land capability class 1b

(environmentally sensitive) has been removed. All land capability classes are in attainment except for class 1b and class 2. Development rights (commodity) transfers by private parties as part of the Transfer of Development Rights Program accounted for 8.08 acres of cover removed from class 1b and 2.45 acres were removed by the California Tahoe Conservancy and the Nevada Division of State Lands.



*Figure ES-6: Summary of the status of soil conservation standards*

With approved plans for the restoration of more than 500 acres of the Upper Truckee Marsh, the Region is nearing attainment of the stream environment zone (SEZ) restoration target established in 1982. This is an historic milestone and one that provides an opportunity to collectively celebrate our accomplishments, reflect on work completed to date, and chart a path forward. The outlook for our Region’s SEZs are significantly brighter today than when the standard was adopted. Development forecasts produced around the time of the standard’s adoption suggested that absent regulation, between 1,550 and 1,770 additional acres of SEZ could have been lost by 1995

(DMDC Inc. 1978). Fortunately, that did not occur. The U.S. Forest Service and the California Tahoe Conservancy have acquired and protected over 900 acres of SEZ (TRPA 1988), and the permit review process and development restrictions prevented any new degradation of non-protected SEZs. To date, 924 acres of SEZ have been restored. TRPA accounting of SEZ restoration projects has historically not included restoration projects completed by the U.S. Forest service in the 1980s, which included restoration of 680 acres between 1984 and 1987 (TRPA 1988). Looking comprehensively, partners have restored 1,604 acres of SEZ and restored/acquired nearly 2,500 acres.

**Outlook:** The attainment of a core restoration goal is within our sights and continued work and coordination between partners can ensure that it is completed. However, it should not be the end point for SEZ restoration in the Region. It is also time to pause and collectively reflect on the important roles SEZs play and consider establishing a new goal for SEZ restoration. Restoration of SEZs remains a cost-effective tool to improve water quality, improve recreational opportunities, and enhance habitat for native species. SEZs provide significant benefits for water quality, wildlife, wildfire protection, and flood control. A robust discussion about the ultimate goals for SEZ restoration would benefit all restoration project implementers.

Since the adoption of the 1987 Regional Plan, progress toward attainment of the impervious cover standard for the 1b land capability class remains challenging. Attainment would require the removal and/or relocation of 659 acres of impervious cover, roughly 8.3 percent of all impervious cover in the Region. It would also likely require removal and buyout (with transfers or retirement) of large portions of existing private development (residential, tourist, commercial) in the Region’s communities. Removal or relocation of this magnitude may be infeasible in a reasonable time-frame.

## Vegetation Preservation

The Region’s vegetation is central to the “Tahoe experience” and plays an important role in providing wildlife habitat, stabilizing soils, and cleansing the air. The threshold standards for vegetation are intended to maintain the community richness and diversity, increase the extent of old growth conifer forests, and provide special protection for uncommon communities and sensitive species.

### Findings and Conclusions:

The vegetation in the Region is recovering from the impacts of legacy land use. The majority of vegetation standards that are currently not in attainment relate to common vegetation in the Region. This finding is consistent with those of past threshold evaluations. As the landscape naturally recovers from the impacts of historic logging, grazing, and ground disturbance activities over the course of this century, many of the standards are expected to be attained.

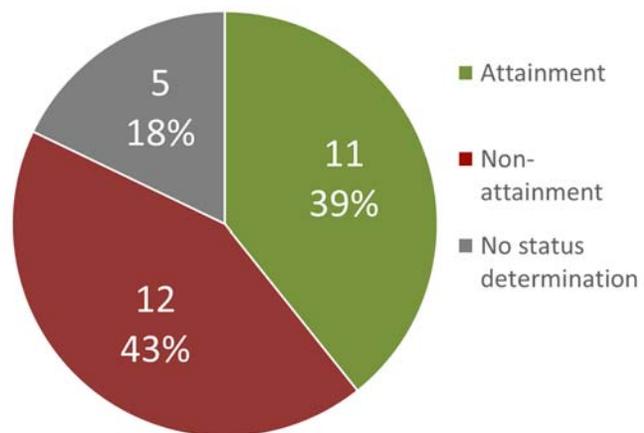


Figure ES-7: Summary of the status of vegetation preservation standards

We are aligning with partners to improve on the number of standards for which insufficient data were available to assess status. The U.S. Forest Service monitors and is currently completing its analysis of status and trend for the five uncommon plant communities reported as “no status determination.” As we move to more frequent and real-time reporting intervals, this data and its findings will be supplied as soon as it is available.

One area of concern is the status of deep water plant communities. Recent surveys suggest that the populations may have declined by as much as 80 percent since they were surveyed in the early 1960s. A decline was also observed in the cushion plant community on Freel peak that was likely the result of changing climate. Sensitive vegetation species are generally doing quite well in the Region. Population status of four of the five sensitive species are considerably better than the standard, with Tahoe Yellow Cress having been removed recently from the federal endangered species candidate list based on active conservation work. Galena creek rockcress is the lone sensitive plant species not in attainment. However, U.S. Forest Service botanists question the identification of the desired number of plant populations as ever actually being accurately observed in the Region.

**Outlook:** Global climate change poses a threat to the integrity of Region’s vegetation communities and plant species and could exacerbate existing stressors. The southern Sierra is experiencing a bark beetle epidemic due to the prolonged drought that has left more than 66 million dead trees on the landscape. The Tahoe Region is also experiencing increased beetle activity but has not yet experienced infestations on the scale observed in the south. Drought and overcrowding reduce trees’ ability to fend off beetle attacks and increase the risk of largescale infestations and tree die-offs. Regional partners have been working for over a decade on fuels reduction and forest health projects in the wildland urban interface (WUI) to reduce the risk of catastrophic wildfire for communities and the environment.

In the face of multiple threats, the science of forest management has begun to focus on landscape-level forest resilience or “the capacity of the system to resist damage and recover quickly when challenged by environmental pressures” (Fuller and Quine 2016). Regional partners are actively exploring forest health treatments beyond the WUI to increase the resilience of Tahoe’s forests. The TRPA strategic initiative to promote forest health supports the U.S. Forest Service and other land management agencies as they address these issues and consider multi-benefit restoration and management through a collaborative, multi-agency process.

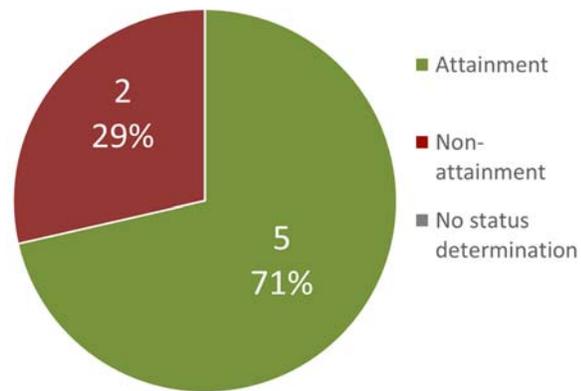
## Fisheries

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Fisheries standards are intended to improve and maintain lake and stream habitat and support efforts to reintroduce the native Lahontan cutthroat trout to the Region.

**Findings and Conclusions:** The Region is meeting most of the threshold standards for fisheries. The reintroduction of Lahontan cutthroat trout in Fallen Leaf Lake is one of the more successful reintroduction projects for this native fish species.

**Outlook:** While the standards were found to generally be in attainment, the standards focus on physical habitat requirements that may not reflect the status of native fish populations. Recent population surveys in Lake Tahoe suggest significant declines in native fish species in parts of the nearshore. Declines are likely the result of impacts from the presence of aquatic invasive species in the lake. While efforts to prevent new invasive species from entering the lake have been successful, mitigating the impact of previously introduced existing invasive species remains a high priority challenge. Invasive species control projects are guided by a science-based implementation plan. Ensuring native fish can persist in the Region and the restoration of the historic trophic structure to the lake will likely require partners to explore novel methods to control invasive species and abate the pressure they are placing on native species. Climate change driven shifts in the timing and form of precipitation in the Region pose a longer term threat to native fish that may need to be monitored.



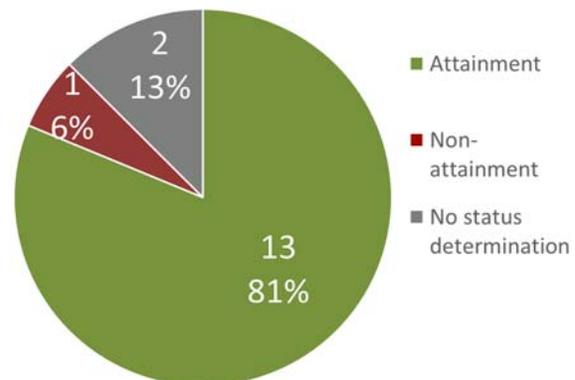
*Figure ES-8: Summary of the status of fisheries standards*

## Wildlife

The wildlife standards are intended to enhance the suitability and extent of riparian habitats and maintain and protect special interest species like bald eagle, osprey, and goshawk.

**Findings and Conclusions:** Twelve of the 16 wildlife standards are in attainment. Over 50 percent of the land area in the Tahoe Region is designated for protection of listed special status species. Populations of special interest species are either stable or increasing.

**Outlook:** While wildlife species addressed in the existing standards are generally doing quite well, significant questions were raised by peer reviewers of both the 2011 and 2015 Threshold Evaluation reports. The reviewers' questions challenged the agency and partners in the Region to consider whether the species of special interest selected for concern in the 1980s remain most relevant and to revisit the ultimate goal for wildlife in the Region. Population standards for special interest species are limited today to avian species, and include five species of raptor and a suite of waterfowl species.

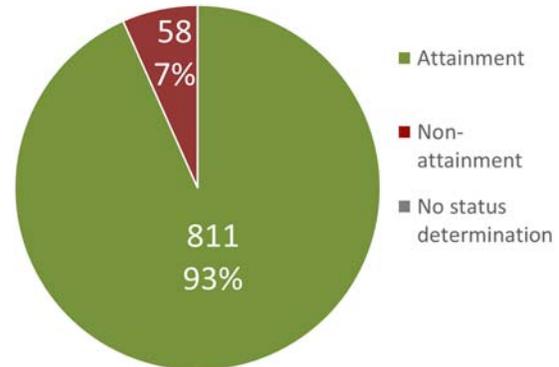


*Figure ES-9: Summary of the status of wildlife standards*

## Scenic Resources

The Tahoe Region is a stunningly beautiful landscape that contains a striking combination of rugged mountain peaks, lakes, and forested slopes. Scenic standards are designed to ensure that the views from the Region’s roadways, shoreline, viewpoints, and other recreational sites are preserved or improved.

**Findings and Conclusions:** Lake Tahoe attracts millions of visitors because of its stunning scenic quality, and the scenic quality of the region continued to improve over the last five years. TRPA’s Scenic Program employs a highly robust monitoring protocol to assess and protect designated scenic values. The agency monitors the visual experience from 869 individual scenic units. Scenic gains were achieved in developed areas along roadways and scenic resources along the lake’s shoreline, the areas most in need of additional scenic improvements. Overall, 93 percent (811 of 869) of the evaluated scenic resource units met the threshold standard and no decline in scenic quality was documented in any indicator category. A summary of the various scenic resources follows:



*Figure ES-10: Summary of the status of scenic resources standards*

- Travel route ratings for roadway travel units – 63 percent in attainment (34 of 54)
- Travel route ratings for shoreline travel units – 67 percent in attainment (22 of 33)
- Scenic quality ratings for roadway travel units – 99 percent in attainment (205 of 208)
- Scenic quality ratings for shoreline travel units – 92 percent in attainment (169 of 184)
- Public areas and bike trails – 98 percent in attainment (381 of 390)

Trend data suggest that programs such as the EIP and management actions implemented such as adoption of the scenic shoreline ordinances along with building design standards in new construction and redevelopment have improved scenic conditions and community character Region-wide.

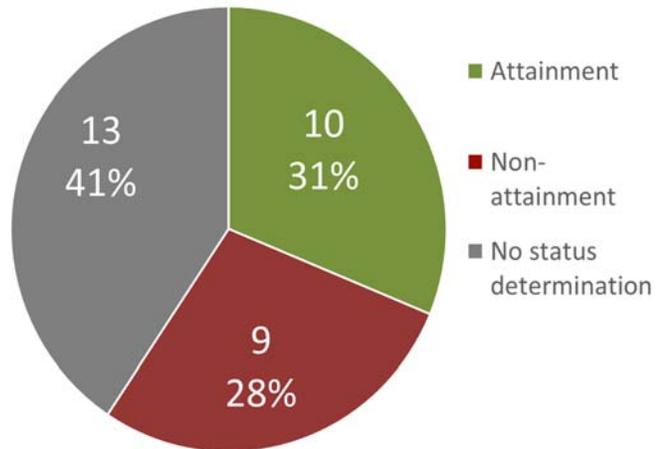
**Outlook:** Roadside parking is emerging as a potential issue for scenic resources in the Region as more visitors use designated and undesignated roadsides for parking to access recreation. Strategies to improve access to recreation areas to ensure a high quality user experience and maintain the scenic beauty are increasingly an active planning priority for TRPA and partners.

## Noise

Excessive noise can impact wildlife, visitors’ experiences, and residents’ quality of life. To maintain noise levels consistent with the needs of wildlife and values held by regional residents and visitors, both single event and cumulative ambient noise standards are specified for the noise threshold category.

### Findings and Conclusions:

Ambient noise levels in seven of nine land-use categories are in attainment with standards, but because of the proximity of existing development to roadways just two of seven transportation corridors are in attainment with ambient targets. Due to insufficient data, status determinations were not possible for nearly half of the single event noise standards. Limited noise monitoring resources were prioritized towards collecting more robust information to analyze ambient noise standards, which are more conducive to influential management actions than are single event sources.



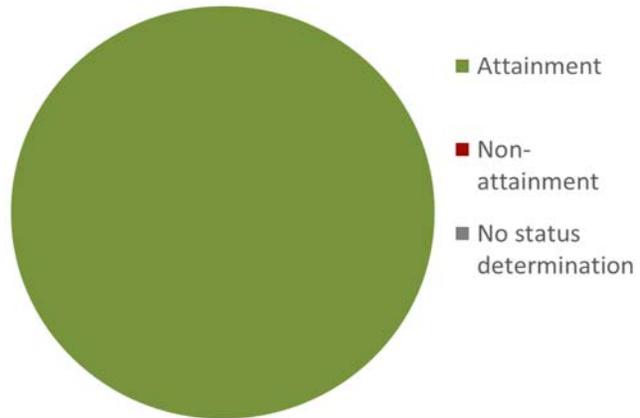
*Figure ES-11: Summary of the status of noise standards*

**Outlook:** Since 2011, when expert peer review suggested the regional framework for assessing noise was infeasible and should be fully revisited, TRPA has worked to overhaul the implementation of its noise monitoring program. These changes allow us to more rigorously monitor and report with greater confidence on noise levels in transportation corridors. The changes were lauded by the peer reviewers of the 2015 Threshold Evaluation Report. However, they again challenged us to comprehensively review the standards and one referred to the evaluation of single event noise standards against a zero exceedance criteria as “unrealistic.” The feasibility of meeting the currently adopted single and cumulative noise events standards (maximum allowable ambient noise levels) should be evaluated to ensure the standards are protective and realistically achievable.

### Recreation

The Lake Tahoe area is a mecca for the outdoor recreation enthusiast. Recreation threshold standards recognize the value of improving public access and maintaining Lake Tahoe’s environmental quality in order to perpetuate society’s desire to recreate in the Lake Tahoe Region.

**Findings and Conclusions:** Both adopted recreation policy statements have been implemented as elements of the Regional Plan and are in attainment. A broad suite of user surveys completed over the last four years suggest that visitor satisfaction with the recreational experience remains high. Public agency land acquisition programs and the Lake Tahoe Environmental Improvement Program have contributed to improved access and visitor and resident satisfaction with the quality and spectrum of recreation opportunities. Partner agencies have improved existing recreation facilities and created new ones, including providing additional access to Lake Tahoe, hiking trailheads, and bicycle trails.



*Figure ES-12: Summary of the status of recreation standards*

**Outlook:** The many limitations of the existing recreation standards are outlined in this report. Anecdotal evidence suggests that demand for Tahoe’s unique recreational experience is growing. New evidence suggests that day trippers make up a significant portion of visitors to the Region. When the standard was adopted, ensuring availability of lands and sewer utility capacity for recreational opportunities was the driving concern. Today, approximately 90 percent of the Region is in public land ownership (up from 70 percent in the 1970s), so that concern is no longer at the forefront. One exception may be shoreline access, where public acquisition has not occurred at the same pace. Today, 45 percent of the shoreline is in public ownership. TRPA and partners are working to update shoreline regulations. Today’s emerging concerns are transportation access to recreation sites and maintaining quality recreation experiences as demand grows, concerns that may require the Region to revisit policies and goals for the recreation threshold standards.

## Agency Direction in Light of Threshold Evaluation Findings

The threshold evaluation report is a comprehensive periodic synthesis of information about the state of the environment of the Region. While its breadth is an impressive collection of information, like any scorecard, it is a snapshot. And the report’s contents become valuable only if the information is translated to knowledge. To this end, we are inspired by guidance from the World Bank on using information to improve governance.

*“It is tempting—but dangerous—to view monitoring and evaluation (M&E) as having inherent value. The value of M&E does not come simply from conducting M&E or from having such information available; rather, the value comes from using the information to help improve government performance.” - (Mackay 2007)*

The threshold evaluation report is not an end point. We can and will draw on it, and on the thoughtful suggestions from independent scientific peer review, to improve how we operate and promote attainment of the Region’s shared vision. As we reflect on the effort, a number of themes for action emerged that cut across the specific recommendations within individual threshold

categories. We highlight some of the key overarching themes here and provide additional details on TRPA's direction in Chapter 13, Conclusions and Recommendations.

### **Collaboration is the Key**

The world is more interconnected today than ever before which has implications for how the agency conducts effective business. TRPA is charged not with implementing projects itself in isolation but with coordinating the many partners in the Region to achieve a set of shared goals that cut across jurisdictions, organizations, and governments. Recognizing the complex landscape in which threshold progress and restoration occur is essential to the basin's collective impact. Partnerships are how we develop and implement the plans that transform our aspirational goals into reality.

A decade ago, TRPA changed its approach and renewed its commitment to a partnership operating model and set strategic goals to make partnership and collaboration more successful and sophisticated. In many ways, this partnership model exemplified the dawn of a new era for how we do business. The 2015 Threshold Evaluation Report is an example in itself of growing and improving partnerships between scientists and management agencies. Partnership and collaboration among federal, state, and local governments implement the majority of the projects in the EIP. Private citizens and local businesses in the Region install water quality best management practices and create defensible space around residential and commercial properties. These aggregate contributions make environmental progress possible and accelerate threshold gains. It also means that both the successes and failures are a product of these partnerships.

The Lake Tahoe Aquatic Invasive Species Coordination Committee is a recent example of how continually growing partnerships leads to successful response to emergent issues. When the threat to the Tahoe Region of quagga mussel invasion became apparent nearly 10 years ago, TRPA and partners convened to set the direction and guide AIS management in Tahoe. The committee is comprised of representatives from 14 agencies – federal, regional, state – and is further supported by local governments and private NGOs. The AIS program now also reaches outside the Region to a larger western states and national coalition to leverage legislative influence, funding, and best practices. Building and maintaining an environment where these types of far-reaching and robust partnerships are successful is the first step toward the actions needed in response to evaluation reports like this one.

New and similar partnerships are now being built and nurtured in added areas responsive to the emerging conditions flagged in the 2015 report. Coalitions are working to address interregional transportation, large forest and vegetation landscapes, recreation and visitor engagement, and nearshore water quality conditions. It is these new associations of partners collaborating on solutions to emergent issues that will account for continued progress toward our regional shared goals.

### **Connections and System Integration**

We've learned through decades of experience that the partnership's effectiveness depends on shifting our focus from silos to understanding system dynamics. As with the 2011 report, the siloed evaluation approach of the current threshold system was again questioned by the 2015 scientific experts in the peer review. For example, the reviewers wondered about the artificial segmentation of issues like water quality, fisheries, and aquatic invasive species to understanding of the larger system of evaluation of nearshore health. The linkage of each silo to the ecosystem dynamic may be recognized or not, but the required evaluation of 178 separate siloed standards perhaps diverts focus from asking or understanding the ecosystem's most important driving influences.

When we see linkages of individual threshold standards to the larger system dynamics, we respond with active management interventions. A clear and pressing example is the nexus among threshold standards for scenic, recreation, and air quality. Visitation to the Region may be growing and visitation patterns changing. This evaluation found that increasing visitation also poses a challenge for the recreation experience and scenic quality. As visitors frequent Lake Tahoe, the roadsides are increasingly cluttered with parked cars. Roadside parking is an emerging stressor on scenic resources. TRPA recently commissioned the development of a recreation travel study to better understand how visitors are getting to and moving around the Region. Understanding visitor systems dynamics is increasingly important to adaptively managing transportation, recreation access, and quality of recreation experience. When the threshold system was conceived, the primary concerns of recreation travel were confined to impacts on air and water quality and sewer capacity for recreation facilities. As the system dynamics change, new values and impacts may today take precedence over historic issues that are today largely resolved.

In other areas where the linkage of standards to system effects are less apparent, the peer reviewers are suggesting we ask whether our siloed standards still reflect the most important system drivers, and if not, to bring the standards up to date.

### **Adaptive Management and Effectiveness**

Understanding where our Region stands in the health of its systems is essential to understanding where to go next. TRPA tracks hundreds of standards and performance measures. Based on the 178 adopted standards we now rely on for threshold evaluation, the findings of this report indicate that the environmental health of the Region is continuing to improve in important areas and flags other areas for action. Knowing that we are making progress is important. Understanding what factors are contributing to improvement or decline is an altogether different and daunting challenge. Today, the greatest opportunity lies in turning this information into knowledge to signal to TRPA and its partners which actions are the most effective and which offer the best potential return on investment. To this end, the peer reviewers of the 2015 Threshold Evaluation Report challenged TRPA to do more to figure out what is working and what is not. Use of the adaptive management cycle (*plan-do-check-adjust*) is the best tool we have to continually and effectively translate information to knowledge. And for a decade we've been using it to accelerate the incidence and frequency of plan improvements and implementation program prioritization to improve effectiveness and better allocate resources to achieve desired outcomes.

Because change is happening all around us and the need to iterate more regularly to adapt to changing needs and conditions is important, we have made the goal of continual adaptive management intentional and support it with more frequent annual, quarterly, and now even real time reporting so decision-makers have the best info available. Relying on adaptive management, we have set in motion work programs in every major resource area to accomplish this need. We are already on track to take needed action with prioritized strategic initiatives in AIS control, forest health management, water quality operations and maintenance, shoreline recreation access, transformative transportation systems management to address growing demands for recreation visitor access, and development rights system modifications to accelerate environmentally beneficial redevelopment.

While we are getting better at mobilizing to make adaptive changes to programs in response to evaluative information, the area where we have not adapted as well is in keeping our evaluation standards and measures of effectiveness up to date. Now it is time for the Region to relook at the standards by which we judge and evaluate our progress.

## **Climate Change**

Both the 2015 report and the peer review comments point to a growing body of knowledge we have been urged to bring into our standards and evaluations. Globally, 2015 was the warmest year on record. Temperatures in 2015 were over 1.5°F (0.8°C) warmer than the average temperatures of the 20<sup>th</sup> century, breaking the record set just a year earlier (NOAA & NASA 2016). The fingerprints of climate change are already visible in the Region. Tahoe City is 2°F (1.1 °C) warmer today than it was 100 years ago (U. S. Bureau of Reclamation 2015). Average minimum air temperature has increased by 4.3°F (2.4 °C) over the last 100 years (UC Davis - TERC 2016). With rising temperatures, there has been a correspondent decrease in the number of days each year with below freezing temperature, which have declined by almost 30 days over the same period (UC Davis - TERC 2016). The lake has steadily warmed since regular measurements began in 1970, and the volume averaged temperature of the lake is now nearly 0.8 °F (0.24 °C) warmer than it was 35 years ago (UC Davis - TERC 2016).

We have already started to plan for climate adaptive actions. In 2013, TRPA and the Lake Tahoe Sustainable Communities Program released the award-winning Sustainability Action Plan which lays out a comprehensive framework for building sustainability and climate change considerations into the decisions that impact the Region's future. For TRPA, considering, responding, and adapting to climate change is part of a process. Not every action we take will be need to be altered by climate considerations, but when planning our programs, policies, and actions, we must ask ourselves if the impacts of changing climate are likely to influence the effectiveness of the strategy. This is evident in how the agency is approaching its multiple strategic initiatives.

For example, climate forecasts for the Lake Tahoe Region suggest that warm temperatures and more variable rainfall are likely to lead to more frequent and dramatic fluctuations in lake levels (U. S. Bureau of Reclamation 2015) and observations from the last 15 years suggest that this is already the case (UC Davis - TERC 2016). To address a more uncertain future, the shoreline strategic initiative set up a joint fact finding committee made up of policy makers, stakeholders, and scientists to address questions about what assumptions should be made about future lake levels and determine the best resources available to planners today about future lake levels. This information will be used to develop proposals for adapting the lake's system of boating access to longer and more frequent periods of low lake levels.

Although climate is changing globally, its effects will emerge locally. Global climate change may alter the composition of the Lake Tahoe Region's vegetation communities and plant species and exacerbate existing stressors. Forecasts suggest high elevation areas such as Lake Tahoe may experience range shifts, re-sorting of species associations, extirpations, and extinctions (e.g. Seastedt et al. 2004, Loarie et al. 2008, Tomback and Achuff 2010). In response, through the forest health strategic initiative, TRPA and its partners are actively exploring forest health treatments beyond the WUI to increase the resilience of Tahoe's forests. These and other important climate adaptations will be considered as we adjust plans and as we update our standards and measures.

## **Review and Update the Threshold Standard System**

All of the action themes outlined above lead to the threshold update strategic initiative endorsed as a priority by the TRPA Governing Board in 2015. The initiative will review and update the threshold standard system, including the thresholds standards and the monitoring, evaluation, and reporting structure that supports the system. This and previous threshold evaluations are a part of the critical evidence base that will inform that process.

The peer reviewers of this report and the 2011 Threshold Evaluation Report challenged us to ask difficult questions about our current system, many of which are likely to help inform the review of the threshold standard system. In area after area, they challenged us to ask “Why?”:

- Why were these specific species selected as the focus of your wildlife program?
- Why focus on total area of SEZ restored when benefits vary significantly by the location and type of restoration?
- Why focus on fish habitat rather than on fish populations?

Again and again, these and many more of the peer review comments and questions are all derivatives of the larger question that frames the threshold update initiative: “Do our current goals (threshold standards) give us the information we need to make decisions that will ensure a healthy future for Lake Tahoe?” So to finish where we started, do each of our current 178 adopted threshold standards improve regional governance? TRPA alone cannot answer these questions. We look forward to drawing on the expertise and experience of partners and stakeholders as we address them through the threshold update initiative.

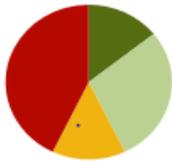
This threshold evaluation report lays the foundation for the initiative to review the threshold standard system. The assessment included in the recommendations and conclusions chapter of this report proposes to systematically review the formulation of the threshold standards against best practice, and we have already begun work with the Tahoe Science Advisory Council to complete that assessment.

The Tahoe Basin has proven over the last several decades that partnership and collaboration can drive positive progress for the environment and communities that surround the lake. The ongoing challenges flagged by the 2015 evaluation and future challenges such as climate change will be tackled head on with TRPA leading and facilitating regional partnerships. As President Obama said during the 20<sup>th</sup> Lake Tahoe Summit in August 2016, “Our healing of Lake Tahoe proves it’s within our power to pass on the incredible bounty of this country to a next generation.”

# Status and Trend Summary Charts for all Standards

## Reporting Icon Legends

STATUS, TREND, AND CONFIDENCE LEGEND						
STATUS	considerably better than target	at or somewhat better than target	somewhat worse than target	considerably worse than target	insufficient data to determine status or no target established	
TREND	rapid improvement	moderate improvement	little or no change	moderate decline	rapid decline	insufficient data to determine trend
CONFIDENCE	high		moderate		low	



In instances where there are too many standards and/or indicators to present each one in its own indicator sheet a pie chart showing the percentage of indicators in each status category are presented instead. The colors of the pie chart correspond to the status colors.

Status Category	Description	Reporting Icon
<b>Implemented</b>	The Management Standard has been integrated into the <i>Regional Plan</i> as policy and/or as an ordinance or regulation and is consistently applied to a project design or as a condition of project approval as a result of project review process. Greater than three examples of programs or actions can be represented to support the Management Standard's implementation. Adopted programs or actions support all aspects of the Management Standard's implementation, or address all major threats to implementation of the Management Standard.	
<b>Partially Implemented</b>	The Management Standard has been integrated into the <i>Regional Plan</i> , but is not consistently applied during the course of the project review process. No more than two examples of programs or actions can be identified to support the Management Standard's implementation and/or adopted programs or actions support some aspects of the Management Standard or address some major threats to implementation of the Management Standard.	
<b>Not Implemented</b>	The Management Standard has not been integrated into the <i>Regional Plan</i> and is not applied during the course of project review. No examples of programs or actions can be identified to support implementation of the Management Standard.	

## Air Quality Status & Trend Summary

Standard	2011	2015
<b>Carbon Monoxide</b>		
Highest 1-hour Concentration of Carbon Monoxide		
Highest 8-hour Average Concentration of Carbon Monoxide		
Average Daily Winter Traffic Volume, Presidents Weekend		
<b>Ozone</b>		
Highest 1-hour Average Concentration of Ozone		
Highest 8-hour Average Concentration of Ozone		
3Year Average of the 4 <sup>th</sup> Highest 8-hour Concentration of Ozone		
Oxides of Nitrogen Emissions		
<b>Regional Visibility</b>		
Regional Visibility 50 <sup>th</sup> Percentile ("Average Visibility Days")		
Regional Visibility 90 <sup>th</sup> Percentile ("Worst Visibility Days")		
<b>Subregional Visibility</b>		
Subregional Visibility 50 <sup>th</sup> Percentile ("Average Visibility Days")		
Subregional Visibility 90 <sup>th</sup> Percentile ("Worst Visibility Days")		

Standard	2011	2015
<b>Respirable and Fine Particulate Matter</b>		
Highest 24-hour PM <sub>10</sub> Concentration		
Annual Average PM <sub>10</sub> Concentration		
24-hour PM <sub>2.5</sub> Concentration		
Annual Average PM <sub>2.5</sub> Concentration		
<b>Nitrate Deposition</b>		
Reduce generation and transport of nitrate to achieve water quality standards		
Vehicle Miles Traveled (VMT)		
<b>Odor - Reduce diesel engine fumes</b>		

### Water Quality Status & Trend Summary

Standard	2011	2015
<b>Pelagic Lake Tahoe</b>		
Winter Average Secchi Disk Transparency (relative to interim target)		Removed (12-12-2012)
Secchi Depth (Clarity Challenge)		
Secchi Depth	Not assessed	
Phytoplankton Primary Productivity		

Standard	2011	2015
Clarity – Vertical Extinction Coefficient (VEC)	Not assessed	
<b>Littoral Lake Tahoe</b>		
Nearshore Turbidity (Stream Influence)		
Nearshore Turbidity (No Stream Influence)		
Nearshore Attached Algae	Not assessed	
Aquatic Invasive Species	Not assessed	
<b>Tributaries</b>		
Suspended Sediment Concentration		
Phosphorus Concentration		
Nitrogen Concentration		
Suspended Sediment Load		
Fine Sediment Load		
Phosphorus Load		
Nitrogen Load		

Standard	2011	2015
<b>Surface Runoff</b>		
Suspended Sediment Concentration		
Phosphorus Concentration		
Nitrogen Concentration		
Suspended Sediment Load		
Phosphorus Load		
Nitrogen Load		
<b>Groundwater</b>		
Nutrient Concentration Standards		
Sediment Concentration Standards		
<b>Other Lakes</b>		
Nutrients		
Secchi Depth		
Other Parameters		

## Soil Conservation Status & Trend Summary

Standard	2011	2015
<b>Impervious Cover</b>		
Percent of Land Coverage Within Land Capability Class 1a (allow up to 1% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 1b (allow up to 1% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 1c (allow up to 1% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 2 (allow up to 1% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 3 (allow up to 5% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 4 (allow up to 20% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 5 (allow up to 25% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 6 (allow up to 30% impervious coverage)		
Percent of Land Coverage Within Land Capability Class 7 (allow up to 30% impervious coverage)		
<b>Stream Environment Zones</b>		
Preserve and Restore Stream Environment Zones		

## Vegetation Status & Trend Summary

Standard	2011	2015
<b>Common Vegetation</b>		
Vegetation Community Richness		
Relative Abundance of Meadow and Wetland Vegetation		
Relative Abundance of Deciduous Riparian Vegetation		
Relative Abundance of Shrub Vegetation		
Relative Abundance of Yellow Pine Forest in seral stages other than mature		
Relative Abundance of Red Fir Forest in seral stages other than mature -		
Size of forest openings and juxtaposition of vegetation communities – Management Standard		
Consistency with Bailey Land Capability System		
Non-Degradation of Stream Environment Zones		
Appropriate Management Practices		
<b>Uncommon Plant Communities</b>		
Deepwater Plants of Lake Tahoe		
Grass Lake (sphagnum fen)		

Standard	2011	2015
Osgood Swamp		
Freel Peak Cushion Plant Community		
Hell Hole (sphagnum fen)		
Upper Truckee Marsh		
Taylor Creek Marsh		
Pope Marsh		
<b>Sensitive Plants</b>		
Tahoe yellow cress ( <i>Rorippa subumbellata</i> )		
Tahoe Draba ( <i>Draba asterophora</i> var. <i>asterophora</i> )		
Cup Lake Draba ( <i>Draba asterophora</i> var. <i>macrocarpa</i> )		
Long-petaled Lewisia ( <i>Lewisia pygmaea longipetala</i> )		
Galena Creek rockcress ( <i>Arabis rigidissima</i> var. <i>demote</i> )		
<b>Late Seral and Old Growth Forest Ecosystems</b>		
Sub-alpine Zone		

Standard	2011	2015
Upper Montane Zone		
Montane Zone		

### Fisheries Status & Trend Summary

Standard	2011	2015
<b>Stream Habitat</b>		
Miles of Stream Habitat in Excellent Condition		
Miles of Stream Habitat in Good Condition		
Miles of Stream Habitat in Marginal Condition		
<b>Instream Flow</b>		
Non-degradation Standard for Instream Flow		
Divert Stream Intakes to Lake Sources		
Lahontan Cutthroat Trout		
<b>Lake Habitat</b>		
Acres of "Prime" Fish Habitat		

## Wildlife Status & Trend Summary

Standard	2011	2015
<b>Special Interest Species</b>		
Northern Goshawk Population Sites		
Osprey Population Sites		
Wintering Bald Eagle Population Sites		
Nesting Bald Eagle Population Sites		
Golden Eagle Population Sites		
Peregrine Falcon Population Sites		
Waterfowl Population Sites		
Deer		
Disturbance Free Zones Management Standards		
<b>Habitats of Special Significance</b>		
Riparian Habitat		

### Scenic Resources Status & Trend Summary

Standard	2011	2015
<b>Roadway and Shoreline Units</b>		
Travel Route Ratings for Roadway Travel Units		
Travel Route Ratings for Shoreline Travel Units		
Scenic Quality Ratings for Roadway Travel Units (Scenic Resources)		
Scenic Quality Ratings for Shoreline Travel Units (Scenic Resources)		
<b>Other Areas</b>		
Public Recreation Areas and Bike Trails		
<b>Built Environment (Community Design)</b>		
Built Environment (Community Design)		

### Noise Status & Trend Summary

Standard	2011	2015
<b>Single Noise Events</b>		
Aircraft Departures/Arrivals		

Standard	2011	2015
Watercraft Shoreline Test		
Watercraft Pass-By Test		
Watercraft Stationary Test		
Motor Vehicles Less Than 6,000 GVW		
Motor Vehicles Greater Than 6,000 GVW		
Motorcycles		
Off-Road Vehicles		
Snowmobiles		
<b>Cumulative Noise Events</b>		
High-Density Residential Areas		
Low-Density Residential Areas		
Hotel/Motel Areas		

Standard	2011	2015
Commercial Areas		
Industrial Areas		
Urban Outdoor Recreation Areas		
Rural Outdoor Recreation Areas		
Wilderness and Roadless Areas		
Critical Wildlife Habitat Areas		
South Lake Tahoe Airport Transportation Corridor		
State Route 28 Transportation Corridor		
Highway 50 Transportation Corridor		
State Route 89 Transportation Corridor		
State Route 207 Transportation Corridor		
State Route 267 Transportation Corridor		

Standard	2011	2015
State Route 431 Transportation Corridor		
Policy Statement Assessment - Adopt noise standards for Transportation Corridors		

### Recreation Status & Trend Summary

Standard	2011	2015
Quality of Recreation Experience & Access to Recreational Opportunities		
Fair Share Distribution of Recreation Capacity		