

Lake Tahoe Watershed Action Plan (LATWAP)



Authors: Anna Singer, Maddie Green, Marlee Evans, Amber Farbman

Table of Contents

| | |
|--|------|
| Mission Statement ----- | 3 |
| Background ----- | 3 |
| Map 1. ----- | 3 |
| History ----- | 4 |
| Policies/Mandates in Place ----- | 4-5 |
| Specific Water Quality Improvement Plans ----- | 5 |
| Map 2. ----- | 5 |
| Problems ----- | 6 |
| Map 3. ----- | 6 |
| Problems Matrix ----- | 7 |
| Problem 1: Loss of Water Clarity ----- | 9-10 |
| Problem 2: Impact of Climate Change ----- | 11 |
| Problem 3: Impact of Non-Native Species ----- | 12 |
| Recommendations ----- | 12 |
| Works Cited ----- | 13 |

History:

Lake Tahoe is considered a sacred life-sustaining water by the tribe that inhabited the area long before any other human interaction came into contact with the lake. These ancestral inhabitants of the area, the Washoe Tribe, called the lake “Da ow a ga” meaning “edge of the lake”. The native tribe collected medicinal plants, fished the cool blue water and hunted and gathered in the area for food and tools. By the 1860’s this all changed as many explorers discovered the area and began to settle in the mountain passes. Upon discovery of the area, there



was also discovery of gold and silver. In order to get to these goods there was clear cutting of the watersheds timber to shore the land to the mines. The settlers became rich from both the excessive logging and mining around the lake. The logging led to better transportation routes within the watershed allowing more and more adventurers to flock to the basin. Throughout the early and mid 1900’s the watershed had experienced rapid development of ski resorts, homes and urban infrastructure. These developments

thrived as outdoor sport enthusiasts enjoyed the basin in the summer months for the expansive beaches and the mountain air, and in the winter for ski and snowshoe excursions. The watershed till this day attracts people from around the world to enjoy its natural beauty and all it has to offer from world class skiing, mountain biking and entertainment.

Historically the basin has been largely affected by logging, fishing, transportation and community development, ranching/grazing. Since the development of man made infrastructures, there has been increased amounts of sediment entering the lake, causing algae growth and reducing the clarity of the lake. Starting in the 1970’s steps were taken to start trying to reduce and prevent the amount of nutrients entering the lake. The major act put into place was treatment and pumping of wastewater out of the watershed, reducing further algae growth from reaching the lake, as wastewater is a major source of nutrients. Due to the Lake Tahoe Watershed being an outstanding recreational resource, and a scenic and ecological treasure, it is recognized as a natural resource of special significance. With this worldwide recognition, it is designated as an “Outstanding National Resource Water” under the Clean Water Act. This is especially important in the Lake Tahoe watershed as their largest problem to this day is nutrient input leading to decreased quality and clarity of the lake till this day.

Policies/Mandates in Place:

Lake Tahoe is a designated Outstanding National Resource Water (ONRW), which is renowned for its extraordinary clarity and purity, and deep blue color. Under this classification, “water quality must be maintained and protected and only temporary and short term changes may be permitted” (West, 1989). The nature of this designation restricts the permitting of any new point source discharges. In addition to the control measures for sediment and nutrients which that were the main focus of the two earlier Lake Tahoe plans, regionwide control measures for toxic pollutants, needed for attainment of the water quality objectives in the EPA's National Toxics Rule, section 131.36 of 40 CFR (120/22/92), and California Toxics Rule, section 131.38 of 40 CFR (5/18/00), which is incorporated by reference, apply to the Lake Tahoe Basin. The Regional Board implements the federal Clean Water Act, portions of the California Water Code (including the Porter-Cologne Act) and a variety of laws related to control of solid waste and toxic and hazardous wastes. The Regional Board has authority to set and revise water quality standards and discharge prohibitions. It may issue permits, including federal NPDES permits and Section 401 water quality certifications, and State waste discharge requirements or waivers of waste discharge requirements. Its planning and permitting actions require compliance with the California Environmental Quality Act (CEQA). The Regional Board has broad enforcement authority; actions may range from staff enforcement letters, through cleanup and abatement or cease and desist orders, to civil penalties or referral to the California Attorney General.

Specific Water Quality Improvement Programs:

- Lake Tahoe Total Maximum Daily Load
- Environmental Improvement Program (EIP)
- Nearshore Protection

Map 2. Watershed Assessment Area: Tahoe Basin

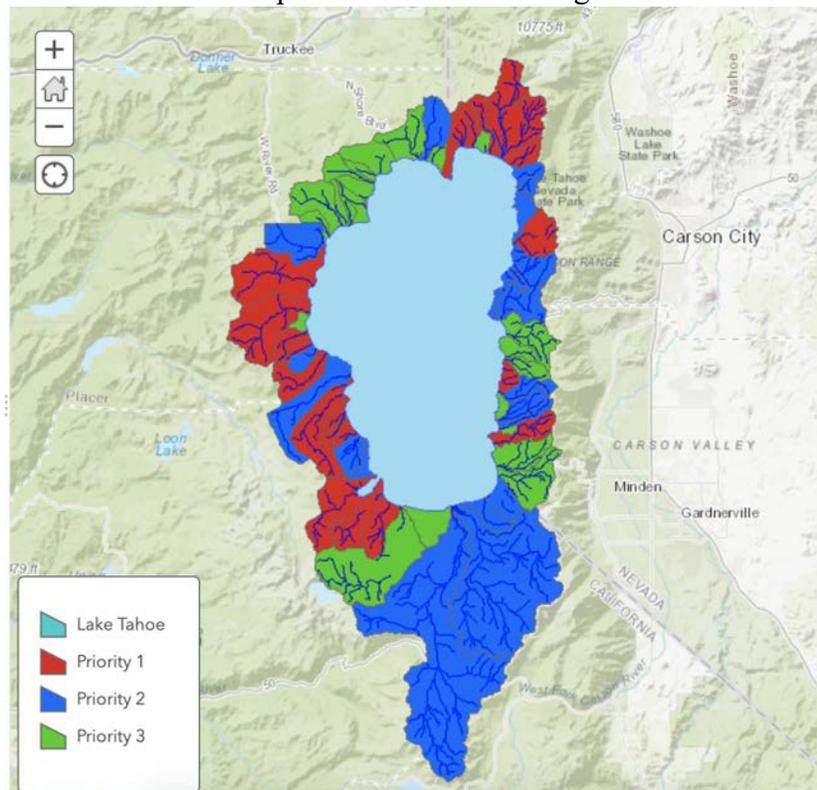


This map layer depicts the Sierra Nevada Conservancy, Watershed Improvement Program (WIP) Administrative Boundaries, which are known as Watershed Assessment Areas (AA).

Problems:

The Lake Tahoe Watershed Action Program will focus on three environmental problems that lead to decreased water quality. The problems listed below will address the various issues the watershed faces from harmful nutrient levels, and how climate change will affect the watershed to how invasive species harm the bodies of water.

Map 3. Watershed Planning



This map highlights priority areas and streams of the watershed, with red being the highest priority, blue being moderate priority and green being the lowest priority according to the Tahoe Regional Planning Agency.

Problems Matrix:

| Problems: | Summary: | Causes: |
|--|--|---|
| Problem 1: Loss of Water Clarity | Algae blooms formed from a large variation of pollutants decrease the water clarity. The nutrients that lead to such growths have continued to grow as anthropogenic changes have increased in the area. Increased nutrient levels in the watershed decrease water quality, defer recreation use, and can harm wildlife due production of harmful toxins. | <ul style="list-style-type: none"> - Pollution - Algal growth - Sediment erosion - Eutrophication - Cultural Eutrophication |
| Problem 2: Impact of Climate Change | Climate change is a huge threat facing Lake Tahoe. It's causing more precipitation to fall as rain instead of snow. This causes more floods and stormwater runoffs that carry sediment into Lake Tahoe. This problem is also increasing the lake's water temperature and affecting regional weather patterns that could change the lake's ecosystem and cause more of a decline in the lake's clarity. It is also related to the growth of tiny alga that thrive in warmer conditions that tends to reduce clarity in the summer months. | <ul style="list-style-type: none"> - Humans - Greenhouse Gas (GHG) Emissions - Cyclic variability, - Volcanic eruptions - Solar output |
| Problem 3: Impact of non-native species | This problem can be seen through changes in the food web as well as invasive and non-native species inhabiting the area. Invasive species are species that take over the native species land and are harmful to the environment. They have seen to have very big negative effects on the environment already and have altered native habitats. | <ul style="list-style-type: none"> - Human activities - Traveling - Ships carrying aquatic organisms on propellers or ballast water |

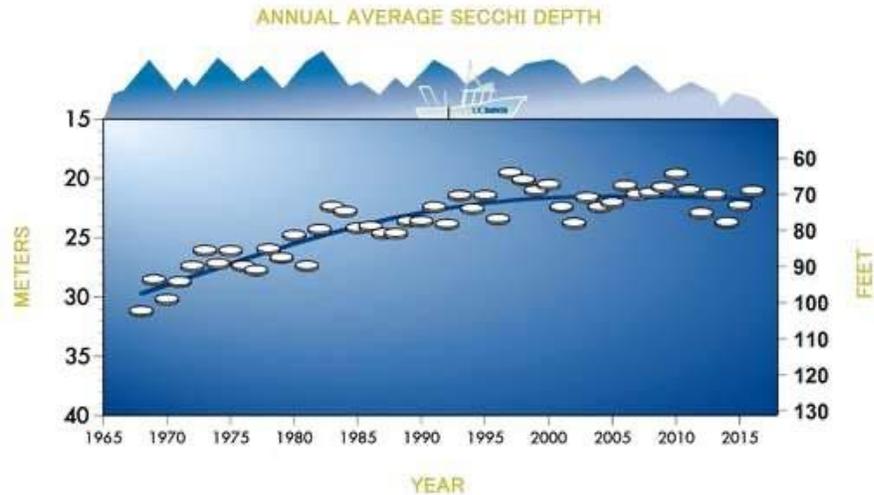
Problem 1: Loss of Water Clarity

Pollution, algal growth, sediment erosion, eutrophication, and cultural eutrophication are all leaders in the loss of water quality in the watershed. Pollution comes from the greater urbanized areas around the lake, from forms of litter, sediment, oil and grease. The nutrient inflows of phosphorus and nitrogen from fertilizers, support the increase of algae and decrease of water clarity. Urban stormwater is the largest source of pollution since when it rains or snow melts, the pollutants are picked up and flow directly into the basin. The increase of anthropogenic sources are accelerated erosion, fertilizer use, car exhaust and urban runoff, and this has caused the rate of algae growth to increase by 5-6% every year. The algae continues to spread and cover the lake due to the reduction in phytoplankton size and faster turnover rate of nutrients.



Sediment erosion occurs naturally from water and wind but has been accelerated in the basin due to human caused disturbances such as driving on roads and motor vehicles on dirt trails. These activities move sediment and grinds it into microscopic particles, the smaller the particles are more harmful to water clarity. The particles suspended in the water column are believed to be the major contributor to Lake Tahoe's long term clarity loss (Goldman, 2006). Eutrophication is also accelerated due to anthropogenic changes in the basin including pavement, rooftops and other impervious surfaces increasing. The overabundance of nutrients leading to water becoming progressively greener due to sediment and algae growth, is occurring at a higher rate in Lake Tahoe. This is due to the cultural aspect of eutrophication in the area from roads and urbanization leading to water running off the surfaces rapidly into the water. The greater flows reaching streams and causing streambank erosion eventually leads to the high loads of fine particles and nutrients in the rivers and eventually the lake.

Lake Tahoe Watershed secchi depth over time. Secchi depth measures water clarity. Algae and suspended particles from erosion impact the water column and decrease the secchi transparency



in the lake. The lower the secchi depth, the higher the algal concentration and the lesser lake water clarity.

Goals:

The goal of the LATWAP is to decrease anthropogenic effects leading to the affected water clarity in the watershed. The plan implements decreasing impervious surfaces by recommending to businesses/lodging to use alternative parking lot materials such as gravel or to simply decrease the surface area of sidewalks. The LATWAP also proposes creating natural buffer zones of trees and bushes on roads and farm land, and regulating the amount of nutrients that can be laid on the grounds in the basin, whether this be on farms or gardens on properties.

Problem 2: Impact of Climate Change

Climate change is one of the biggest threats facing Lake Tahoe. This issue is causing the precipitation to fall as rain rather than snow, causing more floods and storm water runoff that allows for sediment to be brought into the lake. The water's temperature is also rising, affecting the lake's ecosystem and the lake's clarity of water. For example, "In the last four years, the lake has warmed 0.26 degrees per year -- 10 times faster than the long-term warming rate," as stated in an article from UC Davis. This leads to a buildup of nutrients at the bottom of the lake as there is a lack of deep mixing due to this warming.



Goals:

The goal of the LATWAP is to anticipate and plan for future climate change impacts, and to reduce future damage by using these plans. Both states that border Lake Tahoe will be urged to try to minimize the human pressures on the local environment to reduce the ecosystem's vulnerability. This could be by setting stricter regulations and rules for the lake that both state's will have to abide by.

Problem 3: Impact of Non-native Species

In order to try to improve the water clarity of Lake Tahoe, there have been multiple measures taken that include the addition of exotic and non-native species. The diversity of the lake has been greatly impacted by this intentional addition, but has also been damaged by the unintentional additions that have been seen since these measures were taken. Phytoplankton have been added for increased clarity and do not seem to negatively affect the ecosystem, but other additions have severely affected the lake's food web by altering its fishery. For example, Mysis shrimp were introduced into Lake Tahoe to provide a food source for game fish, but they ended up reducing the available food sources for the larger fish by eating many of the lake's zooplankton.



Another major issue are the invasive species that are found in the lake. Invasive species are species that are not native to the ecosystem in which they are found and cause much harm. The source of these species is unknown, but they have negatively affected the lake's ecosystem and food web that have greatly altered the natural habitats.

Goals:

The goal of the LATWAP is to ensure proper boat inspections of local and foreign visitors of the lake, to ensure there are no illegal invasive species that could be introduced into the lake. There will be huge efforts aimed at preventing any sort of foreign species from getting into the lake, unless deemed necessary by the government and those in charge of deciding so.

Summary of Recommendations:

- Ensure proper boat inspections
- Prepare for future climate change implications and consequences
- Reduce the impacts of climate change
- Improve secchi depth to decrease algae production to improve water clarity
- Decrease anthropogenic effects that affect water clarity

Works Cited

- Murphy, Dennis D., Knopp, Christopher M. (March, 2000) The Lake Tahoe Watershed Assessment. Pacific Southwest Research Station, USDA Forest Service. Retrieved From. https://www.fs.fed.us/psw/publications/documents/psw_gtr175/psw_gtr175.pdf
- United States Environmental Protection Agency (n.d) About Lake Tahoe. Retrieved from. <https://www.epa.gov/lake-tahoe/about-lake-tahoe>
- Goldmand, Charles R. (Fall, 2006) Environmental Problems Facing Lake Tahoe. UC Davis. Retrieved from. <https://tahoe.ucdavis.edu/sites/g/files/dgvnsk4286/files/inline-files/Docent%20Manual%20Chapter%204%20-%20Science%20%26%20Research.pdf>
- Brown Jr, Edmund G., Rodriquez, Mathew. (June, 2014) LAke Tahoe Water Quality Protection Plan. California Water Boards. Retrieved from. https://www.waterboards.ca.gov/rwqcb6/water_issues/programs/basin_plan/docs/ch5.pdf
- United States Environmental Protection Agency (n.d) Lake Tahoe Water Quality Improvement Programs. Retrieved from. <https://www.epa.gov/lake-tahoe/lake-tahoe-water-quality-improvement-programs>
- Tahoe Staff. (January 22, 2016) A Brief Lake Tahoe History Lesson. Tahoe.Com. Retrieved from. <https://tahoe.com/articles/lake-tahoe-history>
- West, Barbara. (September, 1989) Outstanding National Resource Waters: A Resource Management Tool. National Park Service. Retrieved from. <http://npshistory.com/publications/water/onrw.pdf>
- Sonner, Scott. (May 22, 2017) Climate Change Taking Toll on Clarity of Lake Tahoe Water. Phys.org. Retrieved from. <https://phys.org/news/2017-05-climate-toll-clarity-lake-tahoe.html>
- AllSignsPointToFish. (February 28, 2016) “Live Mysis Shrimp in a Display Tank.” REEF2REEF Saltwater and Reef Aquarium Forum. Retrieved from. www.reef2reef.com/threads/live-mysis-shrimp-in-a-display-tank.237303/.
- United States Department of Agriculture Forest Service (n.d) Lake Tahoe West Partnership. Retrieved from. <https://www.fs.usda.gov/detail/r5/landmanagement/?cid=fseprd583241>
- About Lake Tahoe. (2019, August 13). Retrieved from <https://www.epa.gov/lake-tahoe/about-lake-tahoe>