TSAC

Tahoe Science Advisory Council

2019 Work Plan

The Tahoe Science Advisory Council (Council) was established in December 2015 by a memorandum of understanding (MOU) between the Secretary of the California Natural Resources Agency and the Director of the Nevada Department of Conservation and Natural Resources. The Council is an independent group of scientists who work together in an advisory capacity to promote and enhance the use of the best available scientific information on matters of interest to both the states of California and Nevada.

This document describes Council activities in three work-plan categories: (1) priority "Science-to-Action" implementation tasks; (2) Tahoe Regional Planning Agency (TRPA) threshold update efforts; and (3) operations and technical support.

I. Lake Tahoe Science-to-Action Plan

Lake Tahoe's iconic clarity has been—and continues to be—the subject of extensive research and monitoring. Data analysis shows that while winter clarity measurements have steadily improved, likely in response to management actions, summer clarity values have continued to decline and threaten to undermine work to restore long-term average annual clarity. Initial analyses suggest changing climate conditions may be contributing to ongoing summer clarity loss.

The impacts of climate change are already apparent in Lake Tahoe, and future projections suggest further significant impacts are possible. In 2018, the two states challenged the Council to recommend research needs to better understand the underlying drivers of ecological health at Lake Tahoe.

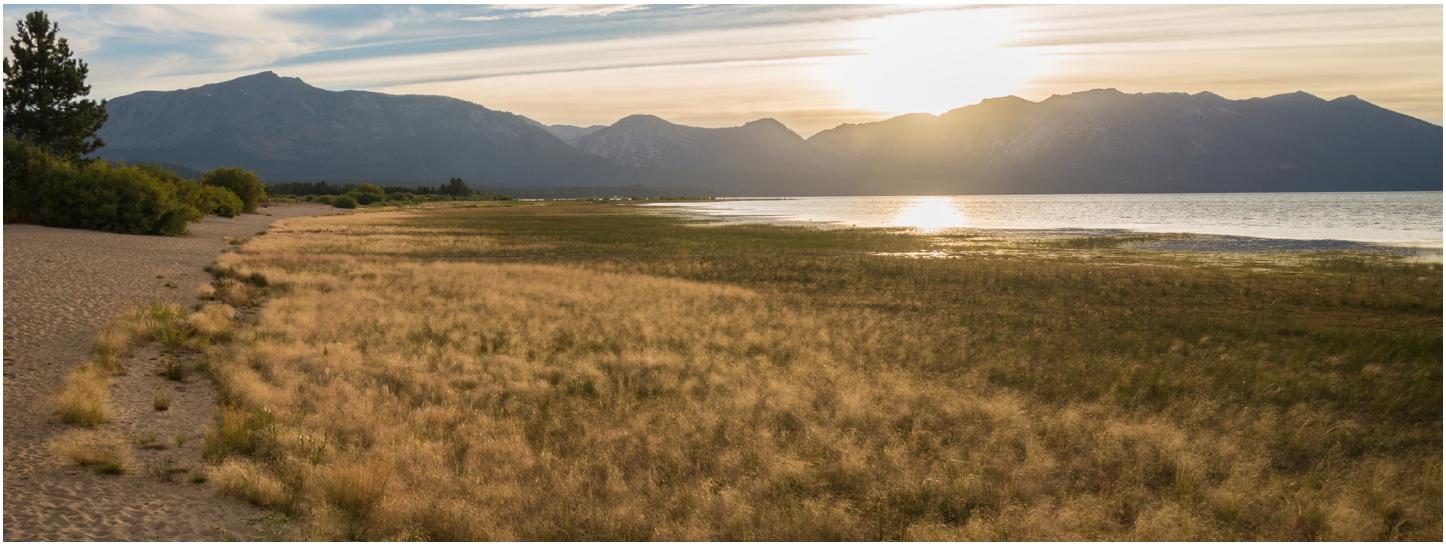
The Council's "Science-to-Action Plan" provides a broad framework for collecting data, performing analyses, and developing the modeling tools needed to provide an updated understanding of changing lake dynamics and ecology. The plan was designed to formally address relevant questions presented to the Tahoe Science Advisory Council in 2018 regarding the record low clarity of 2017, and to provide guidance on how the information resource managers need to develop and evaluate appropriate responses to changing conditions.

The State of California allocated resources in the 2019/20 budget to revisit causes of Lake Tahoe's clarity decline, assess future climate impacts on water quality, and identify potential management actions that address anticipated change. In addition, the Council was awarded residual funding from the Southern Nevada Public Land Management Act to assess lake response to anticipated landscape-scale forest management work and climate change. These projects focus on priority tasks identified in the Science-to-Action Plan that are directly responsive to agency and State concerns regarding current and future water quality conditions at Lake Tahoe.

Scientific Study of Lake Tahoe's Environmental Conditions and Climate Change Impacts

Working with Lahontan Regional Water Quality Control Board, Nevada Division of Environmental Protection, TRPA and other agency staff, the Council will:

1. **Conduct an analysis of the divergence in winter and summer clarity trends.** This task will develop technical and policy briefs synthesizing the available information on the difference between winter and summer clarity trends and drivers. Using available information, the Council will investigate why summer clarity does not appear to be responding to fine sediment and nutrient load reductions in the same manner as winter



clarity. The task will evaluate specific years' data and associated clarity response in the context of observed trends and describe the role of drivers including, but not limited to, particle/nutrient loading, ecological and food web dynamics, thermal stratification patterns, particle/nutrient insertion depth, and the timing and delivery of sediment and nutrients. The work will also define data gaps and research needs to better understand clarity drivers.

The completed briefs will inform resource managers on the relative efficacy of existing pollutant load reduction strategies in the context of summer and winter clarity trends and identify potential actions to address ongoing summer clarity decline.

Task budget: **$120,000**

2. **Annual data synthesis and assessment.** This task will initiate an adaptive management process to provide integrated analyses and executive-level briefings on lake, watershed, and climate conditions. The Council will coordinate quarterly meetings of principal water quality investigators and resource management staff to review ongoing monitoring and modeling efforts, coordinate integration of data collected, and report preliminary findings as yearly conditions evolve. The data synthesis will be augmented by updated statistical models and projections of status and trends in key lake water quality standards.

   An annual workshop will engage agency staff and Council scientists in a collaborative discussion of recent findings, and science priorities to coordinate new information with management programs. Annual findings will be integrated into the Lake Tahoe Total Maximum Daily Load (TMDL) adaptive management process and can be used to guide Environmental Improvement Program investments

   Task budget: **$120,000**

3. **Lake Tahoe Clarity Model Enhancement.** The Lake Tahoe Clarity Model, developed between 2007-2011, was critical for developing current clarity restoration policy. The model is a nested set of sub-models—a hydrodynamic model, an ecology model, a particle model, and an optical model—driven by a complex set of measured and modeled external inputs including meteorological data and sediment and nutrient loading values from streams, groundwater, urban and upland areas

   The Council will update those model components deemed most critical for improving the model's predictive ability. Recent findings suggest the hydrodynamic, ecology, and particle models likely need updating for the tool to provide the greatest resource management value. Updating the ecology model will offer a better understanding of food web dynamics, while improving the hydrodynamic and particle models will better reflect how lake warming and stratification processes influence sediment and nutrient delivery.

   This task includes (1) an assessment of the strengths and deficiencies of the existing model components; (2) an assessment of the strengths and deficiencies of available model inputs; (3) an updated clarity assessment tool, including the improvement or replacement of sub-models as needed; and (4) limited updated model results for both current and anticipated conditions. These results will be considered in the context of the Lake Tahoe TMDL adaptive management process to guide next steps.

   Task budget: **$260,000**

Total project budget: **$500,000**

Funding Source: **State of California Lake Tahoe Science and Improvement Account**

Science Support for Management of Landscape-Scale Changes on Lake Tahoe

Integrated vegetation management and watershed restoration efforts are expected to alter forest dynamics, and anticipated landscape-scale changes to Lake Tahoe forest will have an impact on many drivers of lake conditions. Examples include changes in air temperature patterns, snow cover and duration, soil moisture, stream flow and chemistry, stream temperatures, and alteration of future fire frequency and intensity. Individually or combined, these factors may affect the quality of the nearshore environment, the pelagic environment, and native and invasive species habitat. This Council project will provide scientific support to begin assessing the relative impacts of various mitigation strategies on lake condition resulting from landscape-scale management actions.

The project will gather data to calibrate and validate linked hydrologic models developed for Lake Tahoe West and previous efforts. The Council will work closely with agency and academic partners to leverage existing data collection, modeling results, and forest treatment scenario development performed by the Lake Tahoe West Partnership science team within the Ward Creek watershed. Specific measurements will evaluate snowpack, forest water use, shoreline groundwater flux, and tributary stream flow dynamics to improve system understanding.

The project will advance the goal of establishing a study watershed to link watershed changes to anticipated lake response. Refined hydrologic model results will be coupled with the enhanced Lake Tahoe Clarity Model to evaluate potential water quality effects on Lake Tahoe resulting from identified west-shore forest treatment options.

Total project budget: **$400,000**

Funding Source: **Southern Nevada Public Land Management Act**

Ongoing Science-to-Action Plan Support

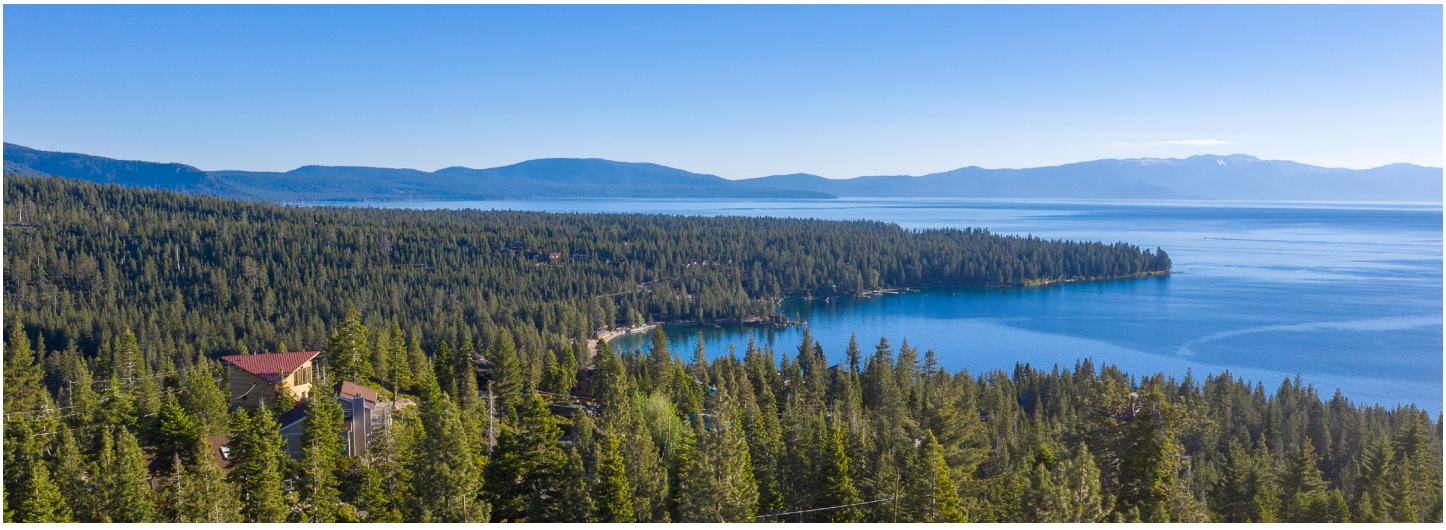
The Council has successfully leveraged operational funds to develop the current Science-to-Action Plan. Using previously encumbered resources, the Council will continue refining the current water quality-focused plan and will initiate additional plan development to prioritize forest and terrestrial science needs. The Council is also working with agency partners to develop a science-based decision support framework to assess planned implementation actions in the Upper Truckee River watershed to anticipated environmental benefits.

II. Tahoe Regional Planning Agency Threshold Update Initiative

The TRPA threshold standards establish goals for environmental quality and express the shared aspiration for environmental restoration of the Tahoe region. Most of TRPA's threshold standards are based on 40-year-old science. A broad bi-state consensus supports updating the thresholds and monitoring systems, and TRPA is working with agency partners, stakeholders, and the Council to review and consider modifying the threshold standards to reflect the latest science in the Lake Tahoe Region.

Supporting TRPA threshold update and review remains an important Council function. Based on previous Council work, the TRPA Governing Board recently co-located the threshold standards within TRPA's Regional Plan and approved an updated system structure to guide threshold standard update.

Growing concern regarding the impact of increased visitor numbers on both the environment and visitor experience has led TRPA and its partners to evaluate recreation threshold standards. Water quality, stream environment zone, air quality, and vegetation standards have also been identified as threshold update priorities. The Council currently has capacity and resources to support these efforts.



Science Support in Development of Sustainable Recreation Thresholds

Visitor and recreation user data in the Lake Tahoe Basin are sparse and incomplete, leading to a general lack of understanding about visitors, their recreation needs, experience, and value of the outdoors. This Council project will support the Sustainable Recreation Working Group to develop an adaptive framework for evaluating, tracking, reporting and planning recreational conditions in the Tahoe Basin and to support the development of appropriate program metrics.

The Council will collaborate with the Sustainable Recreation Working Group to produce a "Recreational Quality and Public Access Best Practices" document, including detailed technical briefs describing:

1. A conceptual model for priority recreational activities and public access to recreational high demand hot spots in the Tahoe Basin; and
2. A sustainable recreation monitoring framework that identifies relevant indicators and metrics for assessing the quality of recreational experience and access to recreational opportunities in the Tahoe Basin.

Identifying critical data gaps and research needs during the process will help guide future investments to better inform management actions and decisions.

Total project budget: **$175,000**

Funding Source: **Southern Nevada Public Land Management Act**

Ongoing Threshold Update Support

The Council will continue to provide targeted threshold update support as funding allows. Currently, the Council is actively supporting a broad stakeholder process related to the sustainable recreation threshold update effort, as discussed above, and is engaged in reviewing the Vehicle Miles Traveled threshold in the context of air quality, water quality, visitor experience, and quality-of-life concerns. The Council is also working with TRPA to review water quality standards to ensure they align with the Council's broader Science-to-Action work and with the recently adopted threshold structure.

III. Ongoing Council Operations and Technical Support

Council operations and technical support activities are funded through annual California State budget appropriations in the amount of $101,000 per year. Council operations generally consists of Council member travel and per diem costs and general administrative costs, including a part-time administrative assistant, meeting support, printing, and website maintenance costs.

Technical support activities include Council chair leadership and representation; maintaining technical peer review capacity for documents or work-products on matters of interest to both Nevada and California; periodic review of regional monitoring programs and data collection methods to inform continuing improvement; and responding to general scientific inquiries (as resources allow or are provided by requesting agency).