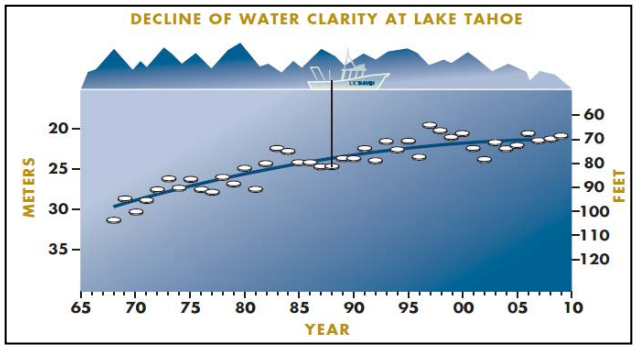
# Science to Improve Lake Tahoe's Water Quality and Clarity

Lake Tahoe's water quality is world renowned. The rare deepwater lake has unique color and exceptional clarity, and contains a diverse aquatic ecosystem. However, long-term monitoring and research have revealed that Lake Tahoe has experienced a decline in water quality since the late 1960s. Degradation of Tahoe's water quality threatens its ecological functions and status, and its value as a recreational destination, its use as a drinking water source, and its value to the local and regional economies.




Source: UC Davis TERC (http://terc.ucdavis.edu/)

Lake Tahoe is differentiated into two zones: deep-water and nearshore. Monitoring data indicate a decline in the water quality of both zones. Since 1968, deepwater clarity has been reduced by approximately 30 percent, from 100 to 66 feet due to increased concentrations of fine sediment and nutrient levels. Similarly, the nearshore has been degraded due to algal blooms and the impact of aquatic invasive plants and animals.

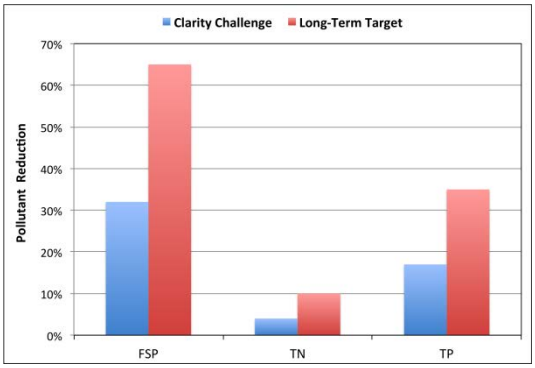
## *Key Management Questions*

- What are the types and sources of pollutants affecting the lake's water quality?
- How much pollution is entering the lake and what reductions are necessary to achieve water quality goals?
- What is the best way to go about restoring lake clarity?
- Is the strategy to restore lake clarity working and is it resulting in commensurate benefits to the nearshore environment?
- Are agency approaches for protecting the nearshore appropriate and based on the best available science?

## *Science Investments to Address Key Management Questions*

During the past decade, research and monitoring activities have focused on understanding and quantifying pollutant inputs and lake response, and on evaluating the most cost-effective approaches to achieve pollutant load reductions. Major accomplishments include:

- Conducting a source analysis as a part of the Lake Tahoe Total Maximum Daily Load (TMDL) to provide baseline basin-wide pollutant load estimates from different sources
- Developing the Lake Clarity Model, capable of predicting the lake response to various pollutant loading scenarios in different combinations
- Implementing research projects to identify appropriate nearshore indicators and evaluate appropriate water quality standards to help guide restoration strategies
- Developing a monitoring program for evaluating Best Management Practice




Load reductions needed to meet TMDL targets for fine sediment particles (FSP), total nitrogen (TN) and total phosphorus (TP) (Source: Lahontan Water Board and Nevada Division of Environmental Protection).

(BMP) effectiveness and status and trends of urban stormwater quality.

## Key Science Findings

- Inorganic fine sediment particles less than 16 micrometers (about 1/3 the diameter of a human hair) are the main pollutant impacting deepwater clarity. However, nutrients also play an important role, particularly with respect to the nearshore condition.
- Model results estimate that a 65 percent reduction in fine sediment particle, 10 percent reduction in nitrogen, and 35 percent reduction in phosphorus loading to the lake are needed to restore deepwater clarity for Lake Tahoe.
- While load reductions are achievable in all major source categories, restoration depends heavily on managing urban stormwater runoff which is both the greatest source and greatest opportunity to control fine sediment particle and nutrient inputs to the lake.

## Management Actions Taken

New scientific information has changed the focus on how to restore Lake Tahoe's clarity and water quality. In response to this, the following management actions have been taken:

- Established the Clarity Challenge, which is an interim goal to achieve 80 feet of clarity within 20 years and considers the opportunities for achievable load reductions
- Developed a suite of urban stormwater tools including a hydrologic load reduction model to aid in the development and selection of alternative project designs, as well as rapid assessment methodologies to determine the relative condition of stormwater assets and to prioritize and evaluate maintenance activities
- Developed protocols and methods facilitating the consistent estimation and tracking of progress toward achieving restoration goals

Pristine Lake Tahoe water on left vs. polluted urban stormwater on right (Source: A. Heyvaert).

- Initiated a TMDL Management System to ensure continual improvement through monitoring, research, and adaptive management

## Next Steps

Research and monitoring will continue to be an integral part of the restoration strategy through adaptive management. Future agency science priorities include:

- Evaluating the effectiveness of existing and new load reduction technologies and management practices
- Improving and enhancing tools and protocols that track and estimate progress toward achieving restoration goals
- Monitoring status and trends associated with deepwater and nearshore conditions to determine the effectiveness of restoration actions

## Where to go for more information

Lahontan Water Board: www.swrcb.ca.gov/rwqcb6/
Nevada Division of Environmental Protection: ndep.nv.gov/bwqp/tahoe.htm
Tahoe Regional Planning Agency: http://www.trpa.org/