TAHOE WATER
SUPPLIERS ASSOCIATION
PROTECT THE SOURCE

2018 Watershed Control Program Annual Report

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Prepared for Board Members of the Tahoe Water Suppliers Association (TWSA)
Published December 2018

Tahoe Water Suppliers Association Membership

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Edgewood Water Company (Edgewood)
Glenbrook Water Cooperative (Glenbrook)
Incline Village General Improvement District (IVGID)
Kingsbury General Improvement District (KGID)
North Tahoe Public Utility District (NTPUD)
Round Hill General Improvement District (RHGID)
Skyland Water Company (Skyland; Douglas County)
Tahoe City Public Utility District (TCPUD)
Zephyr Water Utility (Zephyr; Douglas County)
Lakeside Park Association (LPA)
South Tahoe Public Utility District (STPUD)

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The TWSA Annual Reports are produced through a collaborative effort of the TWSA member agencies with additional public information from local, state, federal government and private agencies.

TAHOE WATER SUPPLIERS ASSOCIATION
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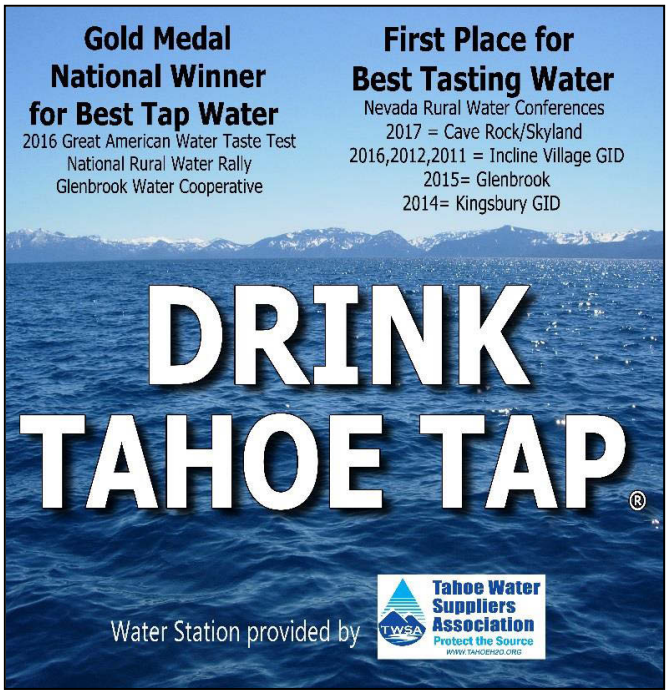

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Appendix A – record of raw water data is attached only for California Members TCPUD, NTPUD and LPA, and their regulatory agents. Please contact the TWSA Executive Director for additional information.

INTRODUCTION

- The purpose of this document is to review and report on the progress of the Association Members' Watershed Control Program between July 1, 2017 and June 30, 2018.

- This report contains extensive reference and documentation to significant Tahoe Basin watershed activities, threats and controls relative to overall water quality for the 2017-18 reporting year.

Who We Are
The Tahoe Water Suppliers Association (TWSA) consists of public water suppliers in the Lake Tahoe Basin whose source of drinking water is Lake Tahoe. The purpose of the TWSA is to protect the quality of the purveyors' drinking water from waterborne contaminants that are potentially harmful to human health. Source water protection is an effective tool in a multi-barrier approach to protecting drinking water. In accordance with federal and state guidelines, members of the association have established a Watershed Control Program (WCP) and report annually on their progress.

Mission Statement
- The TWSA mission statement was created and adopted in June 2008:

"The mission of the Tahoe Water Suppliers Association is to develop, implement and maintain an effective watershed control program in order to satisfy recommendations in watershed sanitary surveys, advocate for the protection of Lake Tahoe as a viable source of drinking water, and to satisfy additional state and federal requirements."

Membership
For the past year, the Association included on the Nevada side: Cave Rock/Skyland Water Companies and Zephyr Water Utility District (Douglas County), Kingsbury General Improvement District, Round Hill General Improvement District, Incline Village General Improvement District, Edgewood Water Company and Glenbrook Water Company.

The California members include: Tahoe City Public Utility District, North Tahoe Public Utility District and Lakeside Park Association. South Tahoe Public Utility District joining as a full member in March 2017. Previously, STPUD had been an associate level, non-voting member.

What is a Watershed Control Program (WCP) Annual Report?
The 1976 Safe Drinking Water Act regulates drinking water in the United States. Under the Act, the Environmental Protection Agency (EPA) has the authority to set standards for drinking water quality and oversee states, localities, and water suppliers. The 1986 Amendments to the Safe Drinking Water Act included the Surface Water Treatment Rule (SWTR) affecting surface water systems and set specific and measurable treatment standards for surface water purveyors.

Federal and state regulations infer that protecting sources of drinking water by implementing watershed control programs can be an effective barrier in a multi-barrier potable water treatment process.

Surface water systems operating under an exemption to filtration (a.k.a. a non-filtration permit) must complete a Sanitary Survey and Watershed Control Plan (WCP) every 5 years with annual updates. The purpose of a WCP is to prevent contaminants potentially harmful to human health from entering sources of drinking water. The EPA considers an effective WCP to include, at a minimum, the following components:

a) Description of the watershed;

b) Identification and mechanisms to control potential contaminating sources; monitoring program to track existing and new detrimental activities;
c) Program to gain ownership or control of the watershed;
d) Annual reports (EPA 2003); and,
e) Consideration of cryptosporidium in control requirements: Interim Enhanced Surface Water Treatment Rule, Long Term Enhanced Surface Water Treatment Rule, Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR/LT2).

The State of Nevada adopted the Safe Drinking Water Act and subsequent updates in NAC 445 A. The regulating authority is Nevada Division of Environmental Protection Bureau of Safe Drinking Water. The previous sanitary surveys and Watershed Control Programs fulfilled the requirements of an effective watershed control program, and included: education and outreach, data management, water quality monitoring, mapping, and regional planning/regulation.

The recent requirements for compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule) have been addressed by all TWSA members. Details are provided in later chapters of this report.

History of TWSA

Nevada members of TWSA first started working together during the state adoption of the 1986 amendments to the Safe Drinking Water Act (SDWA) and the creation of the Surface Water Treatment Rule (SWTR). Together, the Nevada purveyors were successful in including the following language in the Nevada state code, NAC445A.525 Filtration: Avoidance of requirements. (NRS445A.860): 1. A supplier of water may apply to the Division to operate without installing a system for filtration. For the Division to determine the adequacy of a watershed control program for a system located at Lake Tahoe, the supplier must demonstrate that a level of protection which minimized the potential for contamination by *Giardia lambia* cysts, viruses and *Cryptosporidium* is provided by the location of the intake structure and a watershed control program."

Thus began a partnership now in its third decade. The partnership adopted the essential elements of an integrated water management approach for high-quality source water not requiring filtration including: frequent monitoring, watershed controls, demonstrated history devoid of waterborne disease outbreaks, adequate storage in the event of higher turbidity excursions, and flexibility and redundancy in disinfection process (AWWA). The purveyors also completed the first of three sanitary surveys and control programs (1992) and pilot studies to determine trihalomethane formation potential and ozone disinfection design criteria. As a result, the Nevada State Board of Health granted five suppliers "filtration exemptions," while one supplier (Round Hill) implemented filtration.

In 2002, the Nevada Tahoe Water Suppliers Association (NTWSA) was formed. The Tahoe Water Suppliers Association (TWSA), formerly Nevada Tahoe Water Suppliers Association, changed its name in December 2005 with the addition of the first California water purveyor, North Tahoe Public Utility District. In 2017, TWSA celebrated its 15th year as an Association.

The 1992 plan, and subsequent updates, identified potential risks to source water quality including: sanitary sewer overflows, urban run-off, development, and hygiene practices of summer boaters and visitors. The idea of forming an agency to deal with source water protection issues was presented in 1992; but was not implemented until completion of the 2002 ten-year update plan.

In 2002, with encouragement from State Health officials, six purveyors from the original partnership formed an association under a multi-party agreement to address federal and state source water protection regulations, and fulfill recommendations of previous sanitary surveys. Appointed staff members from each agency form the TWSA board. The largest partner, IVGID, offered its Resource Conservationist as

the association's Executive Director. The agreement stipulates cost sharing of expenses incurred by IVGID on behalf of the association. Members pay an annual fee, in part proportional to the size of their service areas and in part, in equal amounts representing common administrative costs. The TWSA budget is between $140,000 to $150,000, annually, for staff and operating costs.

Annual Report Objectives and Goals

Eight areas have been identified as the focus of the WCP including: education, monitoring, data management, regulatory, mapping, administration, water conservation, and water rights.

Annual Report Purpose and Structure

The TWSA members all successfully met goals established during the reporting year and remained within Federal and State water quality standards.

- We are pleased to report that drinking water quality results remained well within state and federal guidelines during the reporting year. Tahoe's tap water remains some of the purest in the world. The water systems have met all drinking water standards for the past 15+ years.

- Based on the quality of the water source and protection programs in place, the TWSA members anticipate the ability to continue to meet the drinking water standards in the future.

The report reflects EPA requirements of an effective Watershed Control Program and includes: an action plan, action plan highlights, description of the water supply, and potential sources of pollution, controls, monitoring and data management.

Information specific to the individual purveyors is highlighted in the Agency Annual Data chapter.

The TWSA Watershed Control Program Action Plan and Timeline (in the next section) is updated annually to address TWSA objectives and goals.

I. TWSA ACTION PLAN

TWSA members use the 'Action Plan' to plan and accomplish the goals of the Watershed Control Program.

PROGRAM	ACTION	RESPONSIBLE PARTY AND PARTNERS	TIMELINE
Education			
1.0	Continue to improve the TWSA education program by redefining the theme and message.	TWSA, TRPA, NTCD, HOAs, USFS	2006-ongoing
1.1	Provide current information, education materials and reports on TWSA website (www.TahoeH2O.org).	TWSA	Updated quarterly, 2004-ongoing
1.2	Create and distribute posters, flyers, brochures, inserts, web media, reminder stickers, booth materials, and print and radio media.	TWSA, NTEEC, NTCD, HOAs, USFS, Local and State officials/agencies and PIO's	2005-ongoing
1.3	Include source water protection information in current customer information mailings, CCRs, new customer mailings, BMP/Water Auditing.	TWSA, member agencies	2005-ongoing
1.4	Distribute information at community events for example: regional Earth Days, chamber mixers, community meetings, etc.	TWSA, HOA's, community partners and environmental groups	2006-ongoing
1.5	Participate in industry level source water protection efforts (American Water Works Association, state programs, regional support agencies, others). Provide professional development opportunities for TWSA members.	TWSA	2006-ongoing 2007-ongoing
1.6	Track customer responses, outreach efforts, web visits, and summarize activities.	TWSA	2005-ongoing
1.7	Participate in 2nd Drinking Water Forum.	TWSA, EPA—Region 9, TRPA, NRWA, NTCD	tabled
1.8	Incorporate parameters of concern to TWSA partners into surface water monitoring programs in the Lake Tahoe Basin.	TWSA, UNR, LTEEC, NTCD, TRPA, NDEP Lahontan RWQCB	2005-ongoing
1.9	Incorporate Aquatic Invasive Species (Quagga Mussel/ NZ mudsnail/plants) information in TWSA outreach.	TWSA, TRCD, TRPA	2008-ongoing
Monitoring			
2.0	Improve current surface water monitoring programs by improving the sampling programs, refining analyses, and reporting success.	TWSA, UNR, LTEEC, NTCD, TRPA, NDEP,TCS	Fall 2005-ongoing

2.1	Incorporate potential parameters of concern into surface water monitoring programs in the Lake Tahoe Basin.	TWSA, UNR, NTEEC, NTCD, TRPA, NDEP, LRWQCB	Fall 2005-ongoing
2.2	Prepare a project proposal with the University of Nevada-Reno to study climatic affects on source water quality and potential sources of pollution.	TWSA, UNR, DRI, TSC, TERC	Other research being conducted (DRI, TSC,TERC,UNR)
2.3	Research potential grant funding for monitoring programs.	TWSA, UNR,USACE	ongoing
2.4	Define the elements of a surface water risk assessment. Provide information to local planning agencies.	TWSA, TERC, AWWA Source Water Protection, Black and Veatch	Phase 2 has been completed June 2014 with funding from NDEP and TWSA. Posted on website. Model and final report Phase 1 was issued Oct. 2008.
Data Management			
3.0	Improve reporting process for intake samples; annual submission of Watershed Control Plan.	TWSA board and staff	2003-ongoing
3.1	Gather, track, and report regularly on TWSA partners' operations, management, project, planning or other changes that may affect water quality.	Planning agencies, local water districts, environmental education programs, recreation facilities.	2003-ongoing
Regulatory			
4.0	Participate in regional planning efforts, including general and technical committees, TRPA Shorezone Ordinance Amendment process, Lahontan Regional Water Quality Control Board Amendment Process.	TWSA staff and board, partners, regulating authorities	2004-ongoing
4.1	Promote TWSA objectives and goals by attending stakeholder meetings and offering presentations or testimony.	Planning agencies, local water districts, environmental education programs, recreation facilities	2006-ongoing
4.2	Set trigger for water supplier notification during a plan review that includes activities that may affect drinking water quality.	TRPA, TWSA, NDEP, LRWQCB	2007-ongoing
4.4	Public comment and working group involvement in Aquatic Invasive Species management plans and projects.	Planning agencies, TWSA, other local water districts, TKPOA, HOAs, environmental education programs	2006-ongoing

Mapping			
5.0	Mapping of potential contaminating sources.	TRPA/Counties/ TWSA staff	2004-ongoing
Administration			
6.0	Develop a plan to incorporate new members into TWSA. Notes: New contract and financial system established July 2007. Bylaws revision March 2017.	TWSA	2005-ongoing
6.1	Review other agencies work to include in the annual reporting process.	TWSA	2006-ongoing
6.2	Submit Annual Report to NDEP –BSDW; CA DDW; members and other regulators. Post on website.	TWSA	Annual, December 2003- ongoing
6.3	Review TWSA Association goals	TWSA	Annual March 2009- ongoing
Water Conservation			
7.0	Incorporate water conservation and source water protection information into packets and education programs	TWSA, NTCD, TRCD	2005-ongoing
7.1	Research current water use and water conservation programs in the Lake Tahoe Basin	TWSA	2005-ongoing
7.2	Develop collaborative water conservation program/plan	TWSA, NTCD, other partners	2005-ongoing
7.3	Research potential grant funding	TWSA, NTCD, other partners	2005-ongoing
Water Rights			
8.0	Review Tahoe annual diversions report prepared by the Nevada State Engineers office	TWSA, member agencies	ongoing

Acronyms

AWWA: American Water Works Association
BMP: Best Management Practices
BSDW: Bureau of Safe Drinking Water (NV)
CCR: Consumer Confidence Report
DDW: Division of Drinking Water (CA)
DRI: Desert Research Institute
EPA: Environmental Protection Agency
HOA: Home Owners' Association
IWMP: Integrated Weeds Management Plan
LRWQCB: Lahontan Regional Water Quality Control Board (CA)
LT2ESWTR: Long Term 2 Enhanced Surface Water Treatment Rule
NvRWA: Nevada Rural Water Association
NDEP: Nevada Department of Environmental Protection
NTEEC: North Tahoe Environmental Education Coalition
NTCD: Nevada Tahoe Conservation District
PIO: Public Information Officer
TCS: Tahoe Science Consortium
TKPOA: Tahoe Keys Property Owners Association
TRPA: Tahoe Regional Planning Agency
TRCD: Tahoe Resource Conservation District
TWSA: Tahoe Water Suppliers Association
UNR: University of Nevada, Reno
USEPA: United States Environmental Protection Agency
USFS: United States Forest Service
USACE: US Army Corps of Engineers

II A:
2017-18 Executive Summary/Action Plan Highlights

TWSA maintains an extensive outreach schedule of events and programs in order to provide community education and technical services in watershed protection and water conservation areas.

Since 2002, TWSA has provided a unified voice for source water protection and watershed protection, developed strong relationships with local research and regulatory agencies and offered professional development opportunities for member staff. Below is a sampling of these accomplishments in the past year. The numbering references the TWSA Action Plan.

<u>Education</u>
1.0:
Continue to improve the TWSA education program; theme and message.

The TWSA mission statement was adopted in June 2008: *"The mission of the Tahoe Water Suppliers Association is to develop, implement and maintain an effective watershed control program in order to satisfy recommendations in watershed sanitary surveys, advocate for the protection of Lake Tahoe as a viable source of drinking water, and to satisfy additional state and federal requirements."*

Membership:
There are 12 water system members in the Association, the bulk of the members provide water as a municipal or community utility. The TWSA Annual Report compiles the water quality data and activities for the 11 members (with Tahoe intakes) of the Association. The TWSA Board meets quarterly: March, June, Sept, Dec, each year. TWSA updated its bylaws with the inclusion of STPUD into the membership in 2017. The update revised the organizational structure, purpose and management of the Association.

1.5
Provide local professional development opportunities for TWSA members.
TWSA staff members maintain professional water industry certifications; all hold AWWA Water Efficiency Practitioner level 1 certifications. Staff members are trained regional 'Eyes on the Lake' team members for aquatic invasive species (AIS) identification. Staff members also attended Project WET and Project WILD curriculum training classes. In addition, staff self-learn on emerging topics with independent research.

1.1 to 1.9
Provide education material
The main emphasis of TWSA's outreach program is to provide ongoing education to the public about watershed protection, water quality and the high value of local tap water.

TWSA staff promotes multiple messages, including trademarked slogans, through wide-ranging event and presentation schedules. TWSA also employs other communication methods such as video, web and print media. TWSA's website is *www.Tahoe H2O.org*.

An estimated 200,000+ persons annually receive the TWSA and IVGID Waste Not messages through various outreach methods.

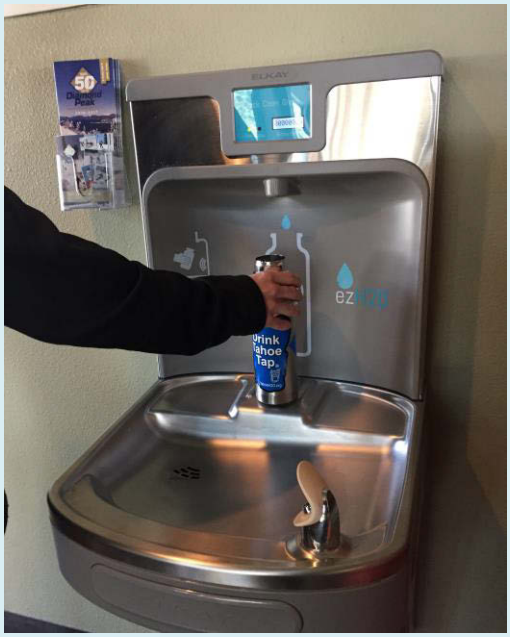
"Drink Tahoe Tap"® & "I Drink Tahoe Tap!"® Stickers
In 2015, based on the campaign popularity and brand recognition, TWSA initiated and completed the trademark registration process for "Drink Tahoe Tap"® and "I Drink Tahoe Tap!"®.

More than 80,000 "Drink Tahoe Tap®" stickers have been distributed since the campaign launched in 2008. In 2011-12, the "I Drink Tahoe Tap!" slogan was added.

"Drink Tahoe Tap®" Taste Test
TWSA staff provides a 'blind taste test' at our outreach booth at local events. Staff provides the waters in 3 unmarked, dispensers using a 2 oz. compostable plastic cup. Each participant votes and the votes are recorded. The taste tests results are consistent; tap water is selected over bottled waters, every event.

TWSA Water Taste Test Awards
In 2017, Cave Rock/Skyland won "Best Tasting Water in Nevada" at the Nevada Rural Water Conference. In January 2016, Kingsbury GID took home the "Gold Medal for Best Tasting Water" at the national Rural Water Rally, in Washington D.C., after receiving "Best Tasting Water in Nevada" at the 2015 annual Nevada Rural Water Association Conference. IVGID received the "Best Tasting Water in Nevada" at the 2016 Nevada Rural Water Association Conference; also in 2012 and 2011.

Distribution of Refillable Water Bottles
Each year, between 3,000 to 6,000 customized, refillable water bottles or pouches are distributed at various events. In 2010, TWSA began this formal program of distributing free, refillable water bottles to attendees at selected events. Since 2010, approximately 50,000 bottles and pouches have been distributed. In 2013, TWSA began offering an extremely popular, refillable, US made, custom glass bottle. Our largest single distribution event is the annual Tahoe Summit where we provide 500 to1500 drinking water containers and water filling stations for the attendees.



Free Tap Water Distribution at Public Events
In 2014, TWSA built its first custom, mobile, tap water fill stations to accommodate the need for water distribution at public events. 10 stations have been built to date that are in use around the lake at various events. The water fill station construction designs are available online as free resource information at *www.TahoeH2O.org*. These stations hook up to standard outdoor faucets, have tap dispenser heads and a carbon filter system. They have proven to be extremely popular and have provided water at multiple large scale community events. TWSA provides these stations or 5 gallon water dispensers to local events for smaller needs. This program has been instrumental in reducing the use of bottled water at area events; serving fresh water to crowds up to 5000 people.

Outreach / Watershed Education Events
Staff conducts outreach with the TWSA "Drink Tahoe Tap ®" education booth at more than 25 community events annually. The booth features an interactive water taste test along with water conservation, watershed protection and tap water awareness information. Some of the annual events include the North and South Lake Tahoe Earth Day Festivals, Snapshot Day, PaddleFest, SnowFest Science Expo, Red White and Tahoe Blue events, Children's Environmental Science Day, The Tahoe Summit, chamber mixers, ski area special events, education events and other events upon invitation or request.

Community Neighborhood, Stream and Beach Cleanups More volunteer led efforts focus on developing the community stewardship culture. TWSA staff serves annually as the Tahoe East Shore/Nevada Coordinators for International Coastal Cleanup Day. North Shore cleanup efforts are coordinated by the League to Save Lake Tahoe and Keep Tahoe Clean for South Lake Tahoe. Annually, hundreds of volunteers collect more than a ton of trash from Tahoe's beaches, streams and lakeside trails.

Sponsorships
TWSA provides support for a variety of conferences and educational programs in the form of fiscal donations or water bottle donations. In the past year, the Association has supported the production of the State of the Lake Report, Tahoe In Depth publication, Nevada Rural Water conference, Eyes on the Lake trainings, the Tahoe Summit, the Tahoe Expo, North and South Lake Tahoe Earth Day events and additional events.

Snapshot Day
Each year, TWSA staff leads Snapshot Day, a large scale volunteer water quality monitoring event for the Tahoe region from Lake Tahoe to Pyramid Lake. At "Snapshot Day" (annually in May) 300+ volunteers spend the morning at 50+ locations within the watershed - collecting samples of turbidity, nutrients, dissolved oxygen and photographic documentation. Many sites have been repeated now for more than 15 years providing long-term watershed condition data. This event is a collaboration between multiple water quality focused agencies. This is one of the longest running watershed citizen monitoring events on the U.S. west coast.

Beach Water Quality Sampling
TWSA staff collects and analyzes raw water samples weekly (summer) and bi-weekly (winter) from 6 Incline Village beach and stream zone locations. AIS inspections of shoreline conditions were added in 2015. Data from this sampling activity has been maintained in a centralized database since 2004.

School Programs
Staff provides school and civic group presentations on Tahoe Tap and source water protection, including water quality sampling lessons and streamside ecology activities in area schools. Since 2011, TWSA and TWSA members (TCPUD, NTPUD, IVGID) have partnered with the Sierra Watershed Education Partnership (SWEP) to offer water quality assemblies annually, to almost 2,000 North Tahoe elementary, middle and high school students. These assemblies feature a presentation by the Truckee High School Envirolution Club's *Trashion Show*, themed on appreciation of tap water, water conservation and watershed protection. At these shows, students receive custom refillable steel water bottles, shower timers and other water conservation education collateral

TWSA Scholarship Fund
In 2012, TWSA initiated a scholarship fund for Tahoe high school students entering college with a focus on science, math, engineering or environmental studies. Four $500 scholarships are offered annually; one for each Tahoe high school.

Outreach Campaigns
TWSA water conservation and water quality protection print publications are updated annually. Outreach materials include a leak detection information card with dye tabs, AWWA 'value of water' and water conservation brochures, TWSA source water protection information, a custom bone shaped dog waste bag holder and bag refills, 'Drink Tahoe Tap ®' stickers and information on the issues of bottled water versus tap water. The regional *Take Care Tahoe* messaging is used extensively.

"What's the Stink about Butts on the Beach?"
TWSA began a Cigarette Butt Awareness campaign in June 2012. A custom brochure highlights the need to keep cigarette butts off area beaches to protect water quality.

"They Drop It, You Drink It" " Be #1 at Picking Up 2" Dog Waste Awareness Campaigns
Initiated in 2010, information on the effects of dog waste on water quality is presented via an interactive pledge campaign. Individuals receive a free custom dog waste bag dispenser when they pledge to pick up after their dog. More than 6000 pledges have been collected to date. Refills rolls are also distributed to the public at events.

Dog Waste Pickup Station Sponsorship
Dog waste bag dispensing stations, custom signage and collection receptacles are placed in high impact areas and monitored by volunteer or partner agency staff.

The dog waste pickup station sponsorship program began in 2009, with TWSA sponsoring the installation of 2 dog waste stations at Burke Creek, as part of a local Eagle Scout project.

To date, 77 stations are in use around Lake Tahoe. 5 to 10 stations are added annually, dependent upon volunteer support. Stations are now located all around Lake Tahoe including the newly acquired Johnson Meadows property, Van Sickle State Park, Sand Harbor State Park, Bijou Park, Burke Creek/Kahle Drive, Lake Tahoe Nevada State Park, Brockway Lookout, Tahoe City Dog Park, Tahoe Vista Dog Park, Incline Village community lands, and in neighborhoods with streamside trails. Approximately 30,000 dog bags are provided by TWSA with an estimated 70,000 more bags being provided by our partners, annually.

The graphics style *Take Care Tahoe* messaging on dog waste collection was incorporated into TWSA outreach materials in 2015.

TWSA Advertising Program

In 2016, TWSA partnered with the regional Take Care Tahoe campaign to develop DRINK TAHOE TAP ® messaging to encourage the use of refillable water containers.

Informational articles and advertisements on source water protection, water quality and water conservation are published regularly in visitor magazines such as *Tahoe In Depth, Tahoe Visitor Guide* and *Tahoe Summer/Winter* supplements. Each publication reaches an estimated audience of 60,000+ persons each summer and winter season. Issues are provided in the rooms of area hotels and are also distributed at shopping centers, visitor centers and local businesses. Water bottles and "Drink Tahoe Tap" ® stickers also serve as a major portion of the advertising campaign.

TWSA staff regularly tapes radio and television public service announcements. Each year, Tahoe Tap is featured on Lake Tahoe Television on multiple segments and TWSA runs "Drink Tahoe Tap"® ads. To view the ad see: *https://m.youtube.com/watch?v=633vLUjWM8A&feature=youtu.be*

TWSA is found on FaceBook as DRINK TAHOE TAP.

Aquatic Invasive Species Outreach (AIS)
AIS information has been incorporated into the TWSA outreach program since the issue emerged at the lake in 2007. TWSA outreach efforts include educating the public about Aquatic Invasive Species. Concerns about the introduction of Quaqqa and Zebra mussels, and their potential effect on drinking water infrastructure and water quality, are presented through customer signs installed at area boat ramps, and via website and brochures. In addition, public comment is regularly offered on proposed AIS management options that may affect water quality. TWSA staff and members are highly involved in providing public comment regarding the Tahoe Keys Water Quality and AIS Management Plans. This issue has become a major component of our work.

Participate in source water protection efforts
TWSA continues to support AIS prevention efforts by other regional agencies including Tahoe Regional Planning Agency (TRPA) and Tahoe Resource Conservation District (TRCD) as a member of the Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG). TWSA staff and utility members are active participants in the LTAISWG, regularly attending meetings and participating in work plan development. TWSA's increased participation has helped resolve past problems related to a lack of communication during the clam removal pilot program with the applicable water agencies. In 2014, TWSA committed funding for the replacement of 20 rubber mats ($5000) used by the AIS management team (bottom barrier, non-chemical treatment program) to smother weeds and Asian clams.

Bottom Barrier Challenge 2017
In 2017, the TWSA partnered with the Tahoe Fund to purchase additional bottom barriers with a 1:1 grant match project for use in 2018. http://www.tahoefund.org/our-projects/active-projects/aquatic-invasive-bottom-barrier-challenge/

Aquatic invasive plants affect water quality around the shoreline of Lake Tahoe. Through a well-coordinated program, the Tahoe Resource Conservation District has been able to remove aquatic invasive weeds with the use of bottom barriers and diver-assisted hand pulling. The inventory of bottom barriers was 1.6 acres short of the maximum 5 acres of coverage permitted for Tahoe. In 2017, the TWSA issued a matching challenge to raise a total of $52,000 to purchase the remaining 175 barriers that would bring the inventory to the full 5 acres. With the full inventory of mats, more aquatic invasive

weeds are removed from the lake and water quality is improved. Media coverage of the successful funding challenge is posted at:

http://www.kolotv.com/content/news/Keeping-Lake-Tahoe-clean-with-bottom-barriers-490967561.html

http://www.ktvn.com/clip/14565568/tahoe-barriers-invasive-species

http://www.ktvn.com/story/38894280/crews-tackle-invasive-aquatic-plant-issue-at-lake-tahoe

In the past year, TWSA staff has participated in TRPA working groups, LTAISWG and local non-profits and environmental group activities. TWSA staff and the water purveyor managers have been active partners in the Asian Clam removal projects and ongoing AIS removal/monitoring projects by the TRCD, TRPA and UC Davis. TWSA staff provided on–site water quality monitoring support on the Asian Clam Removal Projects occurring summer 2011 in the Marla Bay, Lakeside and Emerald Bay areas.

Several TWSA members have been working with Tahoe RCD on AIS controls using non-chemical methods on their properties. In 2017-18, Lakeside Park Association has hosted both UV light and bottom barrier installation sites. North Tahoe PUD used bottom barriers at one site, to evaluate different non-herbicide weed controls.

TWSA staff members maintain training as Tahoe Keepers, Eyes on the Lake volunteers and AWWA Water Efficiency Practitioners (Level 1).

1.6
Track customer responses / summarize activities
Through direct outreach and media contacts, staff estimates 200,000+ people receive TWSA/IVGID Waste Not information annually.

TWSA maintains a website: *www.TahoeH2O.org*. Source water protection, water conservation, TWSA annual reports and sanitary surveys are available for public review on this website. The site averages 500 web hits each month.

2.4
Define the elements of a Surface Water Risk Assessment (SWRA). Provide information to local planning agencies
In June 2012, the TWSA/USACE Lake Tahoe Source Water Risk Assessment (LTSWRA) was used to evaluate potential impacts to drinking water quality from proposed new beach access areas associated with the Edgewood Lodge Project. The project engineer (RO Anderson) provided extensive case study comparisons and conducted multiple runs of the risk model to assuage concerns voiced by NDEP and TWSA water providers to the Tahoe Regional Planning Agency during the project public comment period.

2014 Lake Tahoe Flow Modeling, Potential Pathogen Transport and Risk Modeling Report
S. Geoffrey Schladow, Andrea Hoyer, Francisco Rueda and Michael Anderson / June 2014

In spring 2013, NDEP initiated discussion with TWSA to fund Phase 2 of the Lake Tahoe Risk Assessment Model developed in 2008 (Black & Veatch, B&V Project No. 41717). Phase 2 was funded by NDEP and TWSA for $95,000 in 2013-14.

There had been significant improvement in the data available on lake currents since 2008, so the upgrades provided better modeling with more refined area grids based on this new data. This project re-analyzed lake water current patterns in the southeastern corner of Lake Tahoe, in the area of the Edgewood and Kingsbury intakes. The analysis is related to public water systems at Lake Tahoe and the impact that local potential contaminating activities have on the source water. In addition to new data, new potential contaminating activities had been proposed near the public water system intakes.

Flow Modeling and Pathogens (PO # S004422)
Executive Summary
Swimming and other body-contact recreational activities have been identified by the USEPA, the Nevada Division of Environmental Protection, the California Department of Health Services and other public health professionals as a potential source of microbiological contamination of recreational waters.

This study was undertaken to quantify the impacts of body contact recreation on microbial water quality at the Kingsbury General Improvement District (KGID) and Edgewood Water Company intakes on Lake Tahoe.

This study builds upon the risk assessment conducted previously (Black and Veatch, 2008), and specifically incorporates 5 new features:

(i) Findings of new 3-D hydrodynamic simulations for the nearshore southeastern portion of Lake Tahoe;

(ii) Development of a finer-scale 50 m x 50 m finite-segment pathogen fate-consumer risk model;

(iii) Additional recreational use associated with the proposed Beach Club and Edgewood Lodge/Resort developments;

(iv) Risk assessment for the Edgewood Water Company intake; and

(v) Treatment plant upgrades at KGID and Edgewood that included UV disinfection meeting the requirements of the Long Term 2 Enhanced Surface Water Treatment rule (LT2). As in the prior study, this risk assessment focused on Cryptosporidium because of its low infectious dose, environmental persistence and resistance to conventional disinfection.

Mean annual Cryptosporidium concentrations were predicted using a Monte Carlo-based pathogen fate-consumer risk model. Dose-response calculations applied to predicted concentrations following treatment provided estimates of health risks resulting from consumption of recreationally-impacted treated drinking water.

Model simulations demonstrate that the additional recreational use at Beach Club and Edgewood Resort beaches, in conjunction with improved understanding of transport, results in increased potential for Cryptosporidium to reach the KGID and Edgewood intakes.

For example, the median annual concentration at the KGID intake increased from 0.0018 oocysts/100 L (Black and Veach, 2008) to 0.0082 oocysts/100 L, although the additional 3-log removal achieved with UV disinfection following ozonation greatly lowered treated water concentrations and substantially

lowered risk of infection. The predicted median annual risk of infection was lowered from 0.23 (Black and Veatch, 2008) to 0.0011 infections/10,000/yr (this study) for KGID, while the probability of exceeding the USEPA target of 1 infection/10,000/yr was reduced from 4.9% (Black and Veatch, 2008) to <0.02 infections/10,000/yr (the lowest probability limit based upon the number of simulations). The median predicted annual risk level for the upgraded (ozone+ UV) Edgewood plant was 0.0007 infections/10,000/ yr, with <0.02% probability of exceeding the USEPA target (lowest probability limit).

The modeling results that underpinned these conclusions provide a number of additional insights to minimizing pathogen entrainment into drinking water intakes. Primarily, by using a technique developed under this project, it is now possible to determine the source area of pathogens (or any other contaminant) that arrives at a water intake. The results also provide insight into the complex interplay between the windfield, the strength of the lake's thermal stratification and the transport patterns of pathogens. Most notably, having an intake located below the maximum depth of the thermocline greatly reduces the frequency of pathogen arrival at the intake. This has other implications with respect to lake level and drought conditions.

With prolonged drought episodes (predicted to be more frequent under future climatic conditions), lake level will be lower and thereby reduce the depth of the water intakes. Under those conditions the period of time favorable for pathogen transport to the intakes is likely to increase significantly. Similarly, the time of water withdrawal can be used to minimize risk. Night time and early morning withdrawals seem to pose the greatest risk, as pathogens released the previous day have had little opportunity to be de-activated by solar radiation. This highlights the linkage between drinking water quality and maintenance of high water clarity, particularly in the nearshore region. Maximizing the penetration of UV radiation from solar radiation into the water column provides "free" water treatment.

The release of a surrogate for herbicide transport from the vicinity of Tahoe Keys was simulated, and showed that herbicide could be transported to the vicinity of the nearshore regions of south-east Lake Tahoe within a 24 hour period. Within that period, material did not actually arrive at any of the water intakes, but based on other results in this report, that would occur within less than 48 hours. It must be borne in mind that these results are a first estimate of the fate of herbicides. No account has been taken of the dilution that a real plume of herbicide would be subject to, and the possible breakdown into other chemicals. Likewise, the toxicity (if any) of the herbicide for the case of consumption or body contact recreation has not been considered as it was beyond the scope of the study. However, should the use of herbicides be permitted at Lake Tahoe, there is a strong case that a more complete study of the fate of these products on public health should be undertaken."

A TWSA sponsored workshop on this report and the current data was offered on Nov. 5 and 6, 2014, by Dr. Schladow at both north and south Tahoe locations. Media coverage of the presentations is at:
http://www.recordcourier.com/news/13714581-113/lake-tahoe-schladow-wind
and
http://www.laketahoenews.net/2014/11/scientists-studying-life-below-tahoes-surface/

3.1
Gather, track, and report regularly on TWSA partners' operations, management, project, planning or other changes that may affect water quality:
TWSA members and staff continue to annually report on planning or other changes that may affect drinking water quality. Raw water data (Turbidity, Fecal Coliform and Cryptosoridium levels) is collected and tracked from each of the water purveyors' intakes on a monthly basis. Long term data sets are

maintained. Operational upgrades, capital improvement projects and Tahoe area environmental improvement projects are recorded in the TWSA Watershed Control Annual Report.

The USEPA Long Term 2 Enhanced Surface Water Treatment rule (LT2) required redundancy on treatment for filtration avoidance permit facilities with a deadline of October 1, 2014. All TWSA members have met this deadline.

4.0-4.1
Participate in regional planning efforts, including general/technical committees, TRPA working group and Board activities, agency regulatory language and amendment/ordinance process. Promote TWSA objectives/goals by attending stakeholder meetings and offering presentations /testimony.

Public Drinking Water Protection Advocacy
2010-18 have been major years for TWSA drinking water quality advocacy. Much of this work has focused on opposing/mitigating the impending use of herbicides for aquatic weeds control in the Tahoe Keys. The TWSA has opposed the use of herbicides, citing its applicability only as a last resort in aquatic weeds management; after all other methods are exhausted.

The Lahontan Regional Water Quality Control Board's (LRWQCB) Basin Plan Amendment, was adopted by the Regional Water Board on December 7, 2011 and the CA State Water Board on May 15, 2012. The CA Office of Administrative Law (OAL) has reviewed and approved the amendment. It became effective with US EPA approval granted September 10, 2015. The new regulations allow for LRWQCB review of proposed herbicide/pesticide application projects in Lake Tahoe for aquatic invasive species management. Prior regulations upheld a prohibition on chemical use. TWSA staff and members attend multiple LRWQCB meetings, special planning workshops and CA Water Board meetings, providing both written and public comment. TWSA supported an unsuccessful 5 year moratorium on these projects at Tahoe. Throughout this process, TWSA was heavily involved in public opposition to the LRWQCB revisions of the Basin Plan Amendment, specifically opposing the removal of the pesticide prohibition and the replacement with a potential exemption after project review and approval.

TWSA involvement did yield enhanced public notification measures: any proposed chemical use project now requires notification and solicitation of comments from potentially affected water providers, regardless of the distance of the provider's service area from the proposed projects.

Initially, Lahontan staff began rewriting the amendment in early 2010, without input from the water providers, or the Nevada drinking water and water quality regulators (Nevada Department of Environmental Protection {NDEP} and California Department of Public Health {CDPH}). By providing written and public comment, TWSA staff was successful in bringing the issue of the Tahoe drinking water purveyors' filtration exempt status and their concerns to the LRWQCB. LRWQCB staff was then given direction to work with TWSA, NDEP and CDPH on the regulatory language and review process.

As a result of this process, starting in 2013, TWSA has maintained a presence on the Nearshore Aquatic Invasive Weeds Working Group (NAWWG) and the Tahoe Keys Integrated Weeds Management Plan Technical Advisory Group.

TWSA maintains staff presence on the TRPA Interagency Shorezone Coordination Group.
This group meets monthly to review Shorezone project applications each month.

TWSA staff has been receiving notification on buoy and dock permit applications being re-issued by Nevada State Lands. TWSA staff review these notifications and then forward any applications of concern to the appropriate water agency for further review.

TWSA staff maintains ongoing participation with the TRPA, The Tahoe Fund, Tahoe Prosperity Center, Tahoe Environmental Research Center, Sustainable Tahoe and other working groups to maintain dialogue on source water protection.

Emergency Preparedness
TWSA members are participants in the NvWARN and CalWARN emergency inter-local agreements. The WARN groups of water and wastewater utilities offer a web-driven, statewide mutual assistance program. Managed through the websites (*http://www.calwarn.org*) (*http://www.nvwarn.org)*, CalWARN and NvWARN agreements provide a system for immediate assistance for member utilities during an emergency. Water and wastewater utilities can request equipment and personnel to assist during natural or man-made events that impact water and wastewater systems.

In 2014, a TWSA subcommittee began the revision of a Tahoe specific mutual aid agreement, this update was completed in 2017.

An *ArkStorm @ Tahoe Preparedness Workshop* was held on September 12, 2013, as part of the quarterly TWSA Board meeting. The TWSA members and other agency representatives spent 3 hours discussing the operations of water and sewer supply systems during a potential long-term storm event. The exercise was designed to address potential social and ecological impacts of extreme winter storm events in the Lake Tahoe region, such as those experienced this past winter.

Fire Flow Enhancements
TWSA members and South Tahoe Public Utility District have been working collaboratively on federal funding requests for infrastructure upgrades and inter-tie projects in order to address the need for adequate fire flows in the event of urban wildfire. The Lake Tahoe Community Fire Protection Partnership has worked to secure federal funding which, when matched dollar-for-dollar with local agency funding, allows construction of critical water infrastructure projects with a nexus to fire protection within the Lake Tahoe Basin. Between 2008-2015, more than $31,000,000 in federal funds have been 50% matched by $31,000,000 from Partnership members. (Source: USFS Funding/Lake Tahoe Fire Prevention Partnership). In 2017 the Fire Flow Partnership was formalized, with both TWSA and non-TWSA members. More information can be obtained by contacting Lynn Nolan, at South Tahoe PUD.

4.2
Set trigger for water supplier notification during a plan review that includes activities that may affect drinking water quality
Regulatory language in the LRWQCB Basin Plan Amendment requires water provider notification and solicitation of comments of potential chemical use projects.

It has been an ongoing task for TWSA to expand the zone of protection around drinking water intakes. Current TRPA language includes a 600 ft. buffer for lake intakes. In spring 2011 and again in 2017-2018 TWSA formally requested the TRPA standard change to a 1,320 ft. (1/4 mile) buffer zone of protection around drinking water intakes. This request is finalized in the TRPA Shoreline Plan, for new piers and other activites. The TRPA planning review process currently includes a check mechanism for

notification to a purveyor of any project within 600 to 1320 ft. of groundwater or lake intake drinking water source. TRPA maps are flagged for both groundwater and surface water sources.

TWSA staff receives notification and hard copies of applications of a variety of use permits (piers, buoys) and potential projects as submitted by applicants to Nevada State Lands. These are forwarded to the applicable water providers so they can include comment and mitigation requirements such as turbidity and bacterial sampling for potential impact projects. The NDEP often provides comments.

6.0
Develop a plan to incorporate new members into TWSA
TWSA has a defined cost sharing plan and formal membership agreement. STPUD became a full member in 2017. Also in 2017, the TWSA Board completed a bylaws review process with updates to the agreement.

6.1-6.2
Annual Reporting
The *TWSA Watershed Control Program Annual Report* is submitted to the Nevada Division of Environmental Protection Bureau of Safe Drinking Water and the California Division of Drinking Water Programs (Northern California Field Operations Branch) annually, each December. Reports are posted online at www.TahoeH2O.org. Hard copies of the report are distributed to personnel of area agencies upon request. *TWSA Watershed Control Program Annual Reports* have been published annually since 2003.

6.3
TWSA Future Goals
The TWSA Board conducts annual goal setting and review Below are the 2018-19 Goals revised at the 6/7/18 TWSA Board meeting:

1. ***"Continue and increase emphasis on extensive education and outreach on focus topics of: source water protection, Aquatic Invasive Species (AIS) threats, treatment methods used for AIS and the value of municipal tap water."***
   As detailed in Action Plan Highlights 1.0 through 1.9 – a variety of actions are implemented towards this goal.

2. ***"Continue outreach and advocacy efforts for federal infrastructure funding, especially for fire flow capacity."***
   STPUD and IVGID conduct federal lobbying efforts on behalf of drinking water concerns for the Association. STPUD has conducted collective grant funding management for fire flow enhancement infrastructure such as additional tanks, hydrants, pipe replacement and upgrades in the past 8 years.

3. ***"Continue a strong communication relationship with Tahoe Regional Planning Agency (TRPA), Nevada Department of Environmental Protection (NDEP), Lahontan Regional Water Quality Control Board (LRWQCB) and other regulatory agencies on source water protection."***

The most significant recent development includes participation on the mediation selection team coordinated by TRPA for the Tahoe Keys Property Owners Association "Application for Exemption" resubmitted to the Lahontan Regional Water Quality Control Board in July 2018.
Past participation has included project review and mitigation suggestions provided on the Tahoe Basin Plan Amendment regarding pesticide and herbicide use (land and water use) to Lahontan Regional Water Quality Control Board (LRWQCB). Agency involvement by Nevada Dept. of Environmental Protection and California Dept. of Public Health was prompted by water provider concerns. Initial public comment prompted the LRWQCB Board to direct staff to form a working group to address the water provider concerns and produce appropriate intake protection/mitigation language. This language was incorporated into the existing regulations. TWSA staff has been heavily involved in the Nearshore Aquatic Invasive Weeds Working Group (NAIWWG) in the past 5 years. Public comment is offered. Research is conducted and shared with the group.

TWSA's Executive Director and Chairman are in regular contact with agency staff regarding drinking water provider concerns. Staff has maintained presence on TRPA led planning and workgroup committees for shore zone projects and AIS projects.

TWSA is a sponsor for, and TWSA staff submits articles to, the TRPA *Tahoe In Depth* publication.

4. ***"Maintain and improve project review / involvement process with TRPA, NV State Lands, Lahontan Water Board and other planning/regulatory agencies.***

   Current active projects include:
   - ***Aquatic Invasive Species (AIS) Programs (threats/prevention programs, treatment methods, Integrated Weeds Management Plan)***
   - ***Groundwater Contamination at the 'Y" / PCE Plume Project***
   - ***Tahoe Regional Planning Agency Shoreline Plan and Project Reviews***
   - ***Nevada State Lands notifications on occupancy of lake bottom***
   - ***Truckee River Operating Agreement (TROA) Ongoing regulatory updates***
   - ***Ongoing federal and state regulatory updates***

   TWSA members worked with TRPA on establishing a standardized Memorandum of Understanding (MOU) for routine water utility work, reducing the need to obtain individual permits for standard small scale construction and infrastructure upgrades. As outlined above in Action Plan highlights 4.0-4.1; TWSA staff and member agencies are actively involved in the planning and review of projects, activities and regulations related to source water protection at Lake Tahoe.

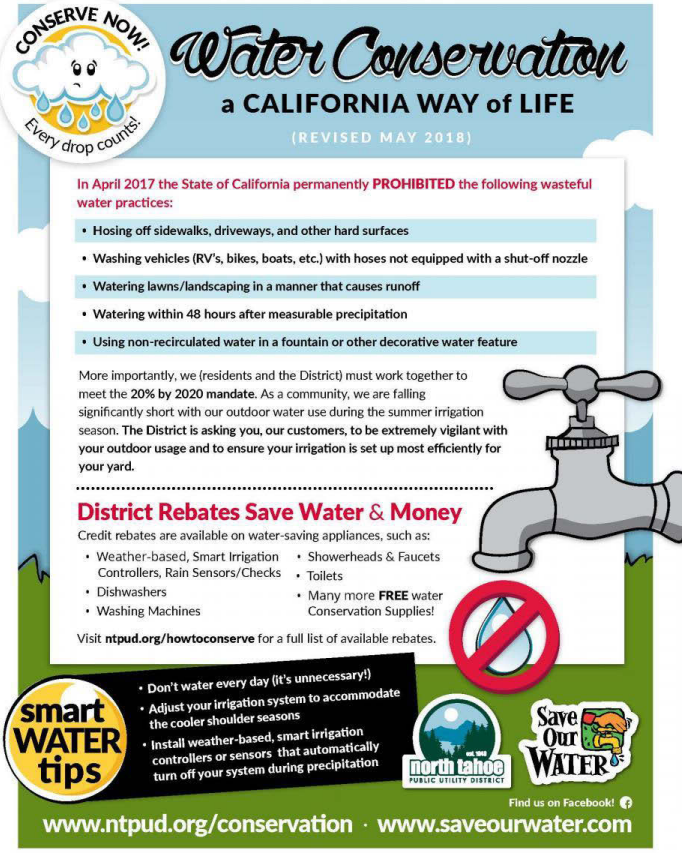
5. ***"Utilize regional studies/projects to determine how they protect source water quality. Continue to work with LTWIP as appropriate."***

   Review of published reports and studies is conducted on an ongoing basis by TWSA staff and member agencies. In the past 8 years, intensive staff resources have been directed to research and public comment in opposition to the potential use of aquatic herbicides for aquatic weeds control, driven by planning efforts in the Tahoe Keys area. Many of the reports and studies released in the past year are referenced in this annual report.

7.0-7.3

Water Conservation

The Tahoe region came out of an intensive and extended drought with record precipitation in the winter of 2017-18; almost 200% of normal in many areas. Lake Tahoe reached its natural rim in just one winter. The drought that has plagued California for half a decade was over and Lake Tahoe, was full for the first time in 11 years. This eased some immediate concerns statewide about water supply, but agencies have remained committed to water efficiency measures.



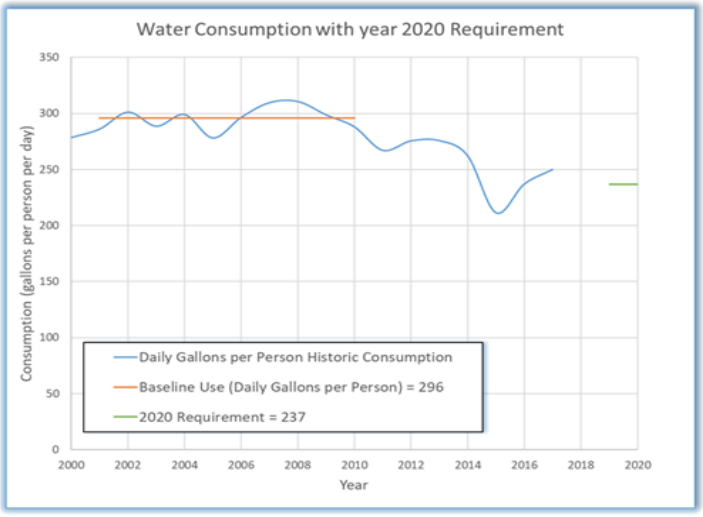
California

The record setting winter precipitation for 2017-18, offset the previous year's drought restrictions in the region. California TWSA members responded to the 2014-2015 California emergency water conservation mandates with extensive education, outreach and enforcement measures. In 2016, emergency restrictions were eased, however all CA members maintained agency focus on conservation. A May 2016 Resolution adopted by the State of California required districts to self-certify their conservation standards.

Common conservation measures implemented include: tiered rates, irrigation restrictions, probation on water use on hardscaping, requirements for water efficient indoor fixtures, online water waste reporting forms and more.

In addition to conservation efforts, the following CA state restrictions are permanently in place:

- Hosing off sidewalks, driveways, and hardscapes (except for pavement resurfacing or sealing, construction services, and/or public health and safety per TCPUD Ordinance 288);
- Washing automobiles with hoses not equipped with a shut-off nozzle;
- Using non-recirculated water in a fountain or other decorative water feature; and
- Watering in a manner that causes runoff, or within 48 hours after measurable precipitation.



North Tahoe PUD

http://ntpud.org/conservation

The North Tahoe Public Utility District has set conservation restrictions; information is posted in detail on the website.

2018: In May 2018, the NTPUD Board of Directors passed a plan to help the District move toward compliance with the 20% by 2020 Mandate.

2016: Through the self-certification process, NTPUD determined a supply excess with a zero conservation goal. The determination is awaiting Water Board approval. However, the 20% by 2020 Mandate remains.

2015: NTPUD's Drought Mandated Reduction was set at 28%. Overall reduction summer 2015 was 29.5%.

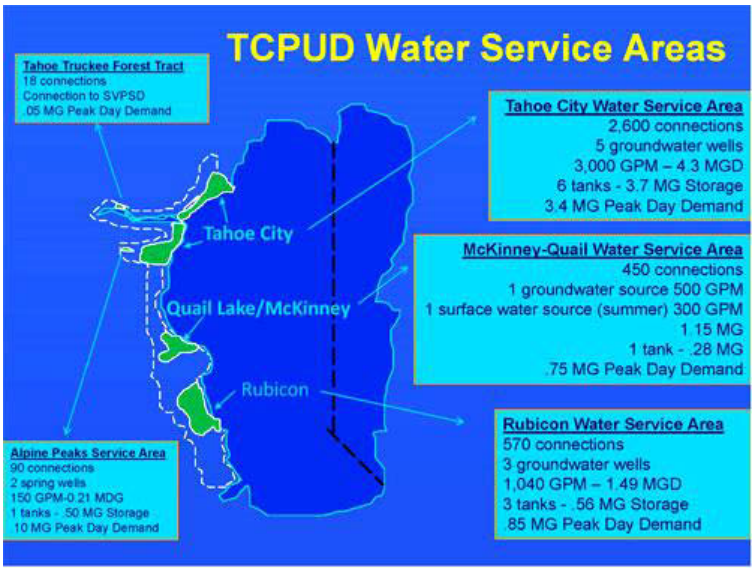
North Tahoe PUD Conservation Programs (http://ntpud.org/howtoconserve)

- Low Flow Toilet Rebate 50% credit $100 per toilet.
- Energy Star Certified Dishwasher Rebate 50% credit max $100 per household.
- Energy Star Certified Washing Machine Rebate 50% Credit Max $150 per household.
- Low Flow Faucets & Showerhead rebate 50% credit Max $50.
- Weather Based "Smart" irrigation controller rebate 50% credit $100 max per controller.

Tahoe City PUD

http://www.tahoecitypud.com

The Tahoe City Public Utility District has set conservation restrictions and information in posted on their website.



2016: Through the self-certification process TCPUD, the District certified a water supply surplus; setting the conservation goal at zero. The determination is awaiting Water Board approval.

TCPUD is offering rebate programs for WaterSense and Energy Star appliances specifically, dishwashers, clothes washing machines, and Smart Irrigation sensors and devices.

Tahoe City PUD Conservation Programs (http://www.tahoecitypud.com/utility-services/water/water-conservation)

- High Efficiency Toilet Rebates 1.28 gpf, $100 water $50 sewer only customers
- Energy Star Dishwasher rebate $75 water customers $37 for sewer only customers
- Energy Star Clothes Washer $100 waster, $50 sewer only customers
- Smart Irrigation Sensors and Devices $25 per device max 3
- State of CA Turf Removal Rebate (SaveOurWaterRebates.com)

STPUD
http://stpud.us/waterconsv
STPUD has a dedicated Water Conservation Specialist on staff. The South Tahoe Public Utility District has set conservation restrictions. Information is detailed on their website.

South Tahoe PUD (https://stpud.us/waterconsv/)

- Toilet Rebate up to $100 for replacing a pre-1992 toilet with 1.28 gpf model
- High-Efficiency clothes washer with a water factor of 5.0 or less, $200
- Turf By Back Program $1.50 sq. ft. up to $2000
- Irrigation Equipment upgrade to High water Efficiency system $400
- Water Wise House call

Lakeside Park Association
http://lakesideparkassociation.org
In 2015, LPA issued letters to customers ring restrictions and enforcement. Additional measures were required of commercial customers.

Nevada
The State of Nevada did not declare a drought emergency; however, water providers enacted conservation education and voluntary water reductions.

The Douglas County Water Conservation Plan is available at:
http://www.douglascountynv.gov/DocumentCenter/Home/View/1137.

Incline Village GID's Water Conservation Plan, was updated in 2015, and can be viewed here:
http://water.nv.gov/programs/planning/plans/InclineVillageGID.pdf
IVGID will be launching a Water Sense appliance rebate in 2019-2020.

Round Hill GID's Water Conservation Plan can be viewed here:
http://water.nv.gov/programs/planning/plans/Round_Hill_GID.pdf

Kingsbury GID's Water Conservation Plan can be viewed here:
RULE 23 - Conservation Plan was updated.
http://water.nv.gov/programs/planning/plans/KingsburyGID.pdf

Governor Sandoval established the Nevada Drought Forum
(http://drought.nv.gov/About/Executive_Order)
On April 8, 2015 Governor Sandoval convened the Nevada Drought Forum – bringing together the best minds, managers and all interested stakeholders to assess the drought in Nevada, identify best conservation practices and policy needs, and make recommendations regarding next steps.

Miscellaneous Water Conservation Measures
All member agencies maintain leak detection programs to reduce system water losses. Many members offer customer leak detection.

Member agencies' rate structures vary, using either flat rates or increasing tier rate structures.

TWSA Staff maintain AWWA Water Efficiency Practitioner Certification (level 1) and have been trained in irrigation auditing.

Water conservation information is featured on the TWSA website and in outreach materials offered at regional events. Shower timers and leak detection tablets are given to the public at events.

TCPUD, NTPUD and STPUD offer water conservation fixture rebates and water conservation kits to residents. The kit consists of a faucet aerator, shower timer, shower head, hose nozzle, and hose repair tools.

IVGID and Nevada Tahoe Conservation District (NTCD) offer free landscape design and outdoor water use audits to the Nevada side of the Lake Tahoe Basin. The Tahoe Resource Conservation District offers similar services on the California side.

8.0
Review Tahoe annual diversions reports
TWSA members did not exceed allocated water rights in the past year.

Lake Tahoe is a bi-state managed watershed. The Truckee River Operating Agreement (TROA) *http://www.troa.net/* was signed on Sept. 6, 2008. This agreement among 16 parties (including Federal, California, Nevada, Pyramid Lake Paiute Tribe, water agencies/irrigation districts and Truckee Meadows Water Authority) was designed to improve the operational flexibility of Truckee River reservoirs, and had been in negotiation for more than 18 years. It is designed to formalize, regulate and monitor water rights and water use within the Tahoe Basin, the Truckee River Watershed and the final outflow areas of Pyramid Lake and the Carson River. Under TROA, Tahoe Basin water rights for water extractions (surface and groundwater) are capped at 34,000 acre feet total, annually. Allocations are 11,000 acre feet per year (afy) for Nevada use and 23,000 (afy) for California use. Implementation of the plan began in December 2014.

III. MONITORING AND DATA MANAGEMENT

TWSA OPERATORS UNDER FILTRATION EXEMPTION *

Ozone plus Ultraviolet Disinfection; chlorine residual for delivery:

- Incline Village General Improvement District (IVGID)
- Kingsbury General Improvement District (KGID)
- Edgewood Water Company (Edgewood)
- Zephyr Water Utility District (ZWUD)
- Glenbrook Water Cooperative (Glenbrook)

Ultraviolet (UV) disinfection and chlorine residual for delivery:

- North Tahoe Public Utility District (NTPUD)

TWSA OPERATORS USING FILTRATION TREATMENT

Filtration and chlorine residual for delivery:

- Tahoe City Public Utility District (TCPUD), the McKinney Quail System
- Skyland Water Company (Skyland)
- Cave Rock Water System (Cave Rock)
- Round Hill General Improvement District (RHGID)
- Lakeside Park Association (LPA)

*Treatment Requirements for Filtration Avoidance

Water Quality Parameter	Surface Water Treatment Rule (SWTR)	SWTR + LT2ESWTR
Giardia	3-log removal/inactivation	3-log removal/inactivation
Virus	4-log removal/inactivation	4-log removal/inactivation
Cryptosporidium		2-log removal/inactivation
Turbidity	<5 Nephelometric Turbidity Unit (NTU)	<5 NTU
Total coliform	<100/100 mL	<100/100 mL
Fecal coliform	<20/100 mL	<20/100 mL

Source: USACE Risk Assessment Report 2008

* Note: All TWSA filtration exempt water purveyors met LT2 upgrade requirements by using a combination of ozone and ultraviolet (UV) treatment, or UV alone. All purveyors use chlorine residual for distribution system disinfection. System upgrades are described in Chapter V.

The EPA defines water quality monitoring as a method to identify new, potentially contaminating activities and control existing activities. Water suppliers are required to monitor raw water that may affect human health for constituents. In 2002, the Tahoe Water Suppliers Association (TWSA) established a central drinking water quality database to improve accessibility, evaluate long-term health of their water supply, distinguish water quality trends and identify potential treatment methods. Between 2003 and 2004, TWSA staff also combined existing climatic databases in the Basin for future causal studies. TWSA staff continues to monitor weather in relation to turbidity and total coliform monitoring spikes. The TWSA has also worked with the Army Corps of Engineers, the Nevada Department of Environmental Protection, the University of California-Davis, the University of California-Riverside, and Black & Veatch Consulting, to complete and update a risk assessment study of the drinking water intakes. TWSA also monitors shorezone development and

aquatic invasive species issues throughout the watershed. These are initial steps in expanding the source water quality monitoring program.

Raw Water Monitoring

Under the Surface Water Treatment Rule, TWSA non-filtering water suppliers are required to complete turbidity (NTU) and total coliform or fecal coliform analyses on raw drinking water, 40 CFR §141.71(a). Samples are taken from the first pump station from the drinking water intake pipe prior to treatment. Sample frequency is dependent on the flow of raw water relative to community demand. For example, TCPUD's McKinney Quail System helps serve an increase in the seasonal community and often does not pump or sample raw water daily during the winter months. The non-filtering water suppliers currently test raw water for total coliform and E. coli coliform. State standards are met based on total coliform results. The filtering water suppliers are not required to test for total coliform and E. coli coliform on raw water but do monitor turbidity. LPA and TCPUD also monitor for coliform, even though they are a filtration system. All purveyor results are included in the following report section (see Chapter IV).

All water suppliers are required to submit the maximum and mean of the required impurities to the Nevada Department of Environmental Protection Bureau of Safe Drinking Water and the California State Water Resources Control Board, Division of Drinking Water Programs, on a monthly basis. Any violations of monitoring or water quality parameter levels must be reported immediately. Violations may require additional monitoring, reporting, customer alerts including boil orders, or ongoing treatment, dependent on the violation type and duration.

To help suppliers identify potential problems and future treatment processes, TWSA developed a combined database which includes:

- maximum turbidity
- mean turbidity
- median turbidity
- maximum total coliform and E. coli coliform
- mean total coliform and E. coli coliform
- median total coliform and E. coli coliform
- total coliform and E. coli coliform colony counts and percentage of positive samples per year
- 90th percentile of constituent readings

The Annual Report summarizes, for each of the purveyors, raw water data for the July 1, 2017, to June 30, 2018 reporting year, and yearly data ranging between July 1, 2007, and June 30, 2018. TWSA maintains a database with many purveyors' data, archived from 1997. The graphic data analysis includes the following:

- monthly mean and maximum turbidity
- annual mean and maximum turbidity
- monthly mean and maximum total coliform
- annual mean and maximum total coliform

The goal of the analysis is to identify trends and to develop methods of maintaining and improving the supply and treatment processes. Following is a brief overview of the purveyors' combined raw water sample results during the 2017-2018 reporting year and between 2007 and the 2018

reporting years. Individual reports are located in the agency sections within Chapter IV of this document.

Turbidity

During the 2017-2018 reporting year, the maximum turbidity readings for the purveyors ranged between 0.29 NTU and 1.67 NTU (Table 5.0 and Figure 1.0). The purveyors' maximum turbidity readings occurred at different times of the year but tended to occur during fall storm events that produce winds from the south (Tables 5.0, 5.1). The winter of 2016-2017 was the wettest on record for the Lake Tahoe region[1], and the UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018 stated that seasonal spring runoff washed more sediment into Lake Tahoe that the previous five years combined[2]. This sediment load likely impact the Lake Tahoe Basin throughout the 2017-2018 reporting year, though the majority of TWSA purveyors show decreased annual maximum turbidity readings form the 2016-2017 reporting year. The maximum turbidity reading, 1.67 NTU, occurred on August 22, 2017, at LPA, during a precipitation event that included rain accompanied by winds gusting up to 13 mph from the south. With all maximum turbidity values, less than 5 NTU, the surface waters of Lake Tahoe provided all TWSA members with raw water that meet filtration avoidance criteria for turbidity.

Following historical trends, maximum turbidity readings have been correlated to wind events producing a wave mixing effect, as well as the influence of sediment washed into Lake Tahoe described above. Of the ten TWSA water purveyors six had maximum turbidity readings in the Fall of 2017; TCPUD October, ZWUD October, Cave Rock/Skyland November, Glenbrook November, NTPUD November, IVGID November (Table 5.1). The summer season of 2017 had three maximum turbidity readings at Edgewood July, RHGID July, and LPA August. Annual spring runoff likely influenced the maximum turbidity reading at KGID that occurred in March 2018.

The highest monthly mean turbidity calculations ranged between 0.23 NTU and 0.44 NTU and occurred primarily during July and October 2017 (Table 5.0). The highest annual mean turbidity reading for the TWSA purveyors was 0.23 NTU and was taken from the LPA's intake, a system that is operated with filtration (Table 5.1).

For the ten-year reporting period of July 1, 2007, to June 30, 2018, maximum turbidity for each of the purveyors has varied. For the 10-year period, the highest maximum turbidity reading was recorded at LPA, 20.20 NTU, during the 2016-2017 reporting year, and the lowest maximum turbidity reading, 0.10 NTU, was recorded in 2008 at Glenbrook (Table 5.2 and Figure 1.1). Although no trends visually appear, many of the maximum turbidity values remained below 5 NTU except NTPUD in 2013, Glenbrook 2014, and LPA 2016(Figure 1.2). Maximum turbidity was the lowest in 2012 for the 10-year reporting period with values 0.26 NTU- 1.00 NTU (Table 5.2). For the 2017-2018 reporting year (noted as 2017 in Table 5.2 and Figure 1.1), maximum turbidity values have been lower across six of ten purveyors, and increased for four, in comparison to the previous reporting year. Linear trendline data for the ten-year period shows that four of the purveyors have a decreasing maximum turbidity trend, six show an increasing trend in maximum turbidity (Figure 1.1).

[1] NOAA National Centers for Environmental Information, State of the Climate: National Climate Report for February 2017, published online March 2017, retrieved on September 15, 2017 from https://www.ncdc.noaa.gov//sotc/national/2017/02/supplemental/page-2.

[2] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.1

Historical annual mean turbidity is relatively consistent for each of the purveyors (Table 5.3). The annual range throughout all the 10-year reporting years and purveyors is 0.07 NTU to 0.77 NTU (Table 5.3). The range for the 2017-2018 reporting year annual mean turbidity values is 0.13 NTU to 0.27 NTU (Figure 1.0). Annual mean turbidity decreased for three purveyors, remained the same for two, and increased for five between this reporting year and the previous (Table 5.3). Although no inclusive trends visually appear, over the 10-year reporting period linear trendline data for annual mean turbidity show four purveyors with decreasing trends, three with stable trends, and three with increasing trends (Figure 1.2).

Figure 1.0: Comparison of annual mean and maximum turbidity results for TWSA purveyors for the 2017-2018 reporting year.

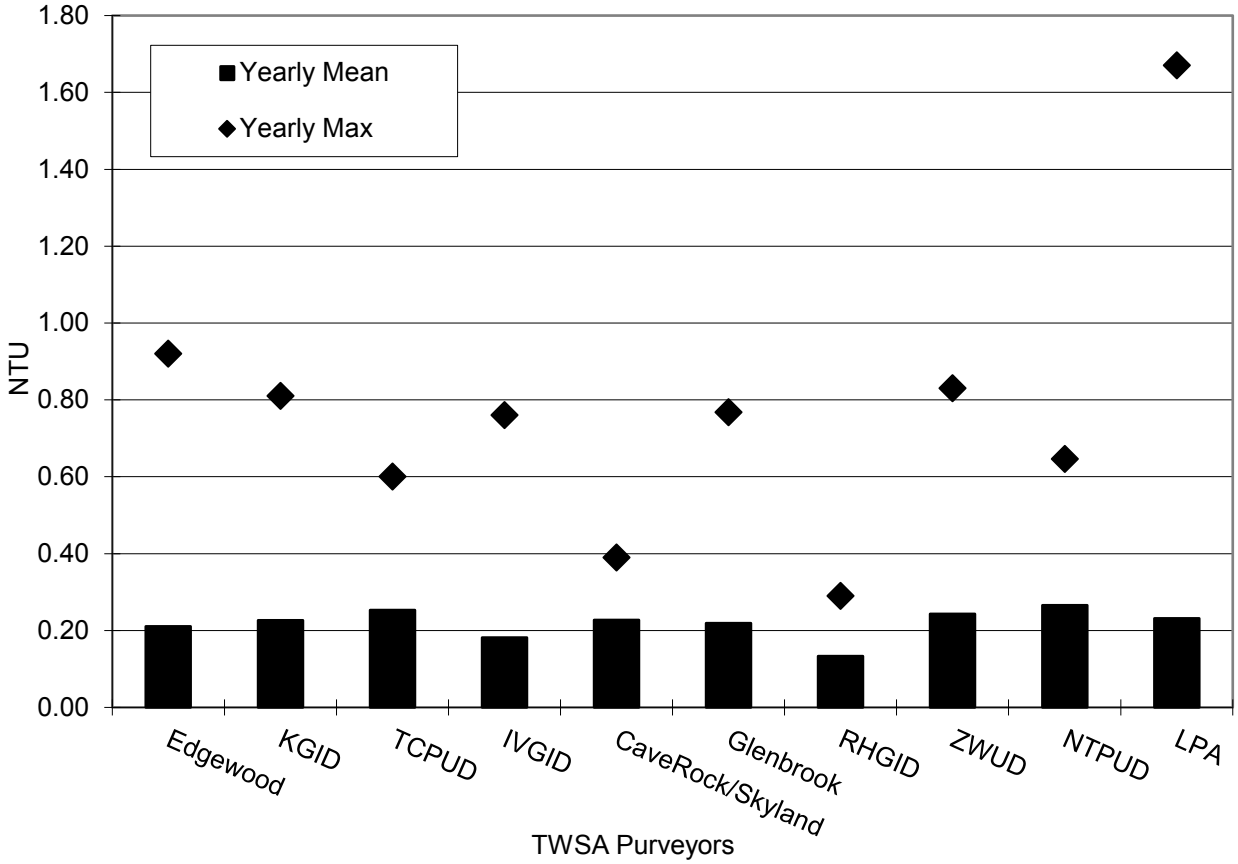


Table 5.0: Summary of TWSA raw water turbidity between July 1st, 2017 and June 30th, 2018.

2017-2018 (NTU)	Edgewood	KGID	TCPUD	IVGID	Cave Rock/ Skyland	Glenbrook	RHGID	ZWUD	NTPUD	LPA
Mean	0.21	0.23	0.25	0.18	0.23	0.22	0.13	0.24	0.27	0.23
Maximum	0.92	0.81	0.60	0.76	0.39	0.77	0.29	0.83	0.65	1.67
Date Maximum	10-Jul	25-Mar	3-Oct	27-Nov	13-Nov	8-Nov	1-Jul	31-Oct	16-Nov	22-Aug
Highest Monthly Mean	0.32	0.26	0.27	0.29	0.27	0.29	0.23	0.34	0.36	0.44
Date Mean	Jul-17	Oct-17	Seb-17 Oct-17	Nov-17	Oct-17 Jun-18	Sep-17	Jul-17	Oct-17	Jul-17 Aug-17	Nov-17

Historic information available upon request.

Table 5.1: Summary of TWSA raw water turbidity data for the 2017-2018 reporting year in relation to weather.

2017-2018 (NTU)	Edgewood	KGID	TCPUD	IVGID	Cave Rock/ Skyland	Glenbrook	RHGID	ZWUD	NTPUD	LPA
Maximum	0.92	0.81	0.60	0.76	0.39	0.77	0.29	0.83	0.65	1.67
Date Maximum	10-Jul	25-Mar	3-Oct	27-Nov	13-Nov	8-Nov	1-Jul	31-Oct	16-Nov	22-Aug
Sustained Wind Speed Average/Max	6 23	6 15	2 13	2 10	12 28	13 33	4 13	2 10	10 26	3 13
Wind Gust Max Speed	29	20	22	10	36	40	17	0	37	0.00
Wind Direction	S SW	S SE	N NE	W SW	S SW	S SW	N NE	S	S SW	S
Weather Event/ Precipitation (in)	0.00	0.1 Snow	0.00	0.06 Rain/Snow	0.20	0.00	0.00	0.00	3.14 Rain	0.08 Rain

Table 5.2: Comparison of TWSA purveyors annual maximum turbidity at results for the July 1, 2007-June 30, 2018 reporting years.

(units NTU)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Edgewood	0.88	1.43	0.80	1.00	0.80	0.75	0.45	0.75	0.70	0.70	0.92
KGID	0.77	1.83	2.15	1.78	0.95	0.61	0.61	0.66	0.60	4.28	0.81
TCPUD	0.42	0.34	0.26	0.43	0.51	0.42	0.42	0.31	0.40	0.50	0.60
IVGID	0.40	0.39	0.40	0.50	0.41	0.53	0.38	0.78	0.63	0.79	0.76
CaveRock/ Skyland	0.57	2.04	1.21	2.11	3.55	1.00	0.99	1.00	0.26	0.46	0.39
Glenbrook	0.21	0.10	0.90	0.22	0.35	0.35	1.00	7.21	1.37	0.59	0.77
RHGID	0.36	0.46	0.66	0.30	0.30	0.26	0.23	0.29	0.27	0.35	0.29
ZWUD	0.45	0.50	0.75	0.77	0.67	0.94	0.81	0.91	0.57	0.48	0.83
NTPUD	3.71	2.42	2.01	0.99	1.30	0.85	5.01	0.99	0.92	1.03	0.65
LPA	2.30	2.00	2.00	1.40	1.40	1.00	1.00	1.00	5.60	20.20	1.67

Table 5.3: Comparison of TWSA purveyors annual mean turbidity at results for the July 1, 2007-June 30, 2018 reporting years.

(units NTU)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Edgewood	0.15	0.20	0.15	0.21	0.18	0.19	0.14	0.18	0.15	0.16	0.21
KGID	0.23	0.28	0.25	0.27	0.25	0.19	0.17	0.18	0.19	0.24	0.23
TCPUD	0.2	0.22	0.18	0.26	0.31	0.22	0.19	0.22	0.20	0.21	0.60
IVGID	0.12	0.14	0.13	0.15	0.15	0.14	0.12	0.14	0.14	0.18	0.18
Cave Rock/ Skyland	0.14	0.16	0.17	0.14	0.14	0.39	0.23	0.22	0.17	0.21	0.23
Glenbrook	0.07	0.28	0.08	0.10	0.10	0.15	0.12	0.23	0.23	0.17	0.22
RHGID	0.43	0.17	0.17	0.13	0.13	0.11	0.10	0.11	0.12	0.14	0.13
ZWUD	0.24	0.26	0.24	0.21	0.18	0.16	0.18	0.17	0.16	0.16	0.24
NTPUD	0.43	0.42	0.31	0.31	0.28	0.27	0.43	0.24	0.26	0.23	0.27
LPA	0.77	0.73	0.76	0.65	0.60	0.33	0.30	0.31	0.30	0.62	0.23

Figure 1.1: Comparison of TWSA purveyors maximum turbidity results for the July 1, 2007-June 30, 2018 reporting years.

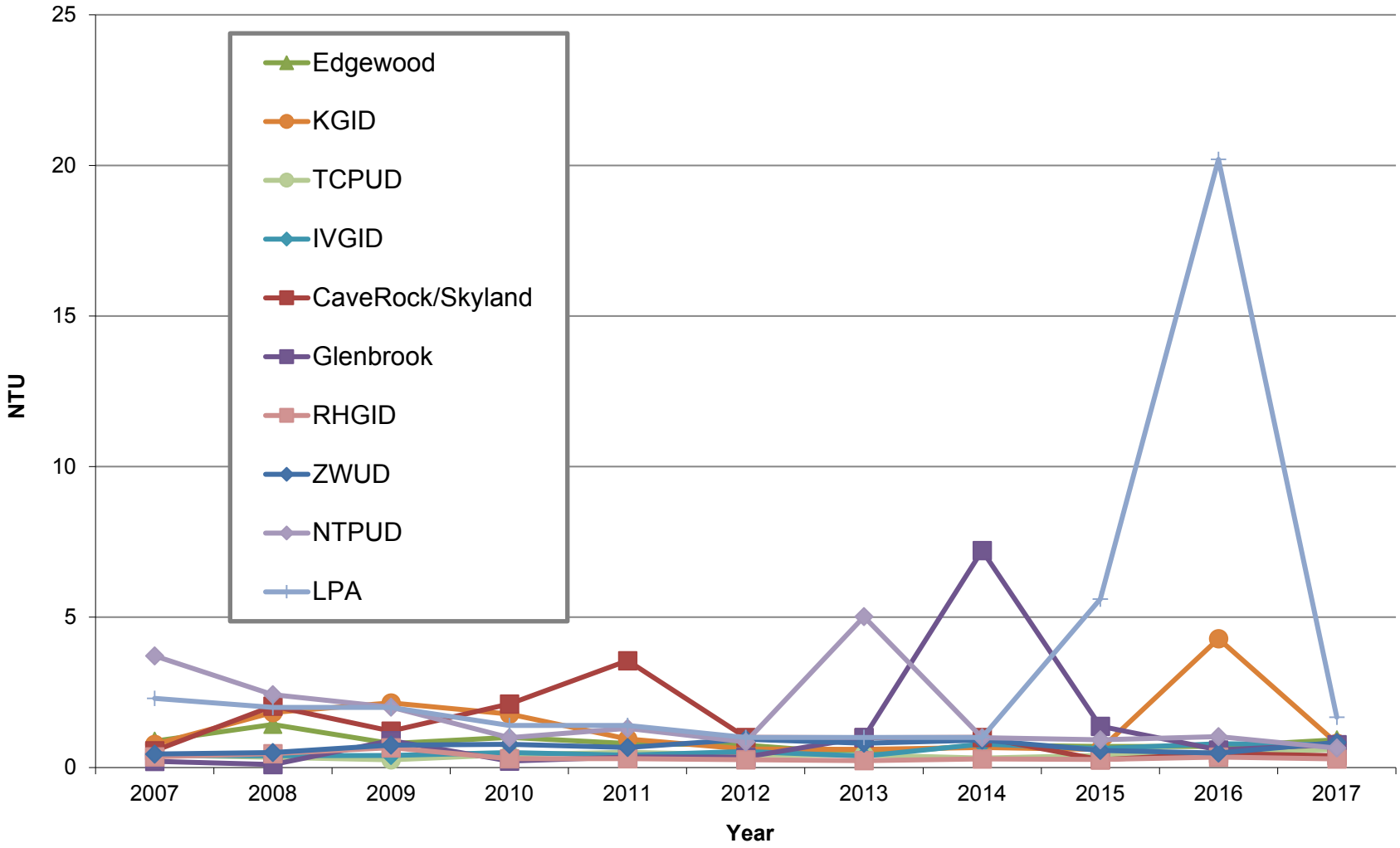
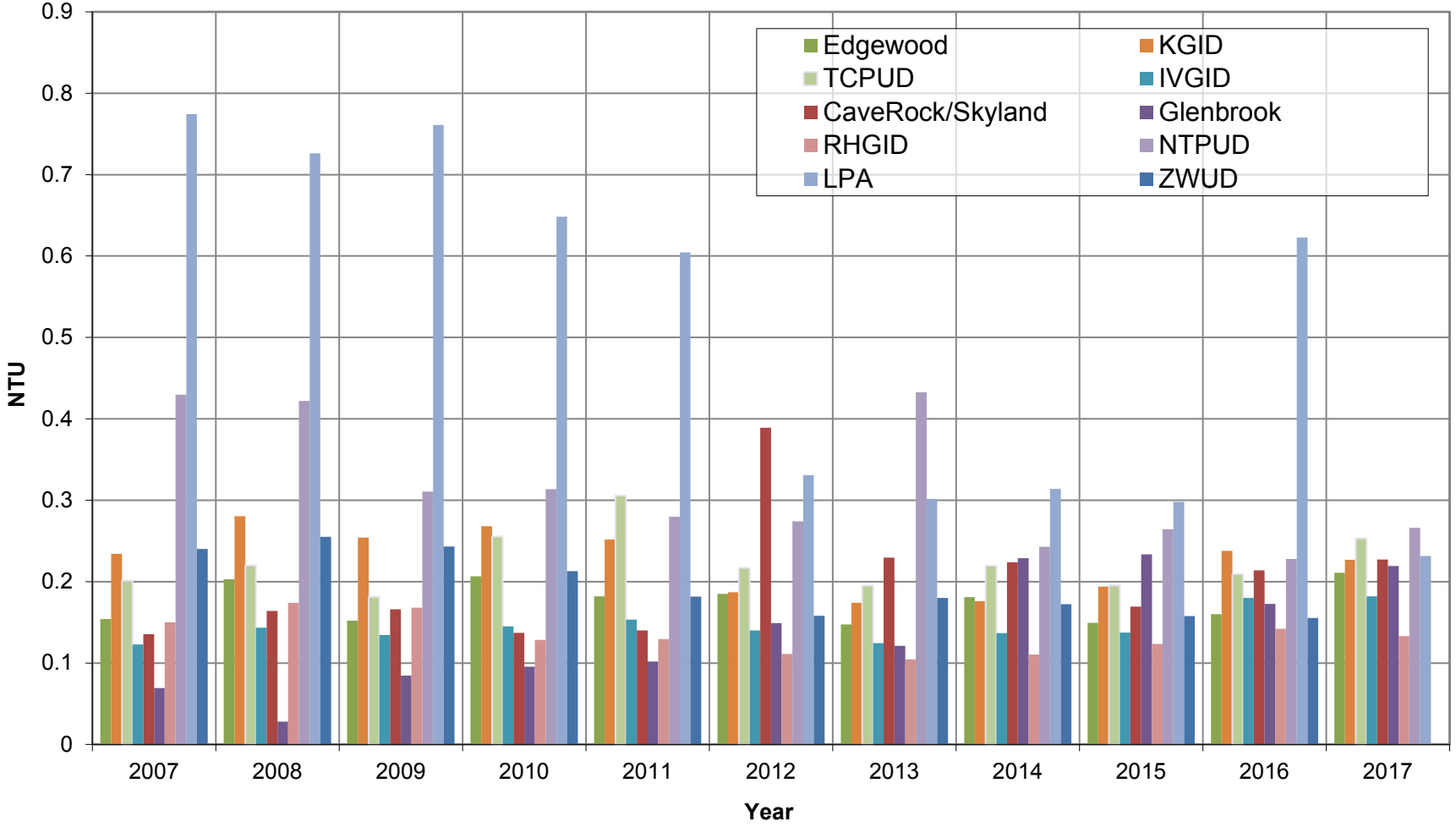


Figure 1.2: Comparison of TWSA purveyors annual mean turbidity for the July 1, 2007-June 30, 2018 reporting years.



Coliform

Maximum total coliform is the highest number of colony-forming units per 100 mL (CFU) or most probable number of colony-forming units per 100 mL (MPN) counted from a single raw water sample during a reporting month or year. The mean total coliform count is the average number of colonies counted per individual sample during the reporting month or year.

During the 2017-2018 reporting year, the maximum total coliform readings for the purveyors were between 29 and 613 CFU/MPN (Table 5.4, Figure 1.3). The annual mean total coliform results for the purveyors were between 1.95 and 69.36 CFU/MPN (Table 5.4, Figure 1.3). The highest annual total coliform reading, 613 CFU, was taken at LPA, a filtering purveyor, first on October 4, 2017, the weather included sustained winds of 2-10 mph with no gusts reported the maximum daily temperature was 50°F during a weekly mean temperature of 44°F (Table 5.6). The increase in temperature, paired with mixing caused by wind, may have contributed to the high total coliform result. The maximum total coliform readings of 613 CFU were greater than the 100 CFU regulatory requirement for filtration exemption, but LPA operates with filtration.

For the 2017-2018, reporting year the filtration exempt purveyor with the highest maximum total coliform reading was NTPUD, with a maximum result of 500 CFU (Table 5.4, Figure 1.3). This annual maximum result was also recorded in October 2017 during a daily maximum temperature of 53°F during a weekly mean temperature of 44°F, with winds creating mixing (Table 5.6). The NTPUD maximum of 500 CFU greater than the 100 CFU regulatory requirement for filtration exemption, but below the 10% of total results requirement, with three out of the 146 readings above 100 CFU equaling 2.05% of total samples.

Figure 1.3: Comparison of annual mean and maximum total coliform for TWSA purveyors for the 2017-2018 reporting year.

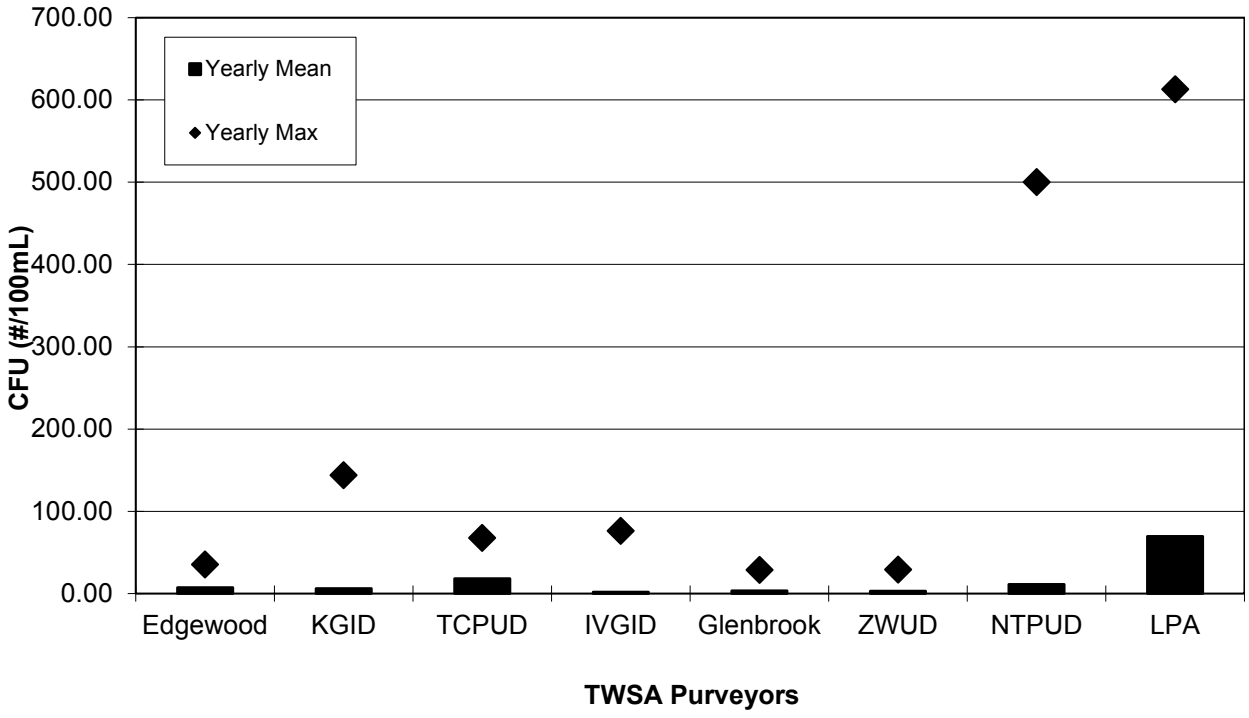


Table 5.4: For the 2017-2018 reporting year, a comparison of annual maximum total coliform (CFU or MPN/100mL) and annual mean total coliform (CFU or MPN/100mL) by date for TWSA water suppliers.

Annual Total Coliform CFU (#/100mL)	Edgewood	KGID	TCPUD	IVGID	Glenbrook	ZWUD	NTPUD	LPA
Maximum	36	144	68	76	29	29	500	613
Date Maximum	25-Oct	30-Aug	5-Sep	25-Sep	25-Jul	20-Sep	19-Oct	4-Oct
Mean	7.33	6.30	18.22	1.95	3.45	3.07	11.21	69.36

During the 2017-2018 reporting year - six of the eight coliform reporting water purveyors reported maximum total coliform results during September and October 2017. Review of Lake Tahoe studies conducted during the reporting period provided TWSA staff with further insight into possible influences on maximum total coliform readings. The UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018 provided a subsurface water temperature profile for 2017. This figure shows the water temperature profile from surface to 330 ft. for the calendar year of 2017. The *State of the Lake 2018* reported that:

> "In 2017, the lake temperature followed a typical seasonal pattern. In February- March, the lake surface was at its coldest, while it was at its warmest at the end of August. The deepening of the warm water zone toward the end of the year is the result of winter mixing, although in 2017 the fall mixing was reduced from earlier years" (Schladow, 2018).

TWSA staff believes that the increase in water temperature at the depths of purveyor intakes paired with the increase in sediment wash, described in the turbidity section above, could have influenced the maximum total coliform results recorded for the 2017-2018 reporting year. Purveyors that may have been affected by the increase in water temperatures, caused by the storage of heat due to the absence of deep mixing for the sixth year in a row[3] are KGID, TCPUD, IVGID, Glenbrook, ZWUD, NTPUD, and LPA. The depths of raw water intakes influenced range from 26 feet to 63 feet and had water temperatures of 55^0F to 70^0F during the month of their maximum total coliform result (Table 5.5, Figure 1.4). The Edgewood intake is located at a depth that likely was uninfluenced.

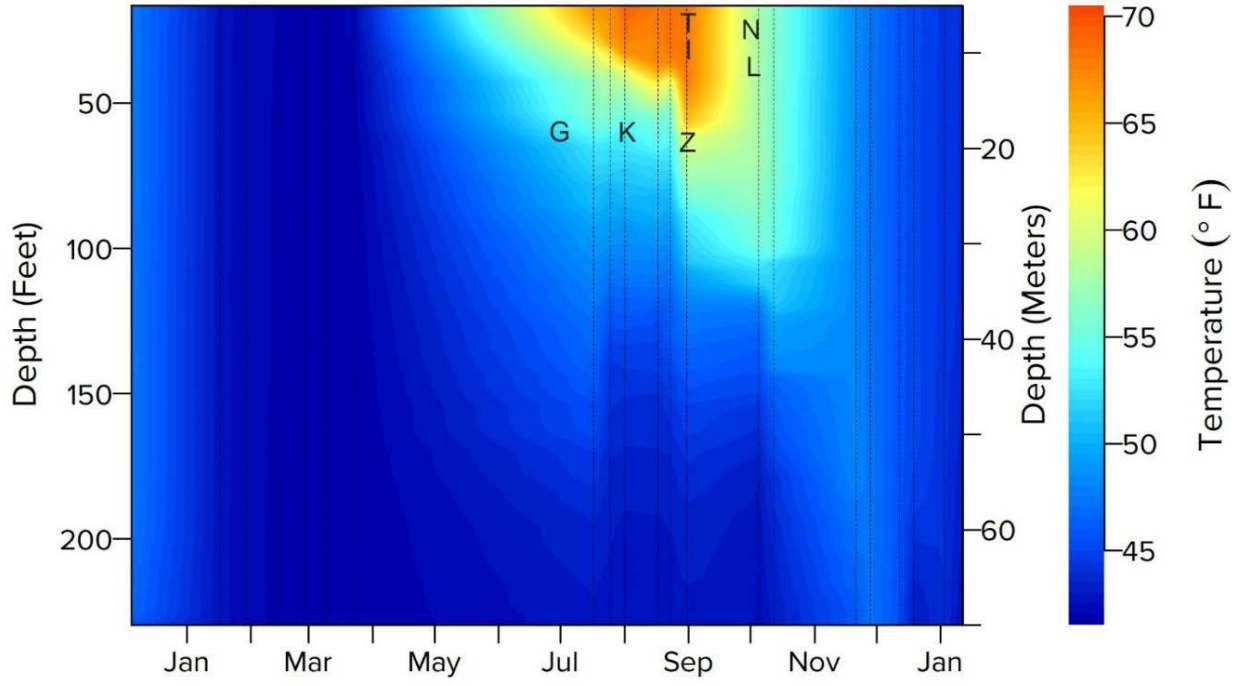
Warm water temperatures, increased sediment wash from the above average winter of 2016-2017, and weather conditions likely provided optimal environmental conditions for the presence of total coliform in raw water during the 2016-2017 reporting year for all TWSA purveyors.

[3] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.3

Table 5.5: TWSA maximum annual total coliform results by depth of raw water intake, with the date of maximum.

Purveyor	Symbol on Figure: Temp at Depth	Raw Water Intake Depth (ft.)	Annual Total Coliform Maximum	Month of Maximum
Edgewood	E	600	36	October
KGID	K	60	144	August
TCPUD	T	26	68	September
IVGID	I	30	76	September
Glenbrook	G	60	29	July
ZWUD	Z	63	29	September
NTPUD	N	28	500	October
LPA	L	37	613	October

Figure 1.4: Temp at Depth Water temperature profile provided by U.C Davis Tahoe Environmental Research Center, State of the Lake Report 2018[4]. Agency annual maximum total coliform result date by raw water intake depth plotted over the figure.



[4] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3

Table 5.6: For the 2017-2018 reporting year, a comparison of annual maximum total coliform (CFU or MPN/100mL) and weather data by date for TWSA water suppliers.

Annual Total Coliform CFU (#/100mL)	Edgewood	KGID	TCPUD	IVGID	Glenbrook	ZWUD	NTPUD	LPA
Maximum	36	144	68	76	29	29	500	613
Date Maximum	25-Oct	Aug-17	5-Sep	25-Sep	25-Jul	20-Sep	19-Oct	4-Oct
Sustained Wind Speed Average/Max	2 8	4 23	3 23	2 12	5 17	12 29	1 12	2 10
Wind Gust Speed	0	29	43	18	24	43	18	0
Daily Max Temp (°F)	70	83	87	62	81	59	53	50
1 Week Mean Temperature (°F)	48	85	80	46	66	46	44	44

For the past reporting years, maximum total coliform for each of the purveyors has varied. Although no trends visually appear, maximum total coliform results were below 100 CFU for all purveyors during the 2015-2016 reporting year. Six purveyors recorded results above 100CFU during the ten-year reporting period of July 1, 2007, and June 30, 2018 (Table 5.7, Figure 1.5). For the 2017-2018 reporting year (noted as 2017 in Table 5.7), maximum total coliform values have been higher across six of eight purveyors in comparison to the previous reporting year. Linear trendline data for the ten-year period shows that six of the purveyors have increasing maximum total coliform results; two have a decreasing trend in maximum total coliform results (Figure 1.5). It should be noted that, during the 2015-2016 reporting year, NTPUD had a statistical anomaly that resulted in the removal of three "Too Numerous to Count" results from the data set. See the 2016 Watershed Control Annual Program Report for full details.

Historical annual mean total coliform results are relatively consistent for each of the purveyors. The annual range throughout all the reporting years and purveyors is 0.00 CFU to 69.36 CFU (Table 5.8). The range for the 2017-2018 reporting year annual mean turbidity values is 1.95 CFU to 69.36 CFU. Although no trends visually appear, the water purveyors are split, with six showing increasing annual mean total coliform and two showing decreasing annual mean total coliform from the previous reporting year (Figure 1.6). Linear trendline data for the 10-year reporting period for annual mean total coliform results is similar to maximum total coliform results with six purveyors showing increasing trends and two showing decreasing trends (Figure 1.6).

Table 5.7: Comparison of TWSA purveyors annual maximum total coliform results for the July 1, 2007-June 30, 2018 reporting years.

(units CFU)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Edgewood	200.50	100.00	130.00	28.00	20.00	27.50	26.20	16.10	60.90	20.30	35.50
KGID	56.00	32.40	56.00	30.60	22.20	200.50	200.50	200.50	83.10	200.50	144.00
TCPUD	4.00	2.00	47.80	53.00	16.40	2.00	3.10	13.70	3.10	5.10	67.70
IVGID	12.00	12.00	1.00	24.00	20.00	20.00	69.00	43.00	37.00	16.00	76.00
Glenbrook	144.50	73.80	7.50	9.90	28.80	40.60	30.60	40.60	62.40	16.40	28.80
ZWUD	28.80	13.20	8.70	56.00	11.10	50.40	30.60	19.20	32.40	38.40	29.00
NTPUD	34.00	30.00	50.00	130.00	220.00	50.00	50.00	110.00	50.00	70.00	500.00
LPA	66.00	14.00	57.00	33.00	32.80	160.70	52.00	12.10	7.50	10.90	613.00

Table 5.8: Comparison of TWSA purveyors annual mean total coliform results for the July 1, 2007-June 30, 2018 reporting years.

(units CFU)	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Edgewood	16.22	2.37	2.31	1.54	1.52	2.10	1.64	1.20	1.71	2.95	7.33
KGID	2.70	2.05	2.46	2.67	1.66	2.90	3.25	5.82	2.70	9.78	6.30
TCPUD	0.00	0.00	19.20	2.00	3.20	0.00	0.00	1.00	1.02	3.73	18.22
IVGID	0.46	0.46	0.03	0.30	0.21	0.24	0.56	0.46	0.35	0.24	1.95
Glenbrook	12.22	5.12	0.84	1.32	1.34	4.00	1.98	3.14	4.01	2.48	3.45
ZWUD	1.70	1.20	0.84	1.95	1.25	3.20	1.79	3.19	2.51	3.54	3.07
NTPUD	1.64	1.34	1.89	2.93	4.32	2.25	3.07	4.42	2.97	2.52	11.21
LPA	7.61	1.91	6.06	9.01	5.51	11.80	6.82	2.32	1.12	1.84	69.36

Figure 1.5: Comparison of TWSA purveyors maximum total coliform for the 2007 to 2018 reporting years.

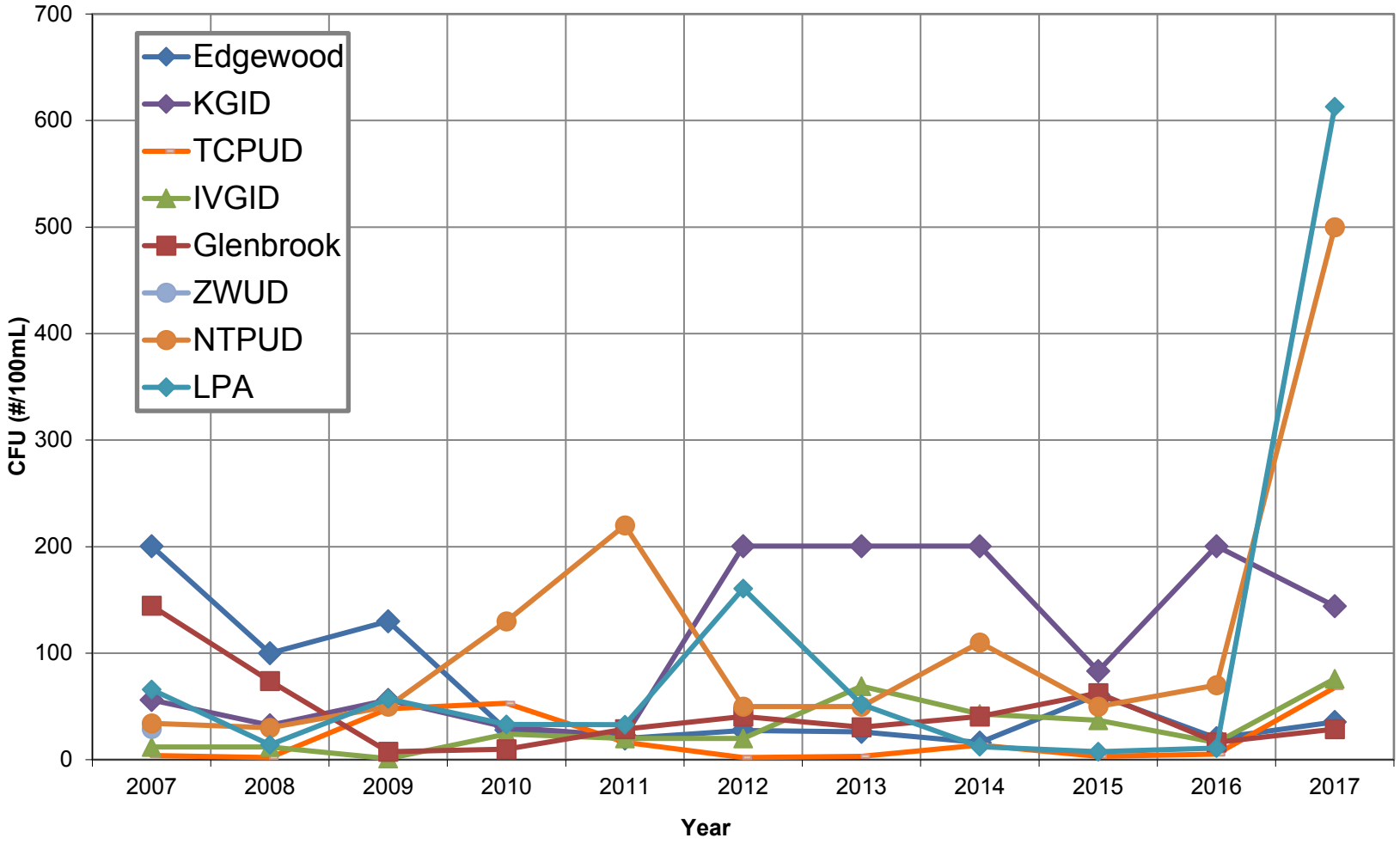
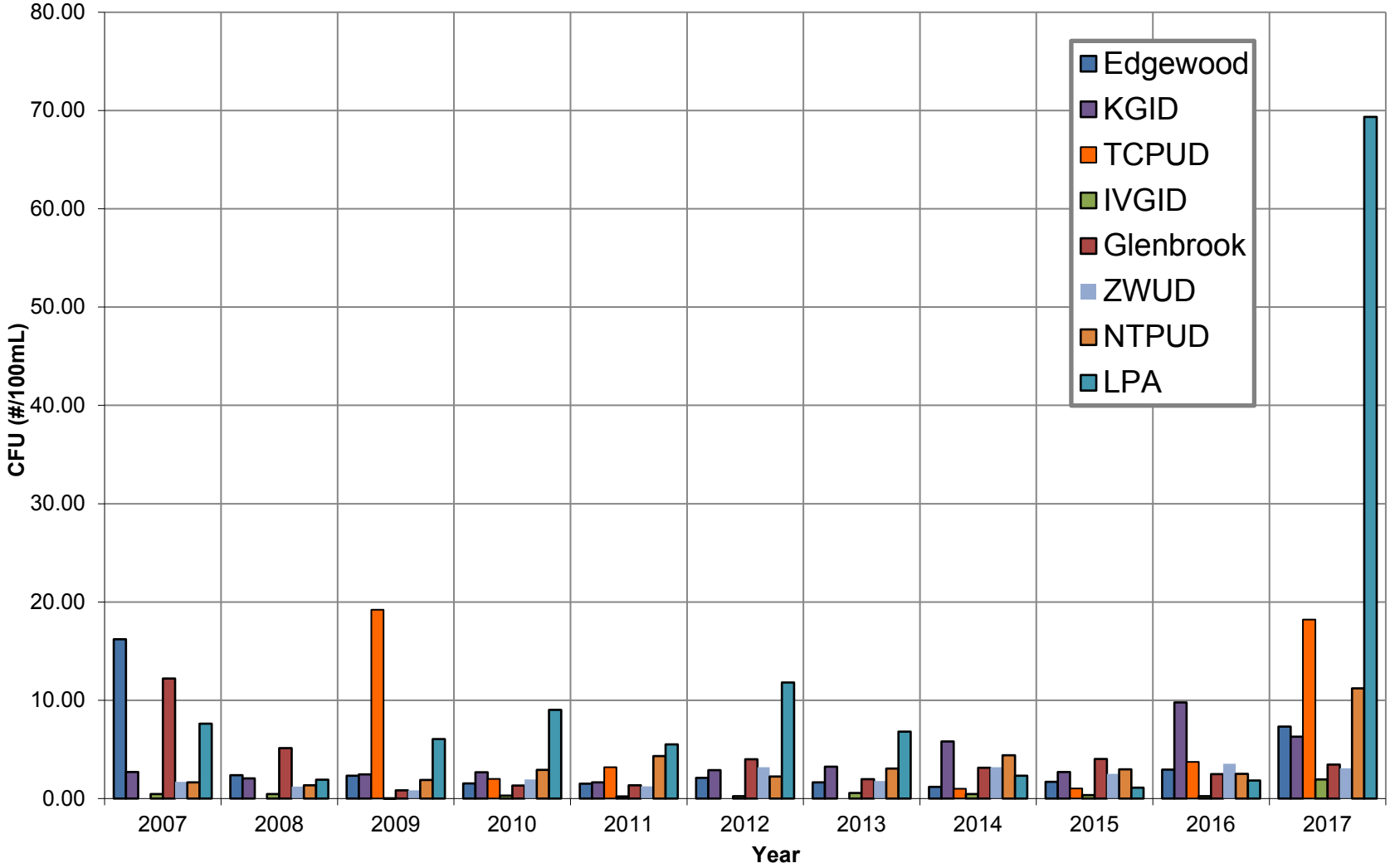


Figure 1.6: Comparison of TWSA purveyors mean total coliform results for 2007 to 2018 reporting years.



Surface Water Monitoring

In the past (1999 to 2010), IVGID partnered with the NDEP to provide a volunteer surface water monitoring program on the north shore of Lake Tahoe. The Incline Village Clean Water Team was a volunteer water monitoring program in the Incline Village/Crystal Bay area, focused on surface water monitoring at eleven locations on a monthly or bi-monthly basis [Plate 11]. At each site, volunteers monitored dissolved oxygen, electrical conductivity, gauge height, pH, and stream flow and collected two grab samples. The grab samples were analyzed in the lab for total coliform, fecal coliform, and turbidity. Results from surface water samples led IVGID staff to broken water pipes and identified social recreation areas (dog walking areas). This information was valuable in providing advice on the future location of a new dog park that would combine areas of high dog use into a managed site. Due to a lack of volunteer support, the Clean Water Team is not currently in operation.

In 2003, IVGID added a beach monitoring program. Once a week throughout the summer season, and biweekly in the winter, staff collects samples from four beach sites and the mouths of two streams [Plate 10]. The samples are analyzed in the lab for turbidity, total coliform, and E. coli coliform. The results of the tests are used to determine if additional studies are needed to assess the effect of recreational activity on source water quality. Initial results indicate an increasing trend in the total coliform at beach and creek sites during the summer months. The goal is to identify and remove or reduce potential contaminating sources. IVGID staff continues to operate their stream and beach monitoring program.

Climatic Database

In 2004, IVGID staff started analyzing climatic databases to provide accessible weather data for causal correlation analyses. The weather data analyzed includes wind speed (sustained and gusts), wind direction, precipitation, humidity, temperature (maximum, minimum, and weekly average) and snow depth. The web-based weather data provided from Weather Underground, *www.wunderground.com*, is used extensively in analysis.

Safe Drinking Water Information System (SDWIS)

The EPA maintains the Safe Drinking Water Information System to track and inform people if a water purveyor has been in violation of the Safe Drinking Water Act. These violations can relate to health, reporting or monitoring requirements that were not met. TWSA purveyors had no violations during the reporting year.

Table 5.9: Violations by TWSA Purveyors of the Health, Reporting, or Monitoring Requirements of the Environmental Protection Agency's Safe Drinking Water Act (SDWIS 2017-2018)

No Violations were reported by TWSA Purveyors during the reporting year, when the database was queried on July 9, 2018.

The following section provides detailed water quality reports for each of the TWSA water purveyors.

Edgewood Water Company
Water Quality Data Summary 2017-2018

During the reporting year, Edgewood Water Company remained within Federal and State water quality requirements. During the same period, the Environmental Protection Agency (EPA) notes no violation of the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9).

Turbidity

Between July 1, 2017, and June 30, 2018, Edgewood Water Company met Federal and State guidelines for turbidity by remaining within regulatory limits. The monthly maximum and mean turbidity measurements did not exceed 1.00 NTU (Figure 2.0). The highest turbidity reading for the 2017-2018 reporting year occurred on July 10, 2017, and was 0.92 NTU, greater than the 2016-2017 reporting year's maximum of 0.70 NTU. This maximum reading continues similar trends seen at Edgewood (Figure 2.1).

The weather on July 10, 2017, included sustained winds from the south-southwest of 6-23 mph with gusts of 29 mph (Table 5.1). Sustained high winds can contribute to an increased turbidity reading by creating waves that can cause a mixing effect. The highest mean turbidity readings, 0.32 NTU, occurred in the summer month of July, which can be correlated to the late spring runoff experienced in the Lake Tahoe Basin from a strong winter season of 2016-2017 (Table 6.0). The highest 90th percentile turbidity reading for the 2017-2018 reporting year also occurred in July 2017.

Table 6.0: Edgewood Water Company turbidity data summary, July 1, 2017, through June 30, 2018. Turbidity measurements are completed on samples collected daily from raw water at the Edgewood intake.

	Monthly max (NTU)	Date monthly max	Monthly mean (NTU)	Monthly median (NTU)	Monthly 90% (NTU)
Jul-17	0.92	10	0.32	0.30	0.40
Aug-17	0.41	18	0.23	0.22	0.30
Sep-17	0.40	30	0.22	0.20	0.30
Oct-17	0.34	21	0.20	0.20	0.30
Nov-17	0.45	4	0.20	0.15	0.30
Dec-17	0.45	12	0.25	0.23	0.34
Jan-18	0.30	23	0.16	0.15	0.26
Feb-18	0.60	3	0.19	0.16	0.26
Mar-18	0.28	10	0.16	0.14	0.24
Apr-18	0.29	7	0.15	0.18	0.22
May-18	0.45	26	0.19	0.18	0.28
Jun-18	0.44	25	0.27	0.25	0.36

Historically, Edgewood has maintained low turbidity measurements. The highest historical reading, 3.5 NTU, occurred in January of 1997 during a 100-year storm event. The maximum turbidity measurement, 0.92 NTU, for the 2017-2018 reporting year was greater than the previous reporting year's 0.70 NTU continuing the decreasing trend of maximum turbidity results over a ten year period. The annual mean turbidity measurement for 2017-2018 reporting

year was slightly higher than the previous reporting year, 0.21 NTU and 0.16 NTU respectively (Figure 2.1). The yearly mean turbidity data from 2007-2018 shows a stable trend.

Coliform

Edgewood Water Company met Federal and State guidelines for total coliform. The maximum total coliform count was 35.5 coliform-forming units (CFU), which occurred on October 25, 2017. The temperature on that day reached a high of 70° F, with a weekly mean temperature of 48° F. The increase in temperature paired with sustained winds of 2-8 mph with no gusts reported (Table 6.1, Table 5.6) likely contributed to the high reading. The highest monthly mean of total coliform, 19.45 CFU, also occurred in October 2017 (Table 6.2).

Total coliform was detected in 73% of the 156 samples analyzed, lower than the previous year's 75%. The annual mean total coliform count was 7.33 CFU, higher than the previous years 2.95 CFU. The median number increased to 5.20 CFU from 2.0 CFU in 2016-2017, and 90% of the samples were below 20 CFU (Table 6.1). The total coliform counts throughout the 2017-2018 reporting year were more abundant than the previous year, with a maximum reading of 35.5 CFU as compared to 20.3 CFU (Table 6.2, Figure 2.2, 2.3). Total coliform results over the past ten years show a decreasing linear trend in maximum readings, and a stable linear trend in annual mean (Figure 2.3).

Table 6.1: Edgewood Water Company annual source water total and E.coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the Edgewood Water Company intake.

	Total coliform (# colonies/100mL)	E.coli coliform (# colonies/100mL)
Mean	7.33	0.05
Median	5.20	0.00
Max	35.50	3.10
90th Percentile	19.90	0.00
Colony Forming Samples	114.00	6.00
Total Number of Samples	156.00	156.00

Edgewood Water Company also completed tests for E. coli coliform on all samples tested for total coliform. E. coli was detected in six samples during the 2017-2018 reporting year. The maximum E. coil coliform reading was 3.10 CFU, this result was taken in July of 2017. The annual mean E. coli coliform result was 0.05 CFU, and 90th percentiles of the samples for 2017-2018 were zero (Table 6.1).

Table 6.2: Edgewood Water Company monthly source water total and E. coli coliform data from July 1, 2017, through June 30, 2018. Analyses completed on samples collected from raw water at the Edgewood Water Company intake.

	Monthly maximum total coliform (# colonies/100mL)	Monthly mean total coliform (# colonies/100mL)	Monthly maximum E.coli coliform (# colonies/100mL)	Monthly mean E.coli coliform (# colonies/100mL)
Jul-17	21.60	8.13	3.10	0.26
Aug-17	21.60	12.39	0.00	0.00
Sep-17	21.80	14.53	0.00	0.00
Oct-17	35.50	19.47	1.00	0.08
Nov-17	27.50	17.07	1.00	0.07
Dec-17	12.20	6.83	0.00	0.00
Jan-18	9.70	3.93	1.00	0.06
Feb-18	7.50	1.75	0.00	0.00
Mar-18	7.50	1.30	1.00	0.08
Apr-18	2.00	0.31	0.00	0.00
May-18	3.10	0.66	0.00	0.00
Jun-18	2.00	0.42	1.00	0.08

Figure 2.0: Monthly mean and max turbidity results for Edgewood Water Company between July 1, 2017 and June 30, 2018.

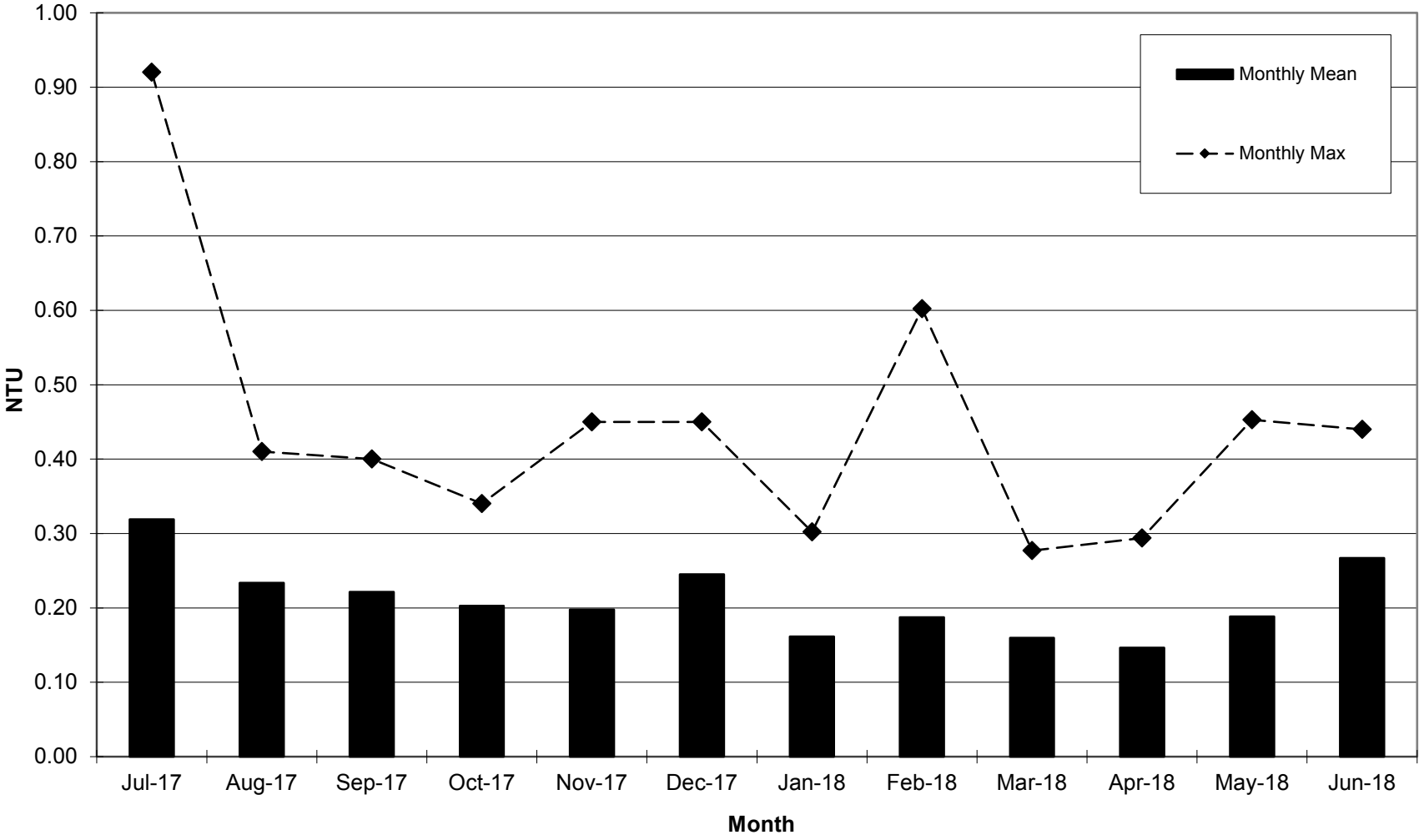


Figure 2.1: Yearly mean and max turbidity results for Edgewood Water Company between July 1, 2007 and June 30, 2018.

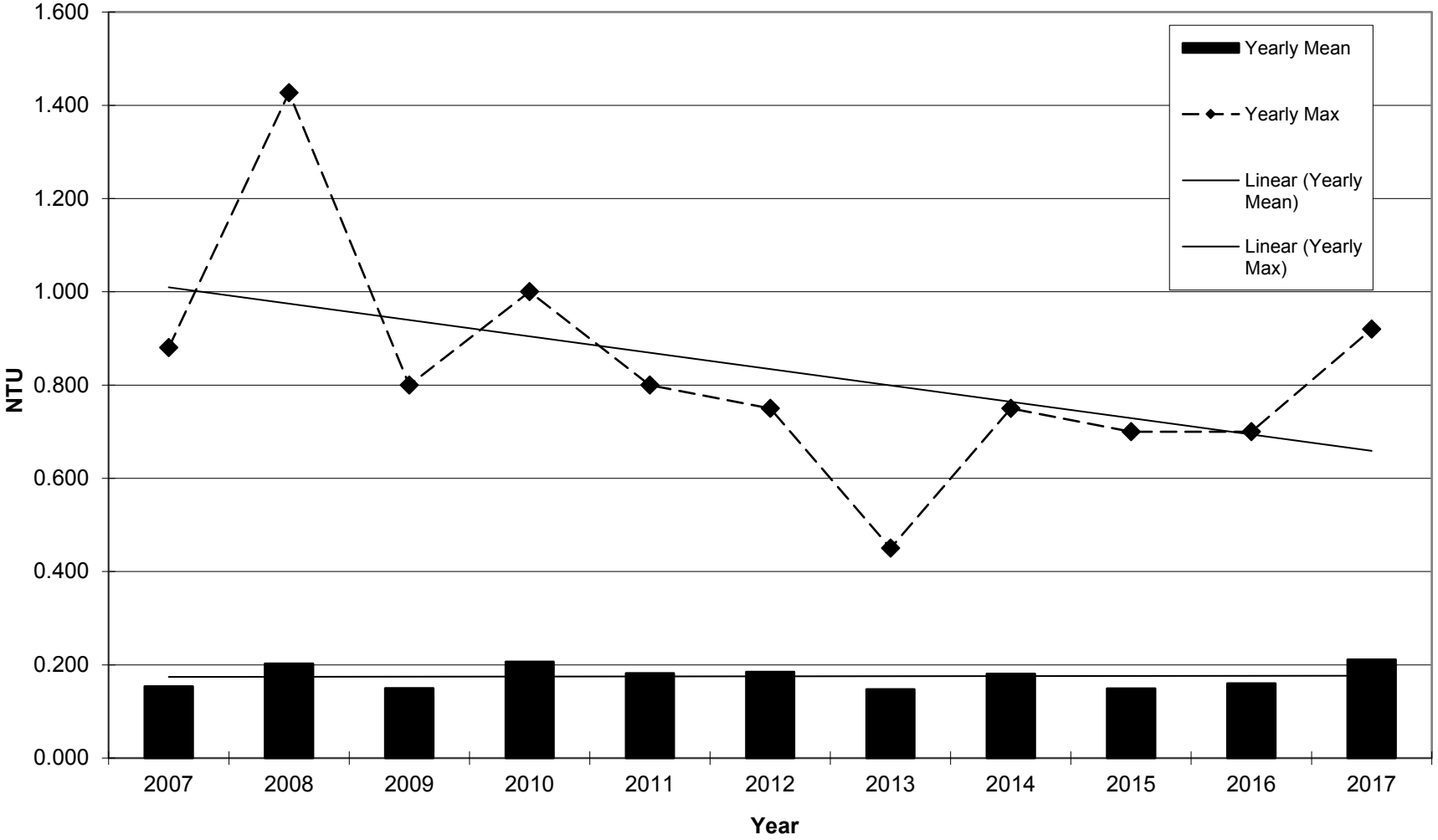


Figure 2.2: Monthly mean and max total coliform results for Edgewood Water Company between July 1, 2017 and June 30, 2018.

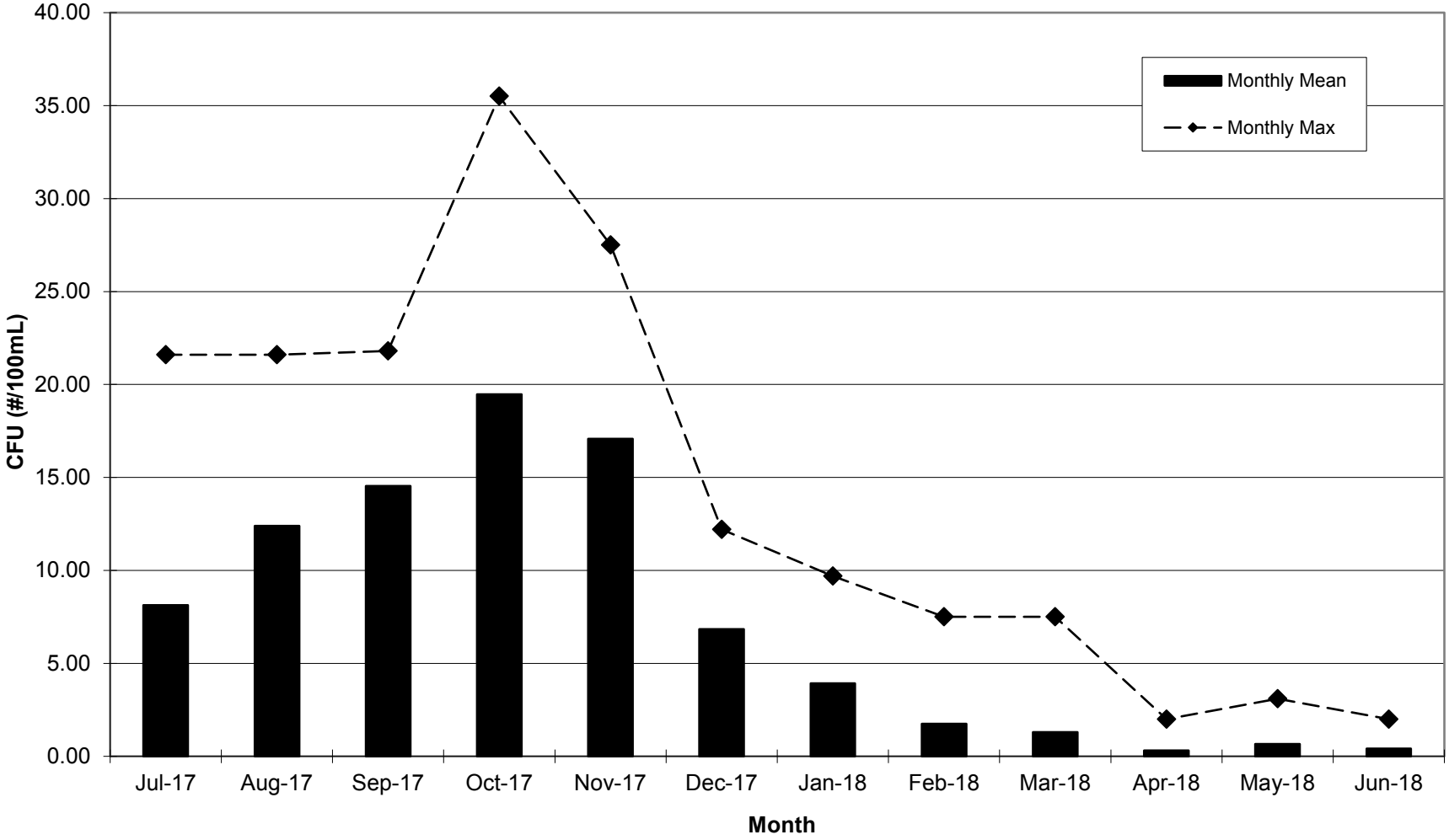
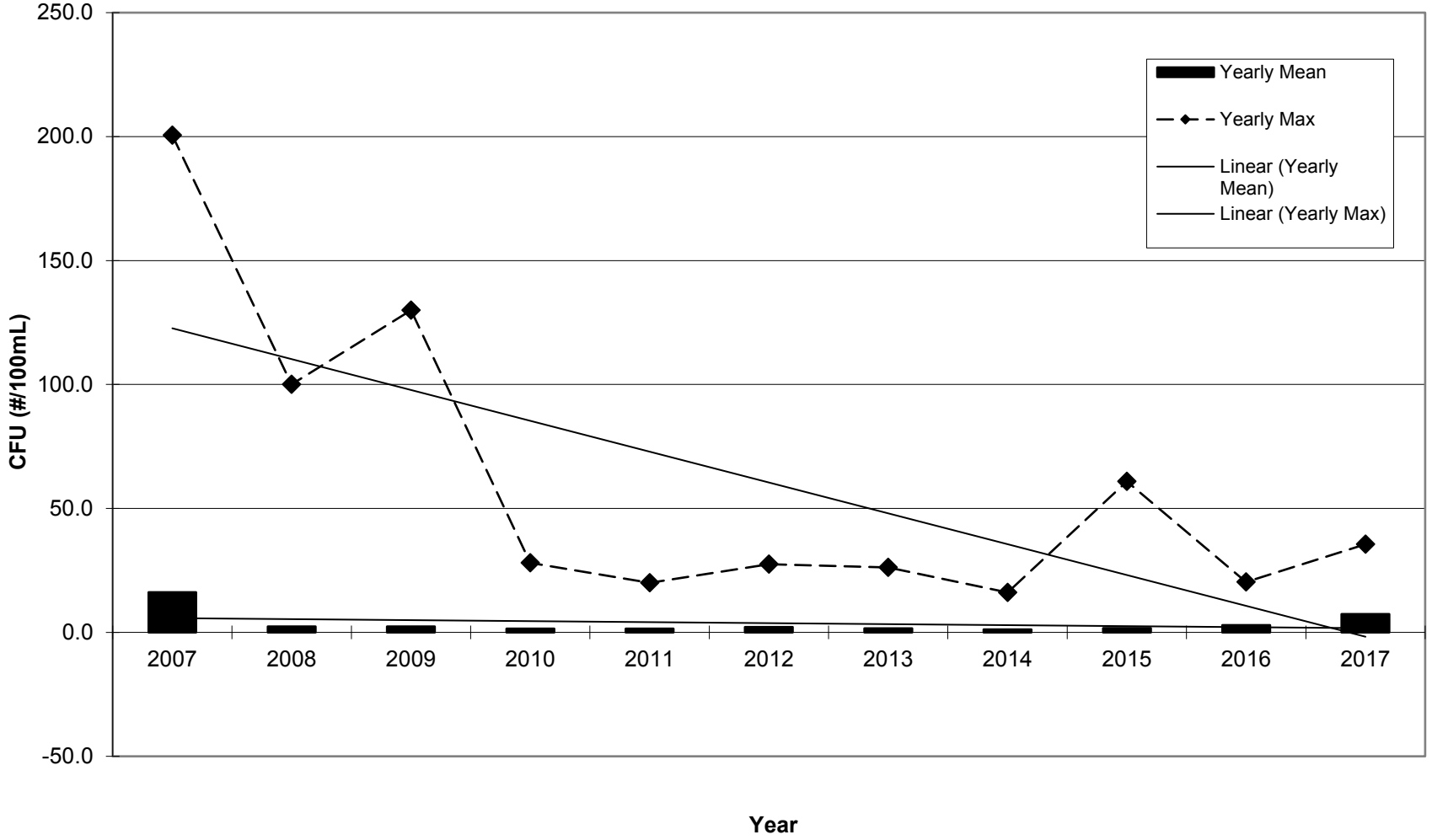


Figure 2.3: Yearly mean and max total coliform results for Edgewood Water Company between July 1, 2007 and June 30, 2018.



Consumer Confidence Report

The Edgewood Water Company

Is Not Required

To Produce a Consumer Confidence Report

Kingsbury General Improvement District
Water Quality Data Summary 2017-2018

During the 2017-2018 reporting year, Kingsbury General Improvement District (KGID) remained within Federal and State water quality requirements. During the same period, the Environmental Protection Agency (EPA) notes no violation of the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for KGID is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, KGID met Federal and State guidelines for turbidity by remaining within regulatory limits. The yearly maximum was 0.81 NTU during a winter storm on March 25, 2017, producing 0.1 inches of precipitation, with winds from the south-southeast of 6-15 mph and gusts up to 20 mph (Tables 5.1, 7.0). The annual mean turbidity result was 0.23 NTU (Table 5.0). The largest monthly mean turbidity, 0.26 NTU, occurred in October 2017 (Table 7.0, Figure 3.0).

Table 7.0: KGID source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the KGID intake.

	Monthly max (NTU)	Date monthly max	Monthly mean (NTU)	Monthly median (NTU)	90th percentile
Jul-17	0.41	27	0.23	0.20	0.31
Aug-17	0.29	22	0.21	0.21	0.24
Sep-17	0.48	13	0.24	0.23	0.27
Oct-17	0.70	27	0.26	0.24	0.33
Nov-17	0.46	19	0.25	0.23	0.29
Dec-17	0.30	29	0.22	0.21	0.29
Jan-18	0.67	31	0.24	0.21	0.26
Feb-18	0.50	19	0.20	0.18	0.24
Mar-18	0.81	25	0.18	0.14	0.30
Apr-18	0.54	14	0.25	0.23	0.38
May-18	0.34	10	0.20	0.19	0.22
Jun-18	0.48	6	0.23	0.23	0.28

Historically (1997-2003), KGID maintained annual mean source water turbidities less than 1.0 NTU. The maximum turbidity ranged from 2.59 NTU to 3.0 NTU between 2004 and 2006, returned to below 1.0 NTU in 2007, increased above 1.0 NTU again in 2008- 2010, dropped below 1.0 NTU in 2011 through 2016, and again for this reporting year. Maximum turbidity did rise about 4 NTU during the 2016-2017 reporting year; this increase has produced an increasing linear trend over the ten-year reporting period of July 1, 2007- June 30, 2018 (Figure 3.1). The annual mean turbidity, 0.23 NTU, for the 2017-2018 reporting year was slightly lower than the previous year, and annual mean turbidity is showing a stable linear trend over the ten-year reporting time (Figure 3.1).

Coliform

KGID met Federal and State guidelines for total coliform during the 2017-2018 reporting year. The maximum total coliform count was 144 coliform-forming units (CFU), below the 2016-2017

reporting year, and KGID historic maximum of 200.5 CFU. The maximum total coliform reading occurred on August 17, 2017; the temperature reached a daily maximum of 83°F and the weekly average temperature os 85°F. High temperatures paired with winds of 4-23 mph with gusts of 29 mph likely produced a mixing effect that likely influenced the maximum reading (Table 5.6). Total coliform was detected in 58% of the 155 samples analyzed, a decrease from 77% in the previous reporting year. The maximum total coliform reading of 144 CFU was the only result greater than 100 CFU, equaling 0.01 % of total samples, which is well below the regulatory limit of 10% of total readings above 100 CFU per reporting year. The annual mean total coliform count was 6.3 CFU, and the median number was 2 CFU (Table 7.1). The monthly mean total coliform results ranged between 0.20 CFU and 22.59 CFU (Table 7.2). The highest monthly mean total coliform results occurred in September 2017, likely impacted by summer water temperatures (Table 5.8, Figure 1.4 and Figure 3.2). Linear trendline data shows an increase in mean and maximum total coliform from 2007-2018 (Figure 3.3).

KGID also completed tests for E. coli coliform on 155 source water samples. During the 2017-2018 reporting year four sample tested positive for E. coli coliform with a maximum reading of 13.70 CFU present, giving KGID an E. coli coliform detect rate of 0.03%. Consequently, the yearly mean for E. coli coliform was 0.12 CFU, and the annual median E. coli coliform reading was 0.00 (Table 7.1).

Table 7.1: KGID annual source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the KGID intake.

	Total coliform (# colonies/100mL)	E. coli coliform (# colonies/100mL)
Mean	6.30	0.12
Median	2.00	0.00
Max	144.00	13.70
90th Percentile	15.00	0.00
Colony Forming Samples	90.00	4.00
Total Number of Samples	155.00	155.00

Table 7.2: KGID monthly source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Analyses completed on samples collected daily from raw water at the KGID intake.

	Monthly maximum total coliform (# colonies/100mL)	Monthly mean total coliform (# colonies/100mL)	Monthly maximum E.coli coliform (# colonies/100mL)	Monthly mean E.coli coliform (# colonies/100mL)
Jul-17	70.00	16.44	0.00	0.00
Aug-17	144.00	22.23	13.70	0.98
Sep-17	70.00	22.59	0.00	0.00
Oct-17	22.00	5.40	0.00	0.00
Nov-17	6.40	2.73	2.00	0.15
Dec-17	5.30	1.55	2.00	0.17
Jan-18	2.00	0.20	0.00	0.00
Feb-18	2.00	0.33	1.00	0.08
Mar-18	3.10	0.75	0.00	0.00
Apr-18	4.20	0.79	0.00	0.00
May-18	3.10	0.29	0.00	0.00
Jun-18	6.40	2.59	0.00	0.00

Figure 3.0: Monthly mean and max turbidity results for Kingsbury General Improvement District between July 1, 2017 and June 30, 2018.

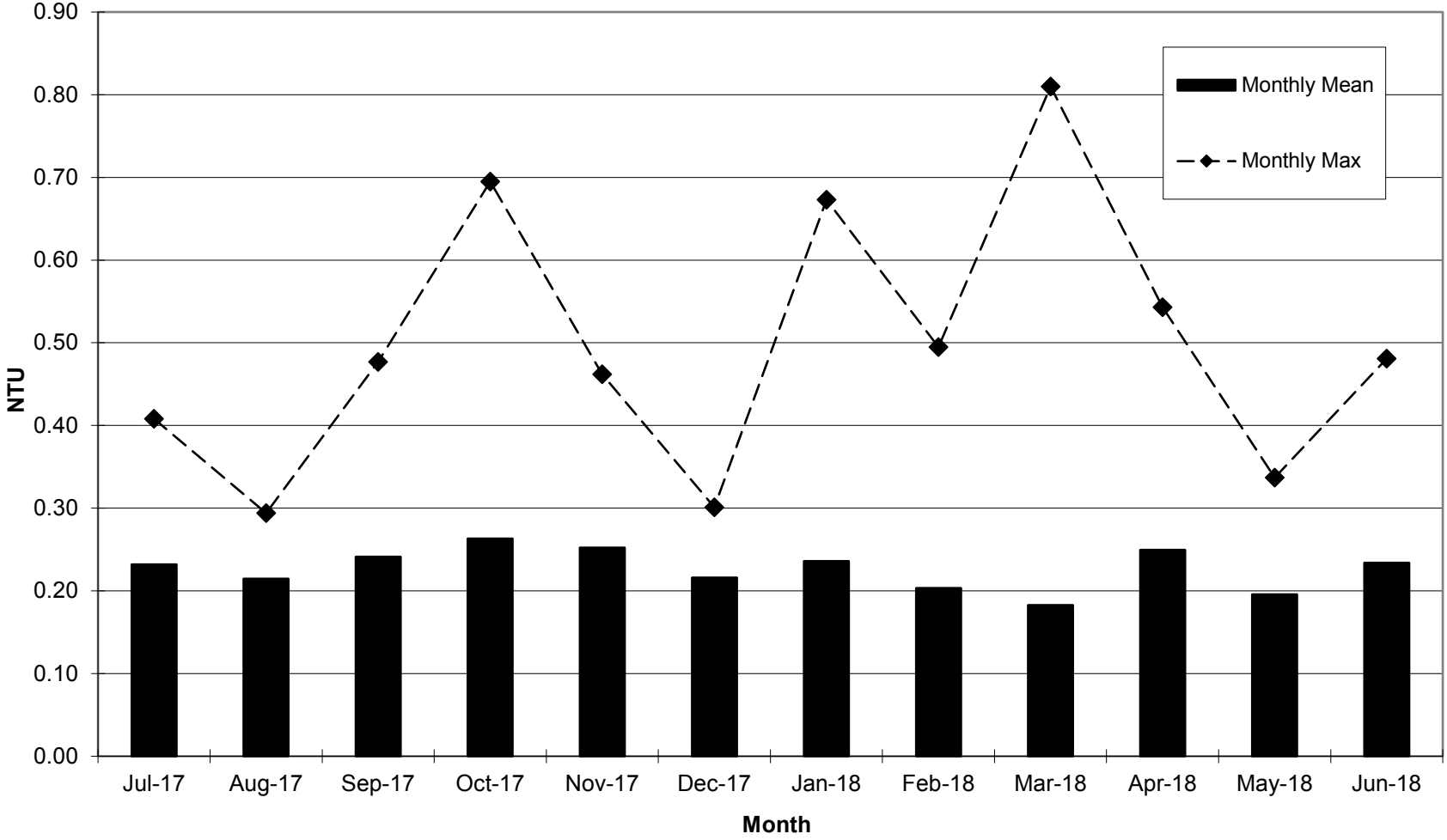


Figure 3.1: Yearly mean and max turbidity results for Kingsbury General Improvement District between July 1, 2007 and June 30, 2018.

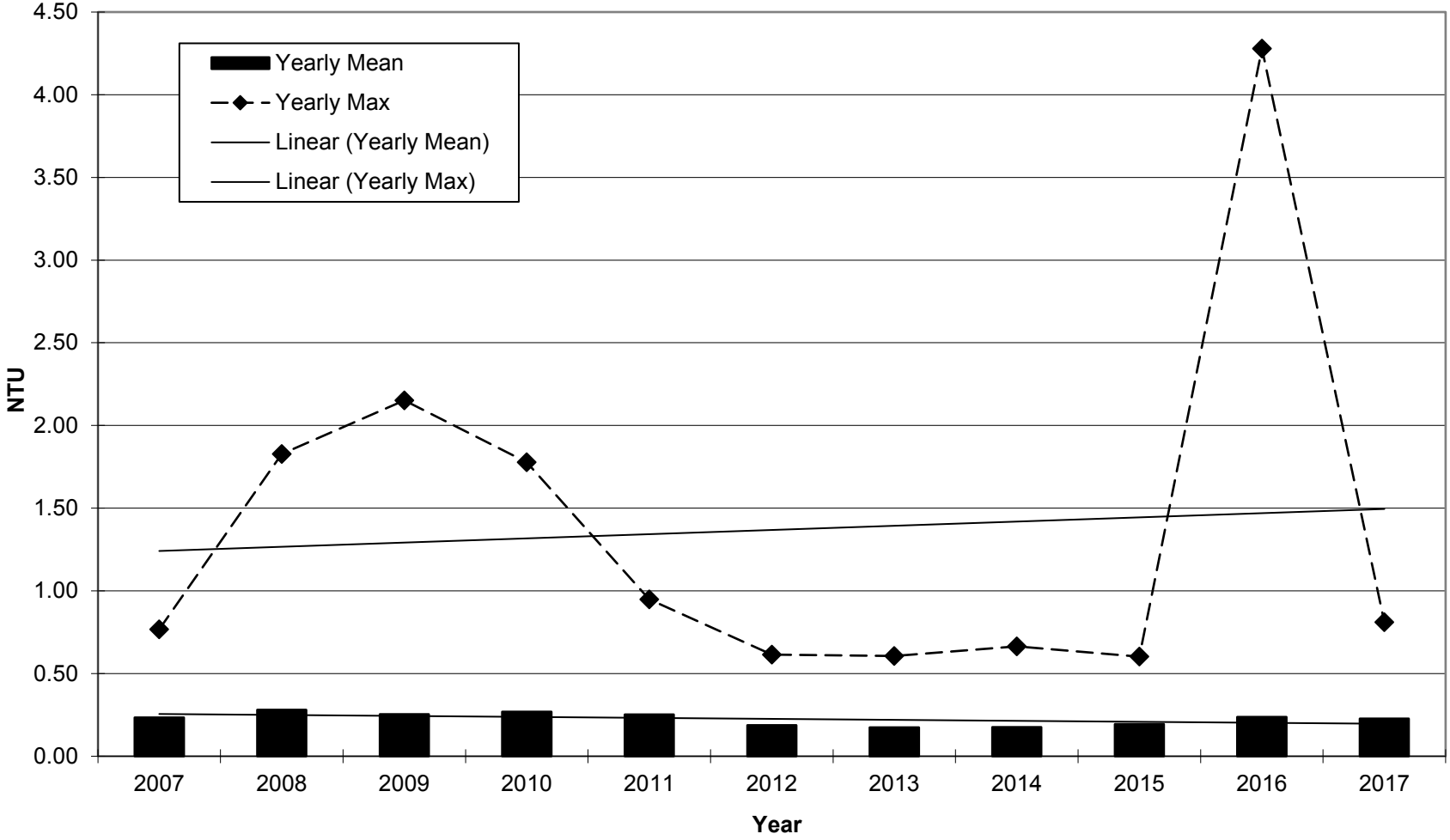


Figure 3.2: Monthly mean and max total coliform results for Kingsbury General Improvement District between July 1, 2017 and June 30, 2018.

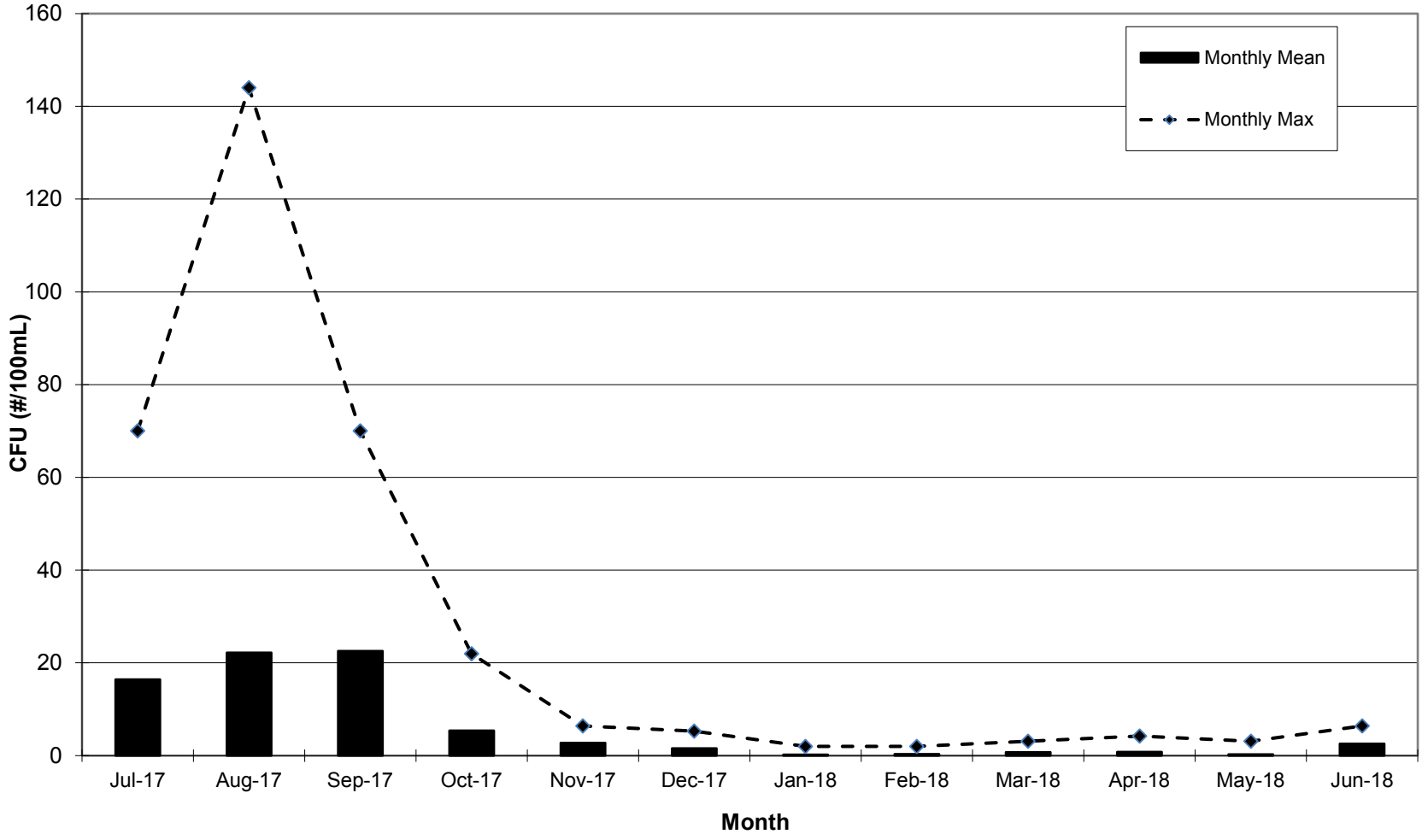
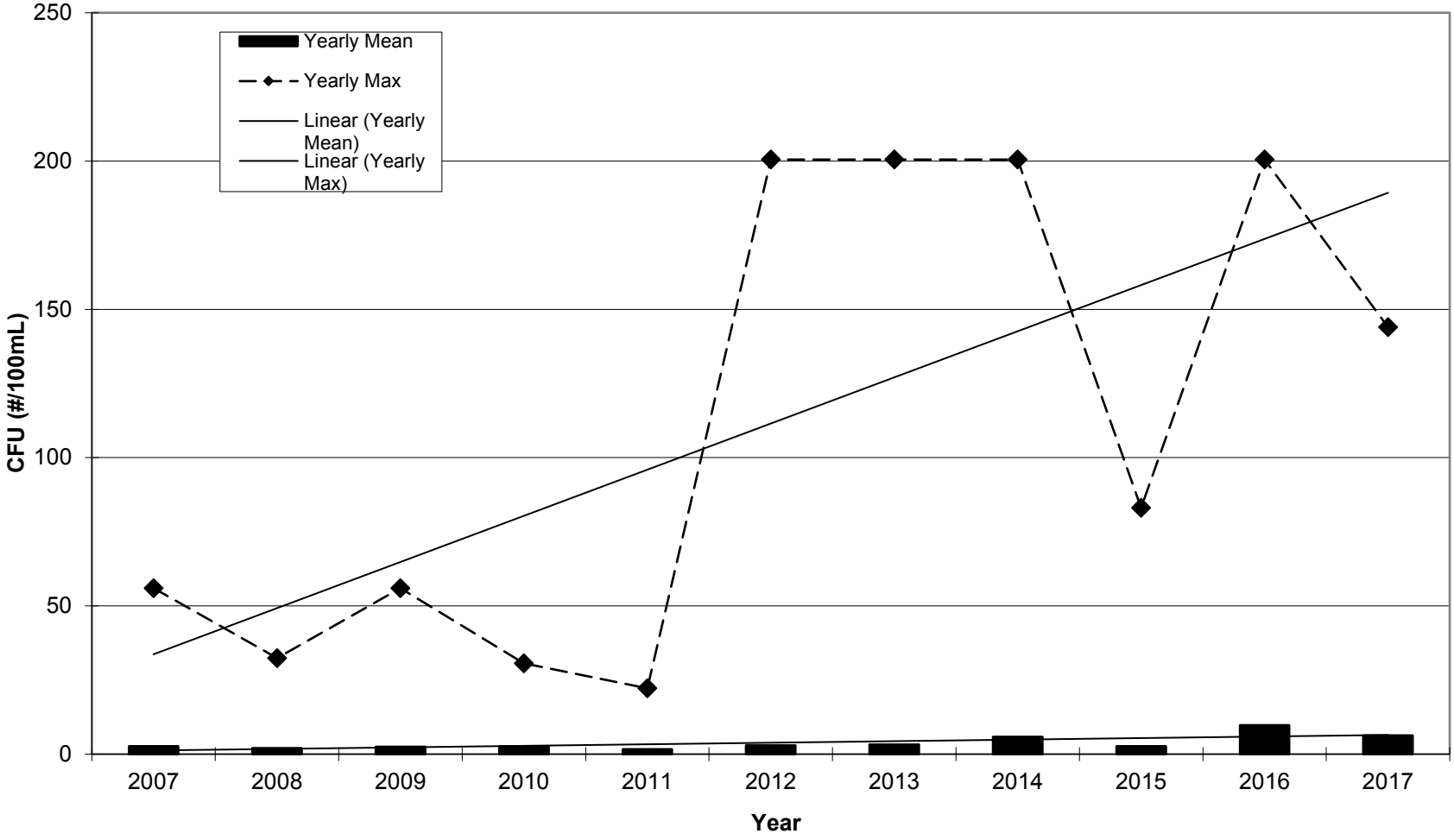


Figure 3.3: Yearly mean and max total coliform results for Kingsbury General Improvement District between July 1, 2007 and June 30, 2018.



2017 Consumer Confidence Report

Is my water safe?

We are pleased to present this year's Annual Water Quality Report (Consumer Confidence Report) as required by the Safe Drinking Water Act (SDWA). This report is designed to provide details about where your water comes from, what it contains, and how it compares to standards set by regulatory agencies. This report is a snapshot of last year's water quality. We are committed to providing you with information because informed customers are our best allies.

Do I need to take special precautions?

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Water Drinking Hotline (800-426-4791).

Where does my water come from?

Lake Tahoe

Source water assessment and its availability

Water from Lake Tahoe is considered moderately vulnerable to contamination by synthetic and inorganic contaminates and highly vulnerable to volatile organic contaminants and microbiological contamination. The water quality can be impacted by storm water and snow melt runoff, as well as recreational activities in and on the lake as well as on the beaches.

Why are there contaminants in my drinking water?

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's (EPA) Safe Drinking Water Hotline (800-426-4791). The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up

substances resulting from the presence of animals or from human activity:
microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife; inorganic contaminants, such as salts and metals, which can be naturally occurring or result from urban stormwater runoff, industrial, or domestic wastewater discharges, oil and gas production, mining, or farming; pesticides and herbicides, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses; organic Chemical Contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems; and radioactive contaminants, which can be naturally occurring or be the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA prescribes regulations that limit the amount of certain contaminants in water provided by public water systems. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water which must provide the same protection for public health.

How can I get involved?

Kingsbury GID is governed by an elected Board of Trustees, which normally meet on the third Tuesday of each month at 6:00 PM at the Kingsbury GID offices at 255 Kingsbury Grade Suite A, Stateline, NV 89449. Agendas are posted at the Stateline and Zephyr Cove Post Offices. The public is invited to attend any meetings and provide comment on issues being addressed by the Board. For further information contact the General Manager, Cameron McKay, at (775) 588-3548.

Water Conservation Tips

Did you know that the average U.S. household uses approximately 400 gallons of water per day or 100 gallons per person per day? Luckily, there are many low-cost and no-cost ways to conserve water. Small changes can make a big difference - try one today and soon it will become second nature.

- Take short showers - a 5 minute shower uses 4 to 5 gallons of water compared to up to 50 gallons for a bath.
- Shut off water while brushing your teeth, washing your hair and shaving and save up to 500 gallons a month.
- Use a water-efficient showerhead. They're inexpensive, easy to install, and can save you up to 750 gallons a month.
- Run your clothes washer and dishwasher only when they are full. You can save up to 1,000 gallons a month.
- Water plants only when necessary.
- Fix leaky toilets and faucets. Faucet washers are inexpensive and take only a few minutes to replace. To check your toilet for a leak, place a few drops of food coloring in the tank and wait. If it seeps into the toilet bowl without flushing, you have a leak. Fixing it or replacing it with a new, more efficient model can save up to 1,000 gallons a month.
- Adjust sprinklers so only your lawn is watered. Apply water only as fast as the soil can absorb it and during the cooler parts of the day to reduce evaporation.

- Teach your kids about water conservation to ensure a future generation that uses water wisely. Make it a family effort to reduce next month's water bill!
- Visit www.epa.gov/watersense for more information.

Cross Connection Control Survey

The purpose of this survey is to determine whether a cross-connection may exist at your home or business. A cross connection is an unprotected or improper connection to a public water distribution system that may cause contamination or pollution to enter the system. We are responsible for enforcing cross-connection control regulations and insuring that no contaminants can, under any flow conditions, enter the distribution system. If you have any of the devices listed below please contact us so that we can discuss the issue, and if needed, survey your connection and assist you in isolating it if that is necessary.

- Boiler/ Radiant heater (water heaters not included)
- Underground lawn sprinkler system
- Pool or hot tub (whirlpool tubs not included)
- Additional source(s) of water on the property
- Decorative pond
- Watering trough

Source Water Protection Tips

Protection of drinking water is everyone's responsibility. You can help protect your community's drinking water source in several ways:

- Eliminate excess use of lawn and garden fertilizers and pesticides - they contain hazardous chemicals that can reach your drinking water source.
- Pick up after your pets.
- If you have your own septic system, properly maintain your system to reduce leaching to water sources or consider connecting to a public water system.
- Dispose of chemicals properly; take used motor oil to a recycling center.
- Volunteer in your community. Find a watershed or wellhead protection organization in your community and volunteer to help. If there are no active groups, consider starting one. Use EPA's Adopt Your Watershed to locate groups in your community, or visit the Watershed Information Network's How to Start a Watershed Team.
- Organize a storm drain stenciling project with your local government or water supplier. Stencil a message next to the street drain reminding people "Dump No Waste - Drains to River" or "Protect Your Water." Produce and distribute a flyer for households to remind residents that storm drains dump directly into your local water body.

Additional Information for Lead

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Kingsbury General Improvement District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead. If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Kingsbury GID is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead

Additional Information for Arsenic

While your drinking water meets EPA's standard for arsenic, it does contain low levels of arsenic. EPA's standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. EPA continues to research the health effects of low levels of arsenic which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

Water Quality Data Table

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of contaminants in water provided by public water systems. The table below lists all of the drinking water contaminants that we detected during the calendar year of this report. Although many more contaminants were tested, only those substances listed below were found in your water. All sources of drinking water contain some naturally occurring contaminants. At low levels, these substances are generally not harmful in our drinking water. Removing all contaminants would be extremely expensive, and in most cases, would not provide increased protection of public health. A few naturally occurring minerals may actually improve the taste of drinking water and have nutritional value at low levels. Unless otherwise noted, the data presented in this table is from testing done in the calendar year of the report. The EPA or the State requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not vary significantly from year to year, or the

system is not considered vulnerable to this type of contamination. As such, some of our data, though representative, may be more than one year old. In this table you will find terms and abbreviations that might not be familiar to you. To help you better understand these terms, we have provided the definitions below the table.

Contaminants	MCLG or MRDLG	MCL, TT, or MRDL	Detect In Your Water	Range		Sample Date	Violation	Typical Source
				Low	High			
Disinfectants & Disinfection By-Products								
(There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants)								
Bromate (ppb)	0	10	2	1	6.6	2017	No	By-product of drinking water disinfection
Chlorine (as Cl2) (ppm)	4	4	.6	.4	.96	2017	No	Water additive used to control microbes
Haloacetic Acids (HAA5) (ppb)	NA	60	12	3	30	2017	No	By-product of drinking water chlorination
TTHMs [Total Trihalomethanes] (ppb)	NA	80	13	8	18	2017	No	By-product of drinking water disinfection
Inorganic Contaminants								
Arsenic (ppb)	0	10	1	NA	NA	2017	No	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes
Cyanide (ppb)	200	200	50	NA	NA	2017	No	Discharge from plastic and fertilizer factories; Discharge from steel/metal factories
Fluoride (ppm)	4	4	.1	NA	NA	2017	No	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factories
Nitrate [measured as Nitrogen] (ppm)	10	10	.05	NA	NA	2017	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Nitrite [measured as Nitrogen] (ppm)	1	1	.05	NA	NA	2017	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
Sodium (optional) (ppm)	NA		8.2	NA	NA	2017	No	Erosion of natural deposits; Leaching
Microbiological Contaminants								
Turbidity (NTU)	NA	5	3.693	NA	NA	2017	No	Soil runoff
Radioactive Contaminants								

Contaminants	MCLG or MRDLG	MCL, TT, or MRDL	Detect In Your Water	Range Low	Range High	Sample Date	Violation	Typical Source
Uranium (ug/L)	0	30	1	NA	NA	2017	No	Erosion of natural deposits
Volatile Organic Contaminants								
Toluene (ppm)	1	1	.0005	NA	NA	2017	No	Discharge from petroleum factories

Contaminants	MCLG	AL	Your Water	Sample Date	# Samples Exceeding AL	Exceeds AL	Typical Source
Inorganic Contaminants							
Copper - action level at consumer taps (ppm)	1.3	1.3	.11	2016	0	No	Corrosion of household plumbing systems; Erosion of natural deposits
Inorganic Contaminants							
Lead - action level at consumer taps (ppb)	0	15	3	2016	1	No	Corrosion of household plumbing systems; Erosion of natural deposits

Unit Descriptions	
Term	**Definition**
ug/L	ug/L : Number of micrograms of substance in one liter of water
ppm	ppm: parts per million, or milligrams per liter (mg/L)
ppb	ppb: parts per billion, or micrograms per liter (µg/L)
NTU	NTU: Nephelometric Turbidity Units. Turbidity is a measure of the cloudiness of the water. We monitor it because it is a good indicator of the effectiveness of our filtration system.
NA	NA: not applicable
ND	ND: Not detected
NR	NR: Monitoring not required, but recommended.

Important Drinking Water Definitions	
Term	**Definition**
MCLG	MCLG: Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
MCL	MCL: Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
TT	TT: Treatment Technique: A required process intended to reduce the level of a contaminant in drinking water.
AL	AL: Action Level: The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.
Variances and	Variances and Exemptions: State or EPA permission not to meet an MCL or a treatment technique under

Important Drinking Water Definitions	
Exemptions	certain conditions.
MRDLG	MRDLG: Maximum residual disinfection level goal. The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
MRDL	MRDL: Maximum residual disinfectant level. The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
MNR	MNR: Monitored Not Regulated
MPL	MPL: State Assigned Maximum Permissible Level

For more information please contact:

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Tahoe City Public Utility District McKinney/Quail Water Quality Data Summary 2017-2018

The Tahoe City Public Utility District (TCPUD) operates numerous small water supply facilities for the northwest shore of Lake Tahoe, from Dollar Hill to the Rubicon area. The following TCPUD water quality data relates to the McKinney/Quail filtering surface water intake. The TCPUD reactivated the McKinney/Quail intake in August 2004 when groundwater supplies could not meet water supply demands. The TCPUD McKinney/Quail intake operates during the summer months only under a temporary permit issued by the California State Water Resources Control Board, Division of Drinking Water Programs.

Filtering water suppliers are only required to report source water turbidity; coliform data has also been provided for comparison to other systems. During the 2017-2018 reporting year, TCPUD McKinney/Quail remained in compliance with Federal and State water quality requirements of a filtering water supplier. During the same period, the Environmental Protection Agency (EPA) notes no violation of the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for TCPUD is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, TCPUD McKinney/Quail met Federal and State guidelines for turbidity by remaining within regulatory limits. The surface water intake was online from July 3, 2017, to October 25, 2017. The monthly maximum and mean turbidity measurements did not exceed 1.00 NTU (Figure 4.0). The highest turbidity reading for the 2017-2018 reporting year was 0.60 NTU on October 3, 2017, weather on that day included sustained winds of 2-13 mph from the north-northeast with gusts up to 22 mph (Table 5.3). The 2017-2018 reporting year maximum turbidity reading is the highest reading for TCPUD but remains below 1.00 NTU, and meets filtration exemption criteria. Linear Trendline data for the ten-year period of July 1, 2007 – June 30, 2018, shows an increasing trend (Figure 4.1).

Table 8.0: Tahoe City Public Utility District (TCPUD) McKinney/Quail source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the McKinney/Quail intake.

	Monthly Max (NTU)	Date Monthly Max	Monthly Mean (NTU)	Monthly Median (NTU)	Monthly 90%
Jul-17	0.40	8,9	0.25	0.22	0.31
Aug-17	0.30	6,20	0.23	0.23	0.27
Sep-17	0.41	23	0.27	0.27	0.34
Oct-17	0.60	3	0.27	0.25	0.37
Nov-17					
Dec-17					
Jan-18					
Feb-18			Intake Offline		
Mar-18					
Apr-18					
May-18					
Jun-18					

The 2017-2018 mean turbidity result was 0.25 NTU higher than the previous reporting years mean result of 0.21 NTU. The highest monthly mean turbidity was 0.27 NTU occurred in both September and October of 2017. TCPUD annual mean turbidity data from 2006-2017 shows a slightly increasing trend (Figure 4.1).

Coliform

TCPUD met Federal and State guidelines for total coliform during the 2017-2018 reporting year. The maximum total coliform count was 67 coliform-forming units (CFU), above the 5.1 CFU of the previous year (Figure 4.2). The maximum total coliform reading occurred during a wind event on September 5, 2017, with sustained winds of 2-23 mph and gusts of 43 mph creating wave action. The wind event was paired with a daily maximum temperature of 87^0F; an increase of 7^0 from the weekly mean temperature of 80^0F (Table 5.4). As discussed in Chapter III of this report, Lake Tahoe was influenced by spring sediment wash greater than the previous five years combined after the winter of 2016-2017[1], and an increase in water temperature, caused by the storage of heat due to the absence of deep mixing for the sixth year in a row[2]. The water temperature profile provided by the UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018[3] shows the water temperature at the depth of the TCPUD intake during September 2017 as 70^0F (Table 5.5, Figure 1.4). This combination of increased sedimentation and warm water temperatures likely provided an optimal environment for the presence of total coliform, and the maximum total coliform result recorded at TCPUD McKinney/Quail intake.

Total coliform was detected in 100% of the six samples analyzed, equaling the previous reporting year. The mean total coliform count was 3.7 CFU, and the median number was 18.2 CFU (Table 8.1). The highest monthly mean result occurred in September 2017, as was 39.95 CFU (Table 8.2). The 2017-2018 maximum total coliform reading of 67 CFU is the highest result for TCPUD, beating out the previous record of 53.0 in 2010 (Figure 4.3). Linear trendline data for the ten-year reporting period of July 1, 2007, to June 30, 2018, show an increasing trend in annual mean and maximum total coliform (Figure 4.3).

TCPUD also completed tests for E. coli coliform on six source water samples. During the 2017-2018 reporting year one E.coli coliform reading was recorded, in September 2017, the maximum E. coli coliform result was 1 CFU, and the annual mean 0.17CFU (Table 8.1). TCPUD had E.coli coliform in 16% of their samples, but only one colony was found within the record total coliform result discussed above.

[1] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.1,
[2] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.3
[3] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3

Table 8.1: TCPUD McKinney/Quail source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the McKinney/Quail intake.

	Total coliform (# colonies/100mL)	E. coli coliform (# colonies/100mL)
Mean	18.22	0.17
Median	12.15	0
Max	67.7	1
90th Percentile	39.95	1
Colony-Forming Samples	6	1
Total Number of Samples	6	6

Table 8.2: TCPUD monthly source water Total and E.coli Coliform data results from July 1, 2017, through June 30, 2018. Analyses completed on samples collected daily from raw water at the McKinney/Quail intake.

	Maximum Total Coliform (# colonies/100ml)	Mean Coliform (# colonies/100ml)	Maximum E.coli Coliform (# colonies/20ml)	Mean E.coli Coliform (# colonies/20ml)
Jul-17	2	2	0.00	0.00
Aug-17	12.20	12.20	0.00	0.00
Sep-17	67.70	39.95	1.00	0.50
Oct-17	12.10	7.60	0.00	0.00

Figure 4.0: Monthly Mean and Max Turbidity Results for Tahoe City Public Utility District between July 1, 2017 and June 30, 2018.

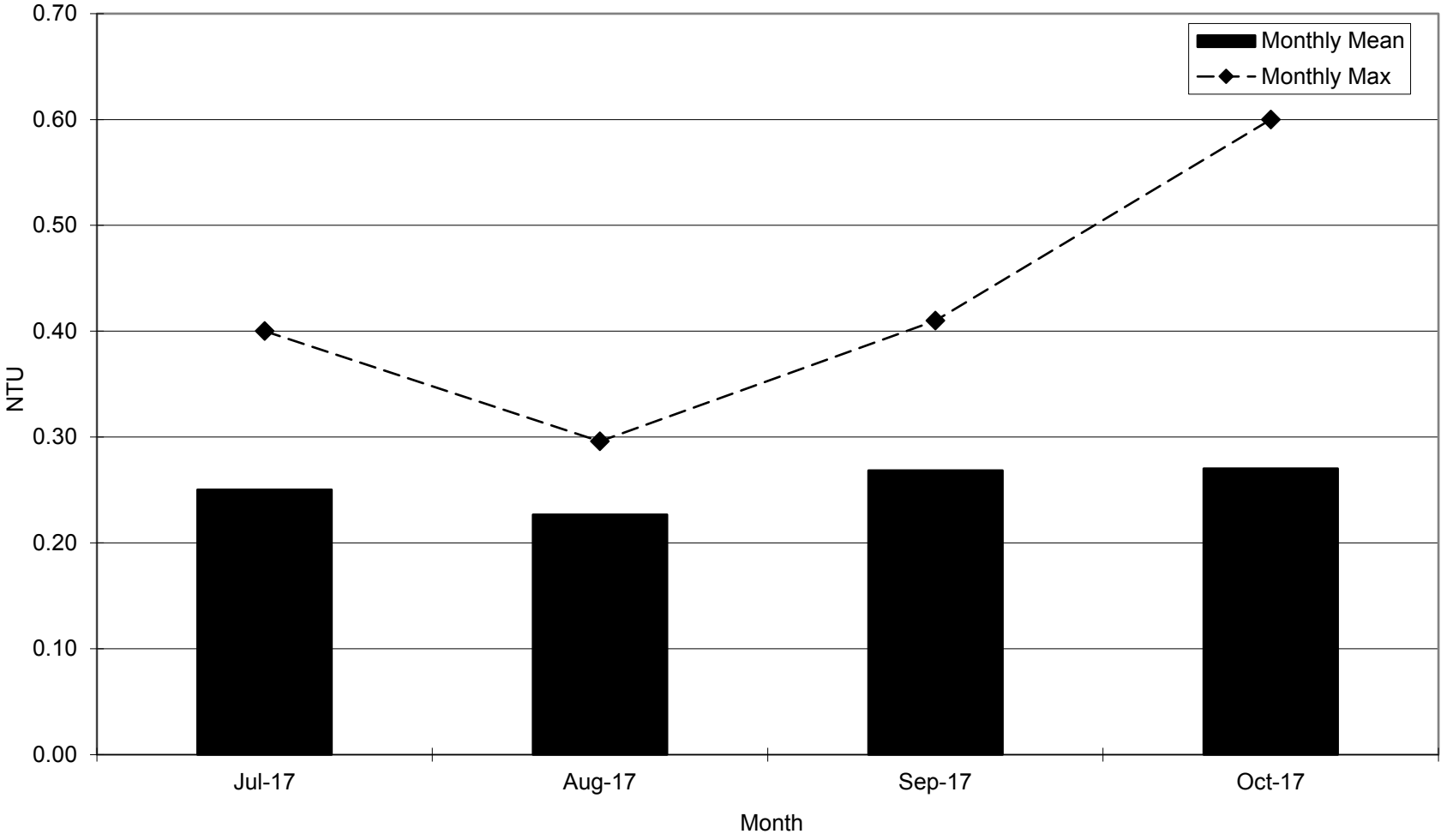


Figure 4.1: Yearly Mean and Max Turbidity Results forTahoe City Public Utility District between July 1, 2007 and June 30, 2018.

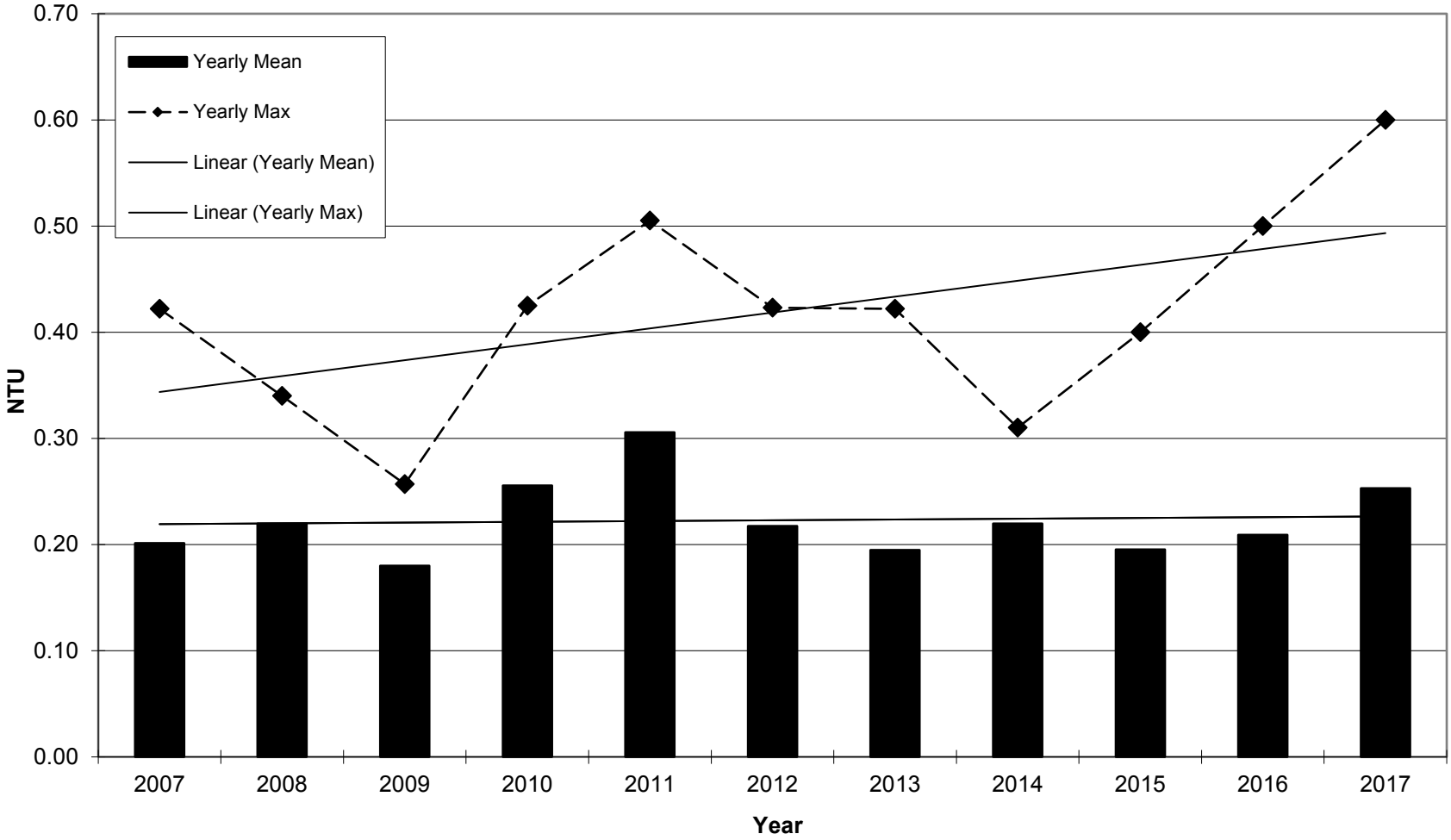


Figure 4.2: Monthly Mean and Max Total Coliform Results for TCPUD between July 1, 2017 and June 30, 2018.

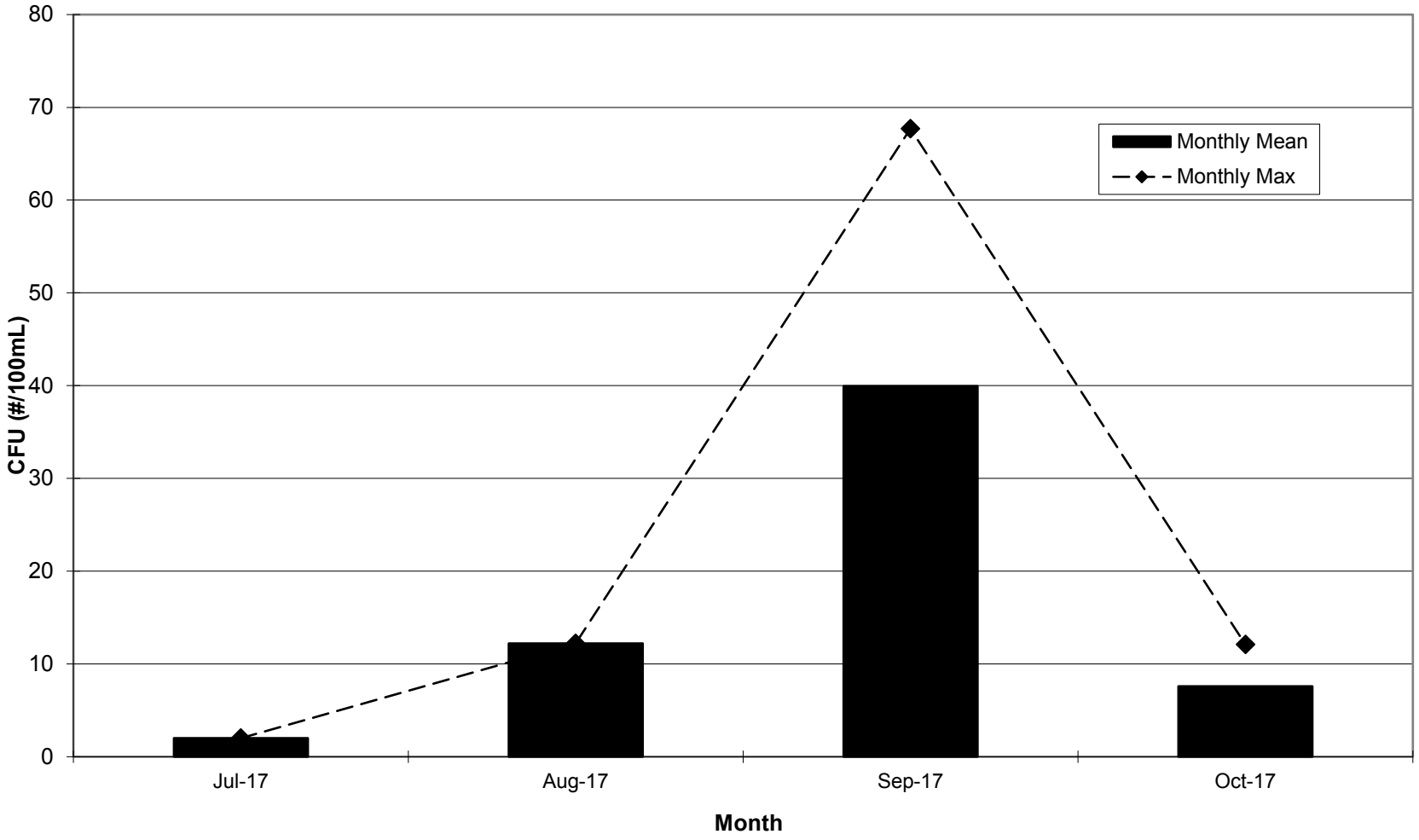
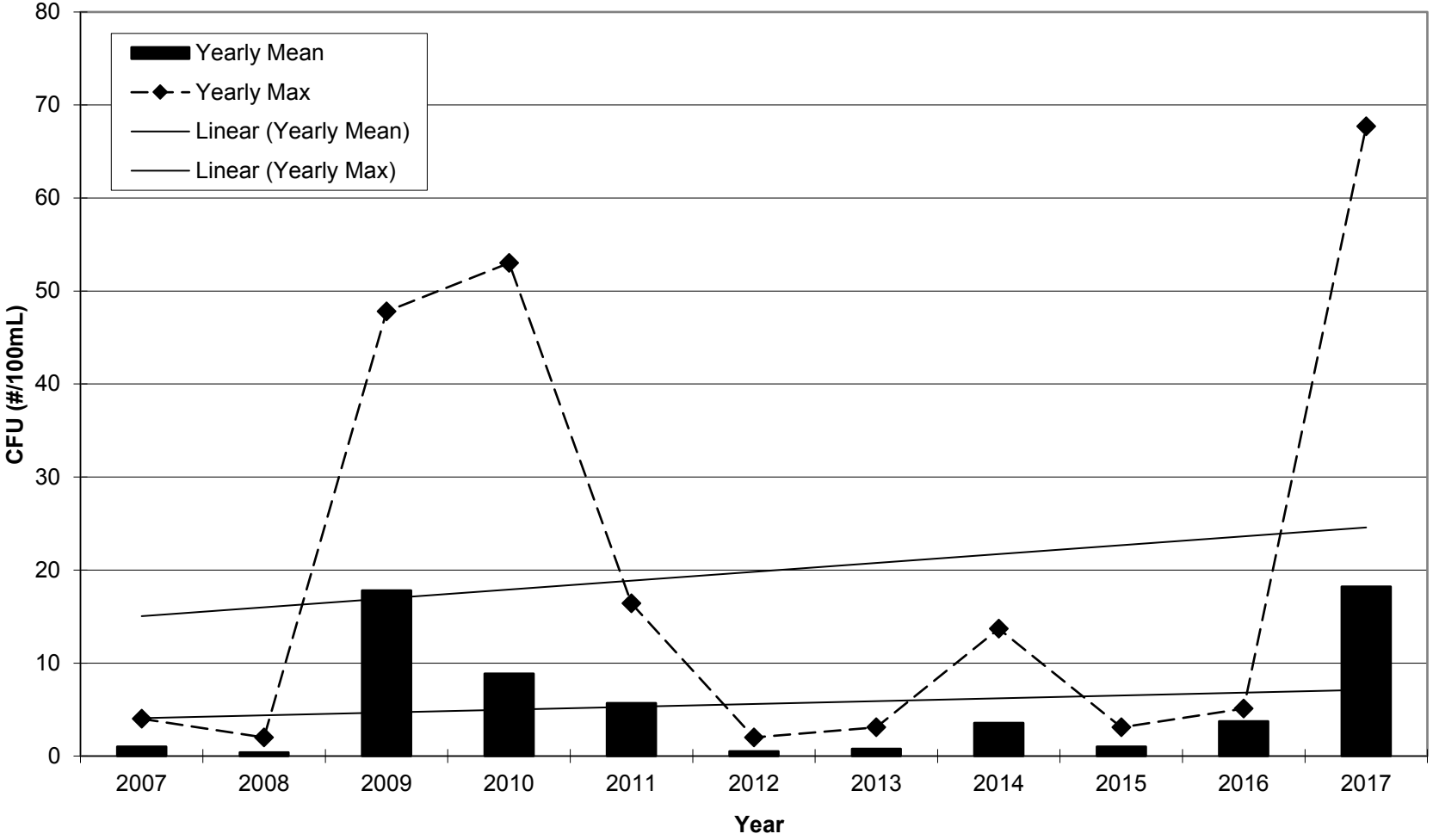


Figure 4.3: Yearly mean and max total coliform results for TCPUD between July 1, 2007 and June 30, 2018.



Tahoe City Public Utility District
2017 Annual Water Quality
Consumer Confidence Report

To Our Valued Customers:

The enclosed information is a report of the quality and laboratory analysis of the drinking water that we delivered to you over the calendar year 2017. The Tahoe City Public Utility District (TCPUD) is pleased to report that all systems, with the exception of Alpine Peaks, met all USEPA and State drinking water health standards. Alpine Peaks customers can refer to Page two for information on the temporary exceedance of Total Coliform, for which they have already been notified. On pages two and three you will find a table containing all detected contaminants in the water as well as general information on water quality, lead and copper sampling results, and different health effect language for various contaminants. Page four has a map showing sources and basic system locations as well as system identification information. This report can also be viewed at our website at: www.tcpud.org/ccr/current.pdf.

While TCPUD water is classified as either treated surface water or groundwater, it is important for you to understand all potential sources of drinking water. Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the U.S. EPA's Safe Drinking Water Hotline (1-800-426-4791). Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. U.S. EPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity. Contaminants that may be present in source water include:

- Microbial contaminants such as viruses and bacteria that may come from sewage treatment plants, septic systems and wildlife.
- Inorganic contaminants such as salts and metals that can be naturally occurring or result urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and Herbicides which may come from a variety of sources such as storm water runoff and residential uses.
- Organic chemical contaminants including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.
- Radioactive contaminants which can be naturally occurring or be the result of oil and gas production and mining activities.

In order to insure that tap water is safe to drink, U. S. EPA and the State Water Resource Control Board (State Board) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. State Board regulations also establish limits for possible contaminants in bottled water that provide the same protection for public health. This Consumer Confidence Report (CCR) reflects changes in drinking water regulatory requirements during 2017. All water systems are required to comply with the state Total Coliform Rule.

Should you have any questions on this report please call the Utilities Superintendent, Dan Lewis, at (530) 580-6330 or the Safe Drinking Water Hotline at (800) 426-4791 or on their website https://www.epa.gov/ground-water-and-drinking-water For general district info, expressing your views, or participating in the decision making process of the TCPUD please attend any or all of our Board of Directors meetings. The District Board of Directors meeting schedule and agendas are available on our website www.tcpud.org or may be requested from the District Clerk's office at (530) 580-6052.

Consumer Confidence Report

Detected Compounds The State allows us to monitor for some contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of our data, though representative, are more than one year old. If a substance or contaminant is not listed, it is either not detected above the detection limit in our sources or not required to be reported or sampled.

				Tahoe City Main						Alpine Peaks	Quail Lake / McKinney Shores		Rubicon System			Violation	Major Origins in Drinking Water
Identify your system >				Highlands Well #1	Highlands Well #2	T.C. #2 Well	T.C. #3 Well	T.C. #4 Well	Tahoe Tavern Well	Riley's Springs	Lake Tahoe Intake	Crystal Way Well	Rubicon Well #1	Rubicon Well #2	Rubicon Well #3		
Contaminant (Units)	Sample Year	MCL	PHG (MCLG)														
Primary Drinking Water Standards (PDWS)																	
Arsenic (ppb)	2014 (2017)	10	4	(3.7)	(2.3)	ND	(ND)	(ND)	ND	ND	ND	ND	ND	ND	ND	NO	Erosion of natural deposits
Nickel (ppb)	2014	100	12	20	20	20	21	ND	20	20	ND	ND	ND	ND	ND	NO	Erosion of natural deposits
Secondary Drinking Water Standards (SDWS)																	
Calcium (ppm)	2014 (2017)	N/A	N/A	7.6	7.5	12.3	10.2	(8.9)	16.7	10.1	7.9	11	8.8	10.2	8.1	N/A	Leaching from natural deposits
Chloride (ppm)	2014	500	N/A	0.5	0.6	0.5	0.3	ND	ND	0.2	1.8	0.3	0.3	3.0	1.1	NO	
Odor (TON)	2014 (2017)	1	3	ND	ND	ND	2	(0)	ND	ND	ND	ND	ND	ND	ND	NO	Naturally-occurring organic materials
Sodium (ppm)	2014 (2017)	N/R	N/R	14.6	11.6	5.0	5.2	(4.3)	5.3	2.9	6.0	4.4	6.6	6.7	5.4	N/A	Leaching from natural deposits
Specific Conductance [E.C.] (uS)	2014 (2017)	1600	N/A	215	189	164	160	(110)	217	115	99.2	119	111	127	78.8	NO	Substances that form ions when in water
Sulfate (ppm)	2014 (2017)	500	N/A	1.3	0.9	1.7	3.6	(2.5)	0.8	ND	1.7	0.5	ND	ND	5.4	NO	Runoff/leaching from natural deposits
Total Alkalinity [as CaCO3] (ppm)	2014 (2017)	N/A	N/A	93.5	87.3	69.3	66.7	(59)	93.7	53.0	45.3	54.6	44.8	47.6	38.9	NO	Leaching from natural deposits
Total Dissolved Solids (ppm)	2014 (2017)	1000	N/A	72	80	83	98	(100)	125	84	65	96	38	92	16	NO	Erosion of natural deposits
Total Hardness [as CaCO3] (ppm)	2014 (2017)	N/A	N/A	44	41	59	51	(43)	74	39	29	43	30	35	23	N/A	Leaching from natural deposits
Treatment Plant Turbidity (1)	2016 (2017)	TT 95% of samples < 0.5 NTU	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	(100% < 0.5 NTU)	N/A	N/A	N/A	N/A	NO	Movement of sediments and minute deposits
Turbidity (NTU)	2014 (2017)	5	N/A	0.25	0.45	0.17	0.23	(0.48)	0.19	0.16	0.19	0.13	0.15	0.55	0.15	NO	
Zinc (ppm)	2014 (2017)	5	N/A	ND	ND	ND	ND	(ND)	ND	ND	ND	ND	ND	ND	0.15	NO	Runoff/leaching from natural deposits
Radiological Monitoring																	
Radon 222 (pCi/L)	2003	N/A	N/A	547	1190	NS	1230	NS	1120	613	3360	465	613	513	422	N/A	Erosion of natural deposits
Disinfection Byproducts and Disinfectant Residuals																	
Total Trihalomethanes [TTHM] (ppb)	2017	80	N/A	ND						N/R	12.1		ND			NO	Byproduct of drinking water chlorination
Haloacetic Acids [HAA5] (ppb)	2017	60	N/A	ND						N/R	16		ND			NO	
Chlorine (ppm)	2017	4(MRDL)	4(MRDLG)	RAA: 0.42, RANGE: 0.20-0.68						N/A	RAA: 0.44 RANGE: 0.11-1.05		RAA: 0.40, RANGE: 0.00-0.62			NO	Drinking water disinfectant added for treatment
Microbiological Monitoring																	
Total Coliform (P /A)	2017	1	(0)	156T / 156A / 0P						38T/ 35A/ 3P	36T / 36A / 0P		24T / 24A / 0P			Yes (B)	Naturally present in the environment
E-Coli (P /A)	2017	1	(0)	156T / 156A / 0P						38T/ 38A/ 0P	36T / 36A / 0P		24T / 24A / 0P			NO	Human and Animal Fecal Waste

Lead and Copper Sampling Results

Water System	Constituent	Year Sampled	# of Sites Sampled	90th % Results	# of Sites Exceeding Action Level	Action Level	PHG
Tahoe City Main	Lead (ppb)	2016	20	1.20	0	15	0.2
	Copper (ppm)		20	0.11	0	1.3	0.3
Alpine Peaks	Lead (ppb)	2017	5	2.2	0	15	0.2
	Copper (ppm)		5	0.175	0	1.3	0.3
McKinney Quail	Lead (ppb)	2015	11	5.7	0	15	0.2
	Copper (ppm)		11	1.2	0	1.3	0.3
Rubicon	Lead (ppb)	2015	10	6.9	0	15	0.2
	Copper (ppm)		10	0.74	0	1.3	0.3
Zero schools requested Lead & Copper sampling in 2017.							
Typical Sources:	Lead: Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits						
	Copper: Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives						

B. **Note for Alpine Peaks System:** Coliforms are bacteria that are naturally present in the environment and are used as an indicator that other, potentially harmful, waterborne pathogens may be present or that a potential pathway exists through which contamination may enter the drinking water distribution system. We found coliforms indicating the need to look for potential problems in water treatment or distribution. When this occurs, we are required to conduct assessment(s) to identify problems and to correct any problems that were found during these assessments. During the past year we were required to conduct one Level 1 assessment which was completed which did not identify any definitive cause and corrective actions. However, the District did perform several preventative corrective actions based on potential causes for the presence of total coliforms.

Level 1 Assessment: A Level 1 assessment is a study of the water system to identify potential problems and determine (if possible) why total coliform bacteria have been found in our water system.

Health Effects and General Information

Lead: If present, elevated levels of lead can cause serious health problems, especially for pregnant women and your children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. TCPUD is responsible for providing high quality drinking water but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you do so, you may wish to collect the flushed water and reuse it for another beneficial purpose, such as watering plants. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/lead.

Arsenic: While your drinking water meets the federal and state standard for arsenic, it does contain low levels of arsenic. The arsenic standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. The U.S. Environmental Protection Agency continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

Radon: Radon is a radioactive gas that you cannot see, taste, or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes, and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will in most cases be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can lead to lung cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, test the air in your home. Testing is inexpensive and easy. You should pursue radon removal for your home if the level of radon in your air is 4 picocuries per liter of air (pCi/L) or higher. There are simple ways to fix a radon problem that are not too costly. For additional information, call your State radon program (1-800-745-7236), the USEPA Safe Drinking Water Hotline (1-800-426-4791), or the National Safety Council on Radon Hotline (1-800-767-7236).

Consumer Confidence Report

Tahoe City Public Utility District
P. O. Box 5249
Tahoe City, CA 96145
www.tcpud.org
530-583-3796

Save Our WATER
Californians Don't Waste

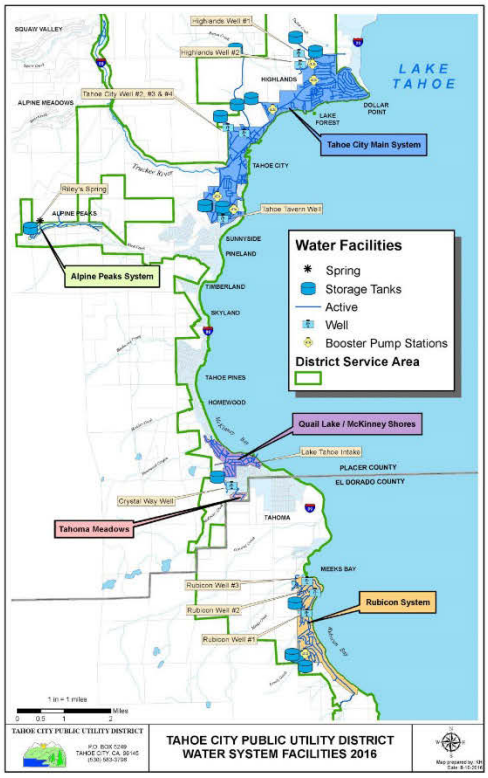
Terms and Abbreviations Used in This Report

(1)	Treatment Plant Turbidity results are for the McKinney Quail Water Treatment Plant only	P	Number of tests detecting presence of bacteria
A	Number of tests absent of bacteria	pCi/L	Picocuries Per Liter: Measure of radioactivity per 1 liter of water.
MCL	Maximum Contaminant Level: The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.	PDWS	Primary Drinking Water Standards. MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.
MCLG	Maximum Contaminant Level Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.	PHG	Public Health Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.
MRDL	Maximum Residual Disinfection Level: The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.	PPB	Parts Per Billion: Parts contaminant for every 1 billion parts of water.
		PPM	Parts Per Million: Parts contaminant for every 1 million parts of water.
MRDLG	Maximum Residual Disinfection Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.	RAA	Running Annual Average
		SDWS	Secondary Drinking Water Standards. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.
NA	Not Applicable	T	Number of tests for bacteria (Laboratory analysis)
ND	Not Detected: Indicates contaminant was not detected in the source water.	TON	Threshold Odor Number
N/R	Not Regulated or Not Required	TT	Treatment Technique: A required process intended to reduce the level of contaminant in drinking water.
NTU	Nephelometric Turbidity Unit: Measure of water clarity using light scattering	Units	Number of units measured
NS	Not Sampled	uS	Microsiemens: Measure of electrical current flow through a solution

Where does your water come from?

All of the drinking water supplied to each water system, with the exception of the Quail Lake/McKinney Shores system, is classified as groundwater. Sources include wells and springs drilled deep into the ground, providing clean, high quality water that consistently meets all standards without significant treatment. The Quail Lake/McKinney Shores water system is comprised of both a treated surface water source and a groundwater source. The Tahoe City Main system serves all residents from Dollar Point south to the Tahoe Tavern area. The Alpine Peaks system serves the area of Alpine Peaks only. The Quail Lake/McKinney Shore system serves the area of Chamberland, Chambers Landing, McKinney Shores, Moana Circle, and Tahoma Meadows area. Lastly, the Rubicon system serves the areas of Meeks Bay south to Bliss State Park. A Source Water Assessment for each active source was completed in 2003. The source(s) are considered most vulnerable to the following activities not associated with any detected contaminants: Sewer Collection Systems, Surface Water, Above Ground Storage Tanks, Transportation Corridors, Historic Gas Stations, and Water Supply Wells. There have been no contaminants detected in the water supply, however the sources are still considered vulnerable to the activities located near the drinking water source. Well construction and security measures should provide protection from most contaminating activities. Copies of all source water assessments are available for review at the TCPUD offices during regular business hours. Upon request, copies can be sent to individuals by contacting the Utilities Superintendent at (530) 580-6330.

Este informe contiene información importante sobre su agua potable. Traduzcalo o hable con alguien que lo entienda bien.



Incline Village General Improvement District
Water Quality Data Summary 2017-2018

During the 2017-2018 reporting year, the Incline Village General Improvement District (IVGID) remained in compliance with Federal and State water quality requirements. During the same period, the Environmental Protection Agency (EPA) notes no violation of the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for IVGID is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, IVGID met Federal and State guidelines for turbidity by remaining within the regulatory limits. The monthly mean and maximum turbidity measurements did not exceed 0.80 NTU (Figure 5.0).

The highest turbidity reading for the 2017-2018 reporting year was 0.76 NTU, coinciding with a wind event on November 27, 2017. The winter storm produced 0.06 inches of mixed rain and snow, paired with sustained West/Southwesterly winds of 2-10 mph with gusts up to 10 mph, which likely affected the turbidity results (Table 5.1). The highest monthly mean turbidity, 0.29 NTU, also occurred during November 2017 (Table 9.0, Figure 5.1).

Table 9.0: IVGID source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the IVGID intake.

Month	Monthly max (NTU)	Date monthly max	Monthly mean (NTU)	Monthly median (NTU)	90th percentile
Jul-17	0.31	5,18	0.20	0.19	0.29
Aug-17	0.20	2	0.14	0.21	0.29
Sep-17	0.49	27	0.17	0.155	0.18
Oct-17	0.56	23	0.19	0.17	0.18
Nov-17	0.76	27	0.29	0.18	0.61
Dec-17	0.50	14	0.14	0.12	0.15
Jan-18	0.69	24	0.17	0.14	0.16
Feb-18	0.67	18	0.17	0.13	0.23
Mar-18	0.63	3,27	0.18	0.12	0.30
Apr-18	0.26	16	0.17	0.16	0.21
May-18	0.24	27	0.18	0.18	0.22
Jun-18	0.60	17	0.18	0.15	0.20

IVGID's turbidity readings have not reached or exceeded 1.0 NTU since 2002. From 1997-2002, maximum IVGID turbidity readings ranged from 1.0 to 1.9 NTU. The yearly maximum, mean and median turbidity for the 2017-2018 reporting year were lower or equal to the previous reporting year (Figure 5.1). Linear trendline data shows an increase in annual maximum and mean turbidity for the IVGID drinking water intake from July 1, 2007 – June 30, 2018, with all results less than 1.0 NTU (Figure 5.1).

Coliform

IVGID met Federal and State guidelines for total coliform and E. coli coliform. The maximum total coliform count was 76 CFU, higher than the previous year's maximum of 16 CFU, and occurred on September 25, 2017 (Table 5.6). The total coliform spike was likely impacted by a 62°F high daily temperature, higher than the average weekly temperature of 46°F, as well as 2-12 mph sustained winds with gusts up to 18 mph (Table 9.1, Table 5.6).

As discussed in Chapter III of this report, Lake Tahoe was influenced by spring sediment wash greater than the previous five years combined after the winter of 2016-2017[1], and an increase in water temperature, caused by the storage of heat due to the absence of deep mixing for the sixth year in a row. The water temperature profile provided by the UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018[2] shows the water temperature at a depth of the IVGID intake during September 2017 as 70□F (Table 5.5, Figure 1.4). This combination of increased sedimentation and warm water temperatures likely provided an optimal environment for the presence of total coliform, and the maximum total coliform result recorded at IVGID.

Total coliform was detected in 13% of the 154 samples analyzed, higher than the 4% detection rate the previous year. Total coliform results show predictable patterns with no results during the winter months and higher results during warm summer months. Annual Total Coliform maximums show an increasing trend over the 10-year reporting period from July 1, 2007, to June 30, 2018 (Figure 5.3). The annual mean total coliform count was 1.95 CFU, an increase from last year's annual mean of 0.23 CFU (Table 5.8, Figure 5.3). The mean total coliform results show a slightly increasing linear trend for from 2007-2018 (Figure 5.3).

IVGID also completed tests for E. coli coliform on the 154 source water samples. E. coli coliform was detected in two samples during the 2017-2018 reporting year. Both results were taken during the warmer summer months of August 2017 and September 2017. E. coli coliform was detected in 1.23% of samples taken by IVGID, and the annual mean E. coli coliform result was 0.02 CFU (Table 9.1 and 9.2).

[1] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.1
[2] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3

Table 9.1: IVGID annual source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the IVGID intake.

	Total coliform (# colonies/100mL)	E. coli coliform (# colonies/100mL)
Mean	1.95	0.02
Median	0.00	0.00
Max	76.00	2.00
90th Percentile	5.00	0.00
Colony-Forming Samples	21.00	2.00
Total Number of Samples	154.00	154.00

Table 9.2: IVGID monthly source water total and E. coli coliform data result from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the IVGID intake.

	Monthly maximum total coliform (# colonies/100mL)	Monthly mean total coliform (# colonies/100mL)	Monthly maximum E.coli coliform (# colonies/100mL)	Monthly mean E.coli coliform (# colonies/100mL)
Jul-17	37.00	12.17	0.00	0.00
Aug-17	15.00	2.86	2.00	0.14
Sep-17	76.00	7.58	1.00	0.08
Oct-17	18.00	1.29	0.00	0.00
Nov-17	0.00	0.00	0.00	0.00
Dec-17	0.00	0.00	0.00	0.00
Jan-18	0.00	0.00	0.00	0.00
Feb-18	0.00	0.00	0.00	0.00
Mar-18	0.00	0.00	0.00	0.00
Apr-18	0.00	0.00	0.00	0.00
May-18	2.00	0.36	0.00	0.00
Jun-18	0.00	0.00	0.00	0.00

Figure 5.0: Monthly mean and max turbidity results for Incline Village General Improvement District between July 1, 2017 and June 30, 2018.

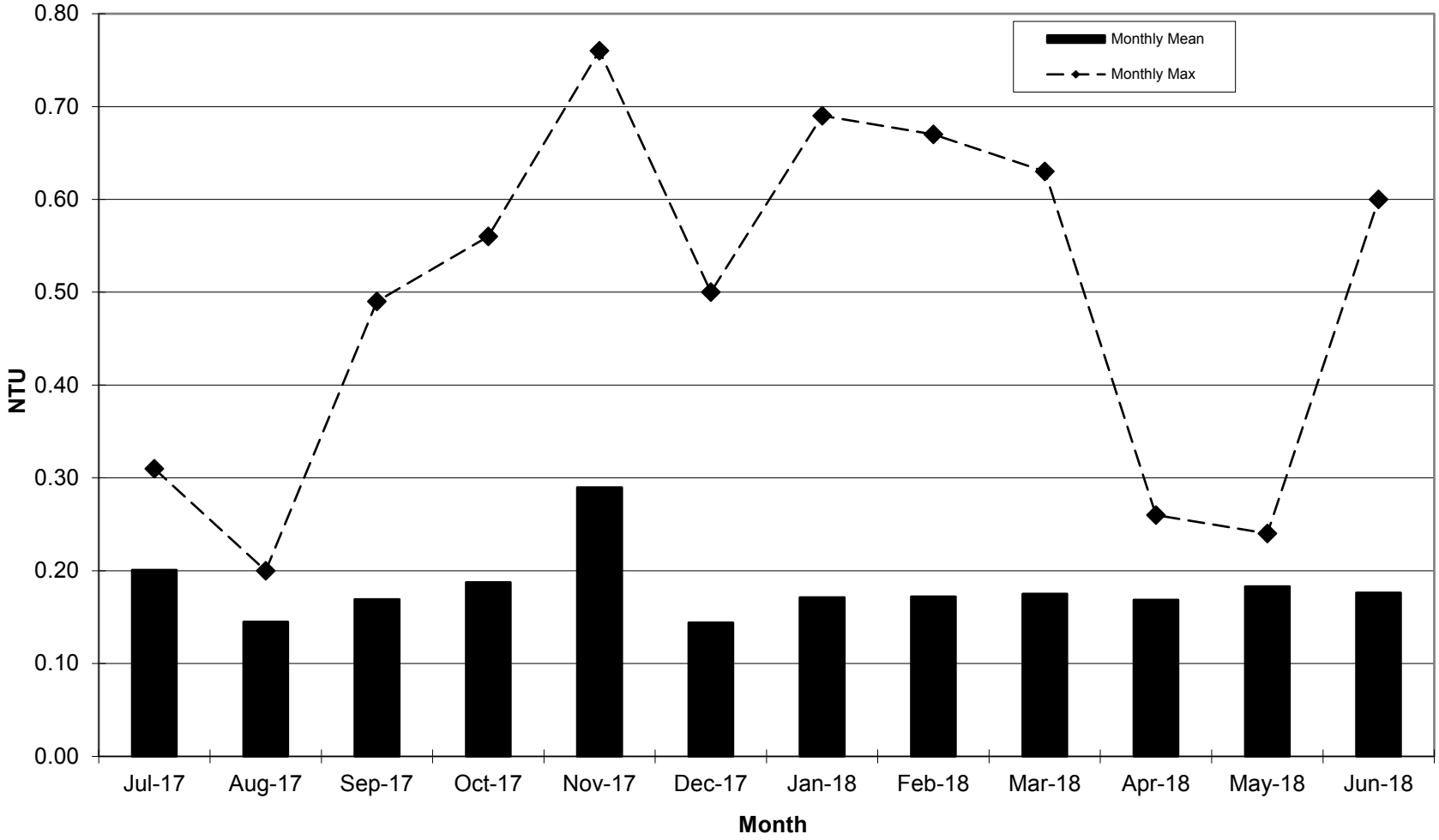


Figure 5.1: Yearly mean and max turbidity results for Incline Village General Improvement District between July 1, 2007 and June 30, 2018.

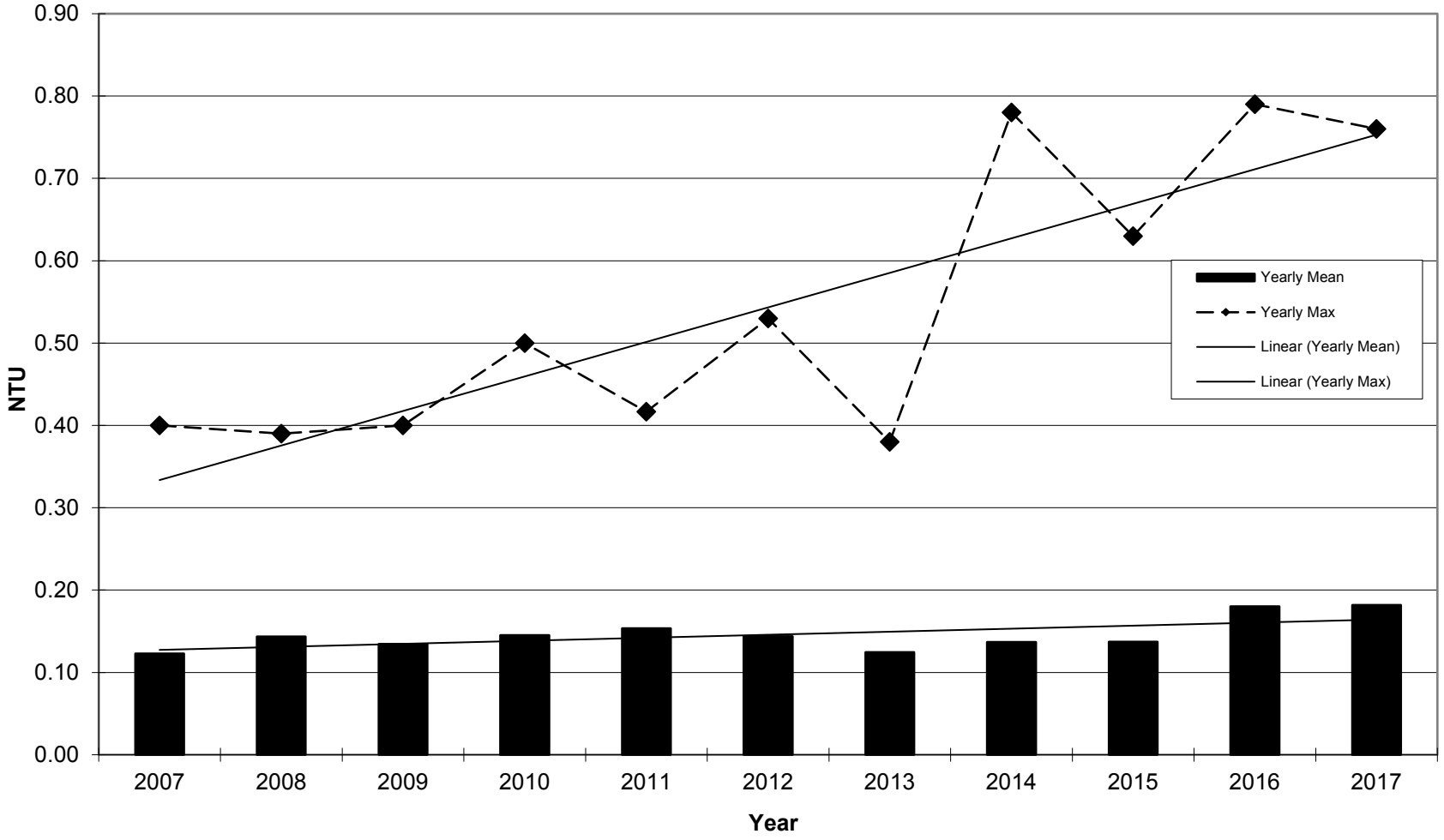


Figure 5.2: Monthly mean and max total coliform results for Incline Village General Improvement District between July 1, 2017 and June 30, 2018.

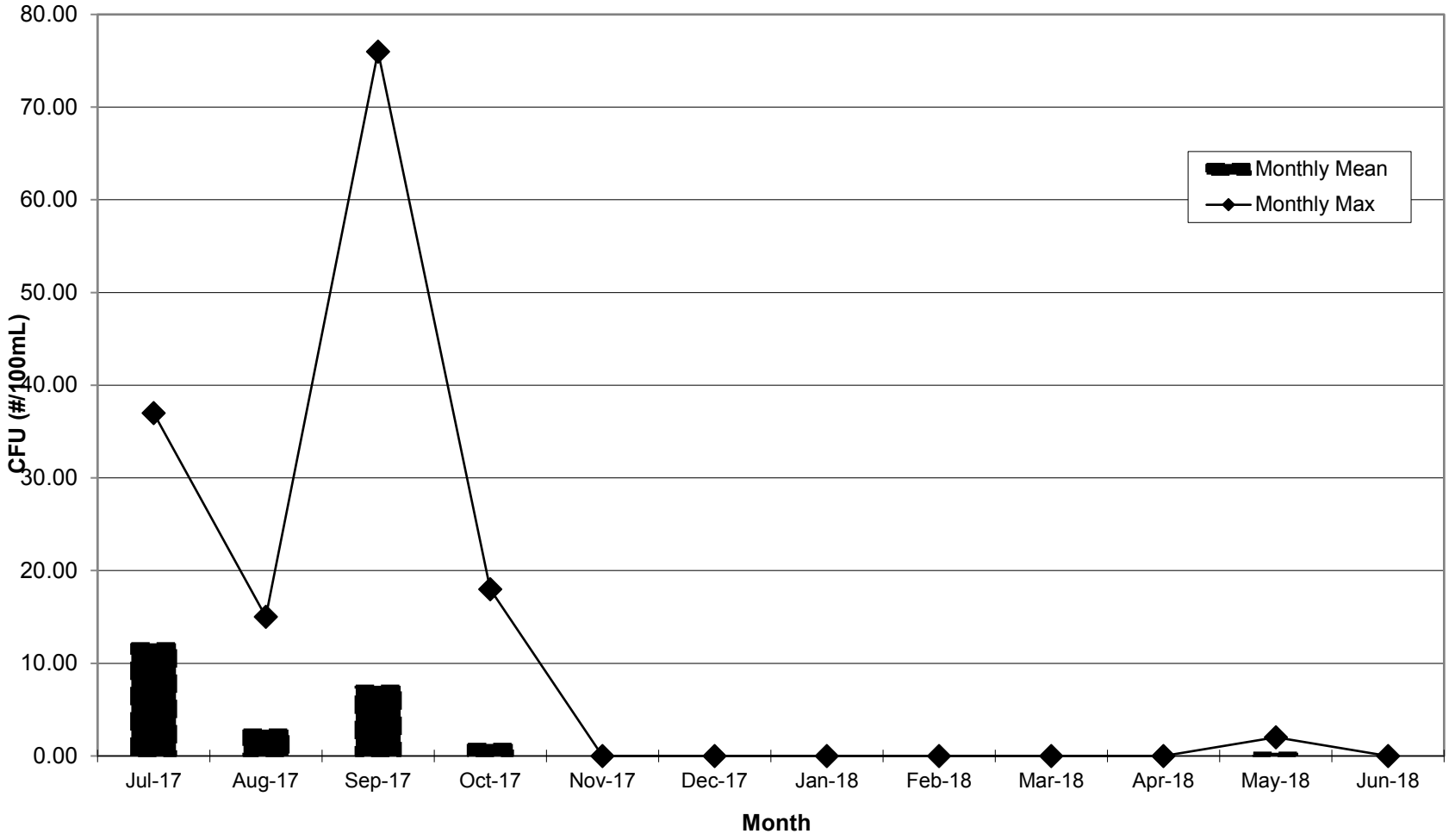
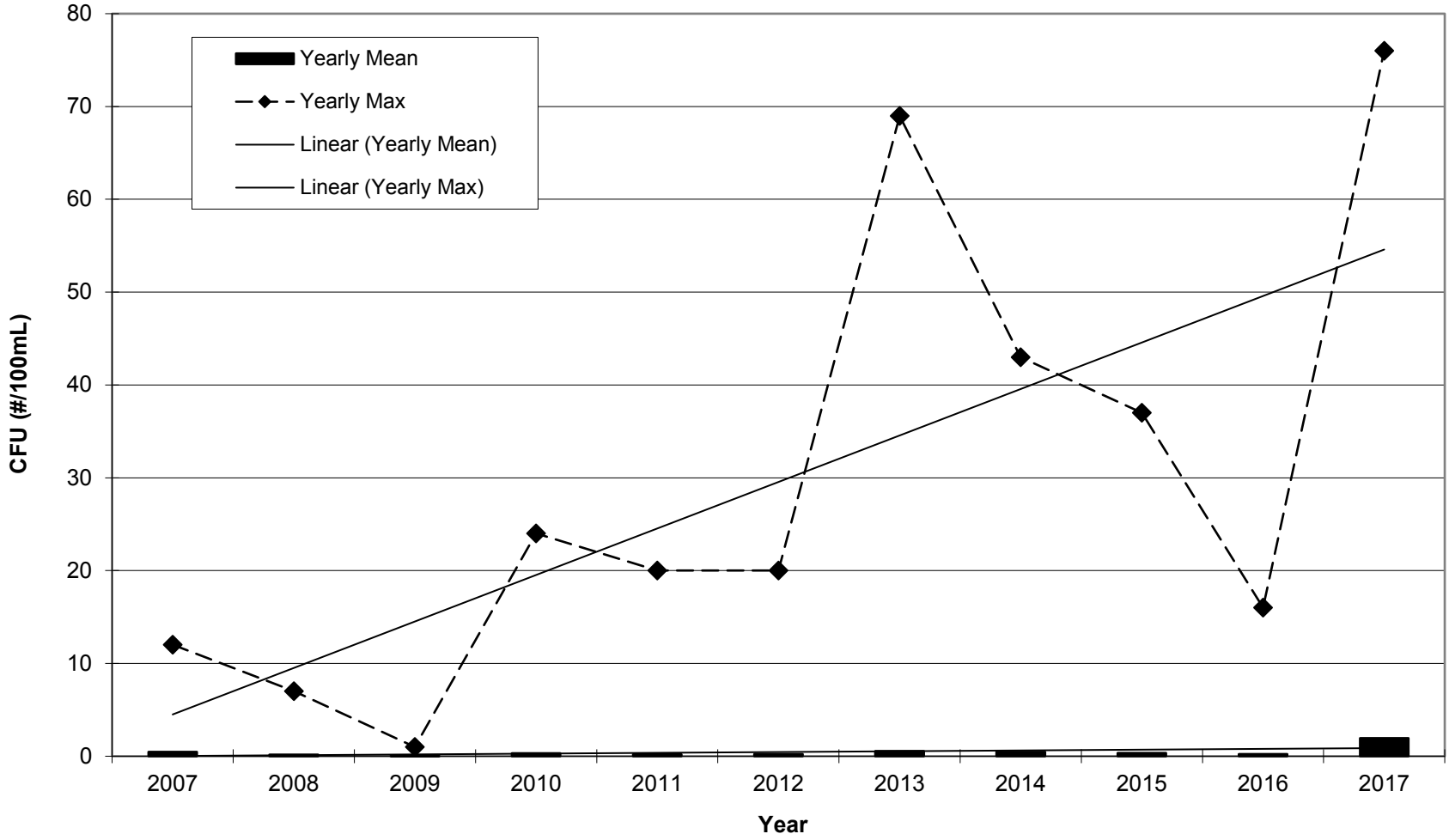


Figure 5.3: Yearly mean and max total coliform results for Incline Village General Improvement District between July 1, 2007 and June 30, 2018.



WATER QUALITY CONSUMER CONFIDENCE REPORT 2018

FOR CALENDAR YEAR 2017

INCLINE VILLAGE PUBLIC WORKS
1220 SWEETWATER ROAD, INCLINE VILLAGE NV 89451 . OFFICE HOURS M-F 8AM TO 4:30PM
P: (775)832-1203 . F: (775)832-1260 . PW@IVGID.ORG . WWW.IVGIDPUBLICWORKS.ORG

This brochure is a snapshot of the quality of the water that we provided last year. Included are the details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and Nevada state standards. We are committed to providing you with information because informed customers are our best allies. It is important that customers be aware of the efforts that are continually being made to improve their water systems.

For more information please contact:
Bob Lochridge at (775) 832-1223

SOURCE NAME	SOURCE WATER TYPE
Lake Tahoe Intake at Burnt Cedar Water Disinfection Plant	**Surface Water**

We add disinfectant to protect you against microbial contaminants. The Safe Drinking Water Act (SDWA) requires states to develop a Source Water Assessment (SWA) for each public water supply that treats and distributes raw source water in order to identify potential contamination sources. The state has completed an assessment of our source water. For results of the source water assessment, please contact us.

MESSAGE FROM THE EPA

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on the appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791) or visit www.epa.gov/safewater.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk.

More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791) or visiting the EPA website at www.epa.gov/safewater.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

CONTAMINANTS THAT MAY BE PRESENT IN SOURCE WATER BEFORE TREATMENT INCLUDE:

Microbial contaminants, such as viruses and bacteria, which may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
Inorganic contaminants, such as salts and metals, which can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
Pesticides and herbicides, may come from a variety of sources such as stormwater run-off, agriculture, landscaping and residential users.
Radioactive contaminants, which can be naturally occurring or the result of mining activity.
Organic contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, may also come from gas stations, urban stormwater run-off, and septic systems.

In order to ensure that tap water is safe to drink, the EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. We treat our water according to the EPA's regulations. Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water, which must provide protection for public health.

Our water system tested a minimum of 15 samples per month in accordance with the Total Coliform Rule for microbiological contaminants. Coliform bacteria are usually harmless, but their presence in water can be an indication of disease-causing bacteria. When coliform bacteria are found, special follow-up tests are done to determine if harmful bacteria are present in the water supply. If this limit is exceeded, the water supplier must notify the public by newspaper, television or radio.

Consumer Confidence Report

WATER QUALITY DATA - INCLINE VILLAGE GID

Public Water System (PWS) #NV0000158

The water provided to you is safe and high quality. Our tap water exceeds all national standards.
The tables below list all of the drinking water contaminants which were detected during the 2017 calendar year. The presence of these contaminants does not necessarily indicate the water poses a health risk. Unless noted, the data presented in this table is from the testing done January 1 - December 31, 2017. The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old.
Violations: During the 2017 calendar year, IVGID is required to include an explanation of any violations.
We are pleased to report to our customers that there were no drinking water violations.
The water provided to you is safe and of exceptional quality.
Health Information about Water Quality: There are no additional required health effects notices.

TERMS & ABBREVIATIONS

Maximum Contaminant Level Goal (MCLG): the "Goal" is the level of a contaminant in drinking water below which there is no known or expected risk to human health. MCLG's allow for a margin of safety.
Maximum Contaminant Level (MCL): the "Maximum Allowed" MCL is the highest level of a contaminant that is allowed in drinking water. MCL's are set as close to the MCLG's as feasible using the best available treatment technology.
Action Level (AL): the concentration of a contaminant that, if exceeded, triggers treatment or other requirements that a water system must follow.
Treatment Technique (TT): a treatment technique is a required process intended to reduce the level of a contaminant in drinking water.
Maximum Residual Disinfectant Level (MRDL): the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG): the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.
mg/L: milligrams per liter
No Detected Results (ND): laboratory analysis indicates that the constituent is not present.
Parts per Million (ppm) or milligrams per liter (mg/l)
Parts per Billion (ppb) or micrograms per liter (µg/l)
Picocuries per Liter (pCi/L): picocuries per liter is a measure of the radioactivity in water.
Millirems per Year (mrem/yr): measure of radiation absorbed by the body.
Million Fibers per Liter (MFL): million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.
Nephelometric Turbidity Unit (NTU): nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.
pH: pH is a measure of the acidity or basicity of an aqueous solution. Pure water is said to be neutral, with a pH close to 7.0 at 25 °C (77 °F). Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline.
TDS: Total Dissolved Solids is a measure of the combined content of all inorganic and organic substances contained in a liquid.
TTHM: Total Trihalomethanes (bromoform, chloroform, bromodichloromethane, chlorodibromomethane)
RAA: running annual average.
Soft/Hard Water: Because it is the precise mixture of minerals dissolved in the water, together with the water's pH and temperature, that determines the behavior of the hardness, a single-number scale does not adequately describe hardness. However, the United States Geological Survey uses the following classification into hard and soft water: Classification by hardness in mg/L: Soft = 0 to 60; moderately hard = 61-120; hard = 121-180; very hard >180.

MONITORING AND TESTING RESULTS FOR INCLINE VILLAGE GID

Microbiological	Result	MCL	MCLG	Typical Source
ND = No detected results were found in the calendar year of 2017.				

Regulated Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
BARIUM	05/03/2017	0.012	0.012	ppm	2	2	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
ARSENIC	05/03/2017	2.1	2.1	ppb	10	0	Erosion of natural deposits. Run-off from orchards. Runoff from glass and electronics production wastes
FLUORIDE Naturally occurring; Fluoride is NOT ADDED to IVGID tap water	04/05/2017	ND = No detected results	ND	ppm	2	4	Erosion of natural deposits; Water additive which promotes strong teeth; Discharge from fertilizer and aluminum factory.
RADIONUCLIDES Gross Alpha including Radon & U	08/03/2016	0.8	0.8	pCi/L	15	0	Decay of natural and manmade deposits.

Disinfection By-Products	Monitoring Period	RAA	Range	Unit	MCL	MCLG	Typical Source
TOTAL HALOACETIC ACIDS (HAA5)	2017	7	4.4-7.1	ppb	60	0	By-product of drinking water disinfection.
TTHM	2017	18	7-25.1	ppb	80	0	By-product of drinking water chlorination.

LEAD and COPPER	Date	90th Percentile level detected / range		Unit	AL	Sites Over AL	Typical Source
COPPER, FREE	2014-16	0.059	.0086	ppm	1.3	0	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives.
LEAD	2014-16	2	1.5	ppb	15	0	Corrosion of household plumbing systems; Erosion of natural deposits.

Secondary Contaminants	Collection Date	Highest Value	Range	Unit	SMCL	MCLG	Typical Source
ALUMINUM	04/05/2017	ND	ND	MG/L	.2		
BROMATE	05/03/2017	4.5	1.9-4.5	ppb	10	1	By-product of drinking water ozonation and chlorination.
CALCIUM	10/05/2015	9.2	9.2	MG/L			
CHLORIDE	04/05/2017	4	4	MG/L	400		
COLOR	04/05/2017	0	0	CU	15		
HARDNESS	10/05/2015	34	34	MG/L	Total as CaCO3; 34 is soft water		
MAGNESIUM	04/05/2017	2.3	2.3	MG/L	150		
IRON	04/05/2017	0.068	0.068	MG/L	0.6		
PH	04/05/2017	8.82	8.82	pH	8.5		
PHENANTHRENE	07/08/2015	0.049	0.049	UG/L			
SODIUM	04/05/2017	10	10	MG/L	200	20	
SULFATE	04/05/2017	2.1	2.1	MG/L	500		
TDS	04/05/2017	55	55	MG/L	1000		
TEMPERATURE	04/05/2017	22.3	22.3	C			

COMMONLY ASKED QUESTIONS

Where does my drinking water come from?

The source of your drinking water is Lake Tahoe. Pumped directly out of the lake, your drinking water is first disinfected, then distributed through 90 miles of pipelines, stored in one of 13 water storage tanks and finally delivered to your property. Due to the high quality of our drinking water source, IVGID is not required to perform filtration. Our treatment system meets stringent national water quality standards through rigorous watershed management practices, extensive water quality monitoring and state-of-the-art ozone and ultraviolet disinfection with a chlorine residual.

How healthy is our drinking water?

Our drinking water is healthy and pleasant to drink!

The water tests well below the maximum contaminant level for both health and aesthetic contaminants. In 2012, 2013 and 2016, IVGID won the "Best Tasting Water in Nevada Award" from the Nevada Rural Water Association.

IVGID is a member of the Tahoe Water Suppliers Association (TWSA). This group provides a unified voice for source water protection in the Tahoe Basin. As purveyors of some of the finest drinking water in the United States, we encourage you to fill up a glass and **DRINK TAHOE TAP!**

To learn more about how you can protect the source of your drinking water, visit the TWSA website: www.TahoeH2O.org, the IVGID Public Works website: www.ivgidpublicworks.org, or call (775) 832-1284.

Does IVGID add fluoride to the drinking water?

No, fluoride is not added to IVGID's drinking water.

Should I be concerned about lead?

Your water meets State and federal requirements for lead. If present at elevated levels, this contaminant can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. IVGID'S water system is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Should I filter the water?

IVGID tap water is safe and pleasant to drink from the tap. If you have concerns about the tap water, a simple carbon block filter (pitcher or tap mount) will remove final traces of metals (from your plumbing), chlorine (a disinfectant required in municipal water distribution) and resolve any taste or odor issues.

What agencies set testing standards for drinking water?

In order to ensure that tap water is safe to drink, the EPA prescribes many regulations and testing requirements that limit the amount of certain contaminants in water provided by public water systems. The Food and Drug Administration (FDA) regulations establish limits for contaminants in bottled water. In general, the EPA standards for tap water are much more stringent than the FDA standards for bottled water.

How can I get involved?

The IVGID Board of Trustees meeting dates and times are posted on the Meeting & Agendas page of our website: www.yourtahoeplace.com/ivgid/board-of-trustees/meetings-and-agendas. To be emailed agendas for meetings send and email to: info@ivgid.org with the subject "Agenda."

ABOUT IVGID

The Incline Village General Improvement District, commonly referred to as IVGID, is a quasi-public agency established under Nevada Revised Statute, Chapter 318 and chartered to provide water, sewer, trash and recreation services for the unincorporated communities of Incline Village and Crystal Bay, Nevada. It is governed by an elected Board of Trustees which, acting on behalf of the electorate, sets policy and determines strategies to accomplish its charter. Both Incline Village and Crystal Bay, Nevada are located within Washoe County, the entity that had the authority to create IVGID.

¡ATENCIÓN!

Este folleto contiene información sobre la calidad de su agua potable y está disponible en espoñol. Por favor llame a (775)832-1203 para obtener una versión traducida.

Cave Rock/Skyland Water Utility District
Water Quality Data Summary 2017-2018

Cave Rock/Skyland Water Utility District (Cave Rock/Skyland) is a filtration supplier and is only required to report source water turbidity. During the reporting year, Cave Rock/Skyland remained in compliance with Federal and State water quality requirements for a filtering water supplier. During the same period, the Environmental Protection Agency (EPA) notes no violation of the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for Cave Rock/Skyland is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, Cave Rock/Skyland met Federal and State guidelines for turbidity by remaining within regulatory limits. The monthly maximum and mean turbidity measurements did not exceed .40 NTU. The highest turbidity reading for the 2017-2018 reporting year was 0.39 NTU and occurred November 13, 2017. A storm producing 0.20 inches of rain, paired with winds 12-28 mph from the south-southwest and gusts up to 36 mph, likely produced a mixing effect causing the maximum turbidity reading (Table 5.1). The annual mean turbidity for Cave Rock/Skyland was 0.23 NTU. The highest monthly mean turbidity was 0.27 NTU, which occurred twice in the reporting year, October 2017 and June 2018 (Table 10.0, Figure 6.0).

Table 10.0: Cave Rock/Skyland source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the Cave Rock/Skyland intakes.

	Monthly max (NTU)	Date monthly max	Monthly mean (NTU)	Monthly median (NTU)	90th Percentile
Jul-17	0.27	22	0.22	0.23	0.25
Aug-17	0.31	27	0.23	0.23	0.26
Sep-17	0.35	27	0.26	0.25	0.33
Oct-17	0.35	21	0.27	0.27	0.31
Nov-17	0.39	13	0.23	0.22	0.27
Dec-17	0.30	17	0.21	0.20	0.25
Jan-18	0.30	12	0.21	0.21	0.25
Feb-18	0.28	11	0.19	0.19	0.23
Mar-18	0.31	23	0.23	0.22	0.29
Apr-18	0.25	16	0.19	0.19	0.22
May-18	0.34	31	0.22	0.20	0.30
Jun-18	0.37	22	0.27	0.26	0.33

Historically, Cave Rock/Skyland has maintained turbidity measurements below the 5.0 NTU regulatory requirement for filtration exemption (Figure 6.1). The record maximum turbidity reading of 3.55 NTU occurred during the 2011-2012 reporting year. The annual maximum turbidity reading for the 2017-2018 reporting period is slightly lower than the previous reporting year. Linear trendline statistics show a decrease in maximum turbidity from July 1, 2007- June 30, 2018, though the mean turbidity measurements are showing an increasing trend (Figure 6.1).

Figure 6.0: Monthly mean and max turbidity results for Cave Rock and Skyland Water Districts between July 1, 2017 and June 30, 2018.

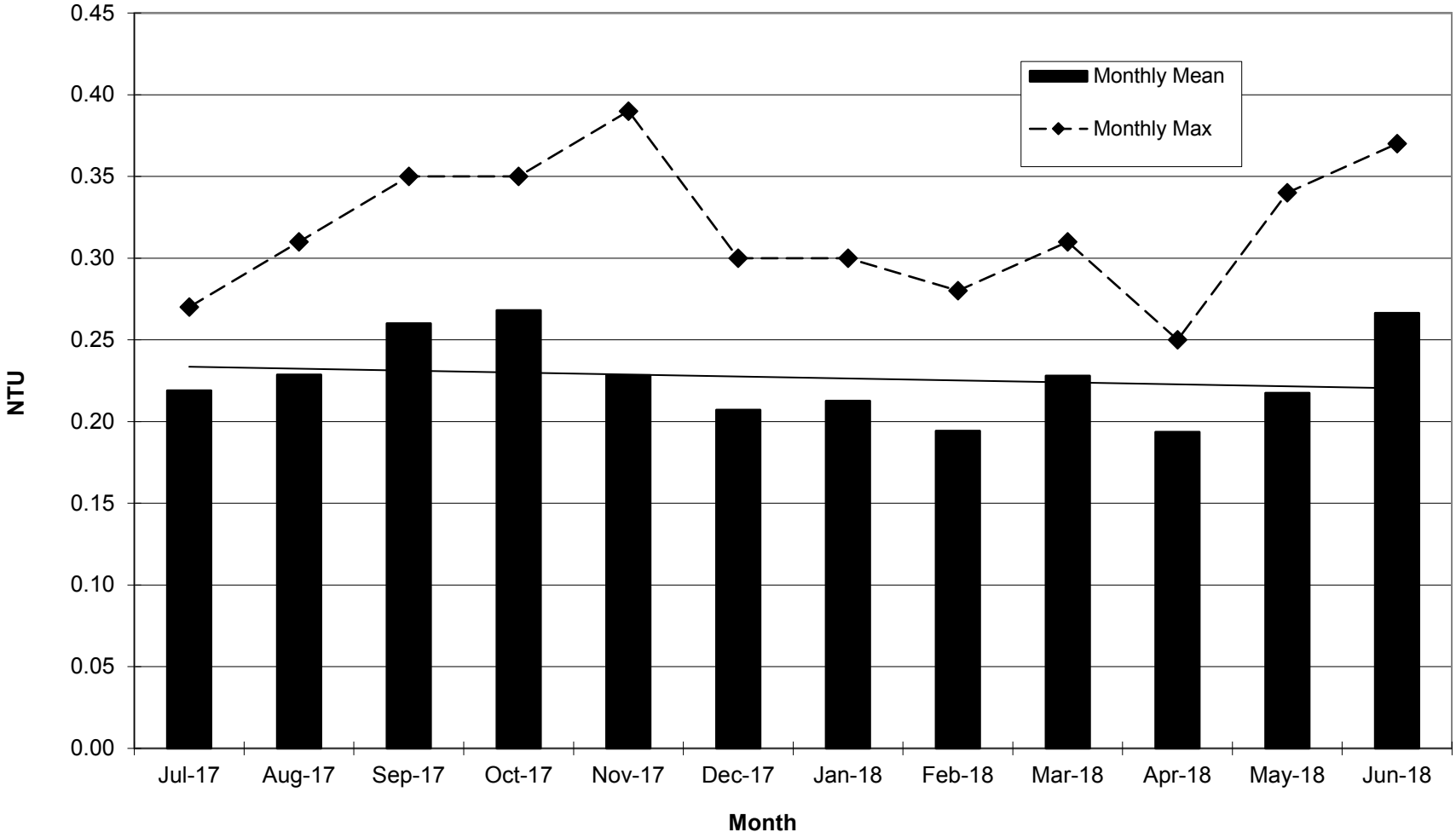
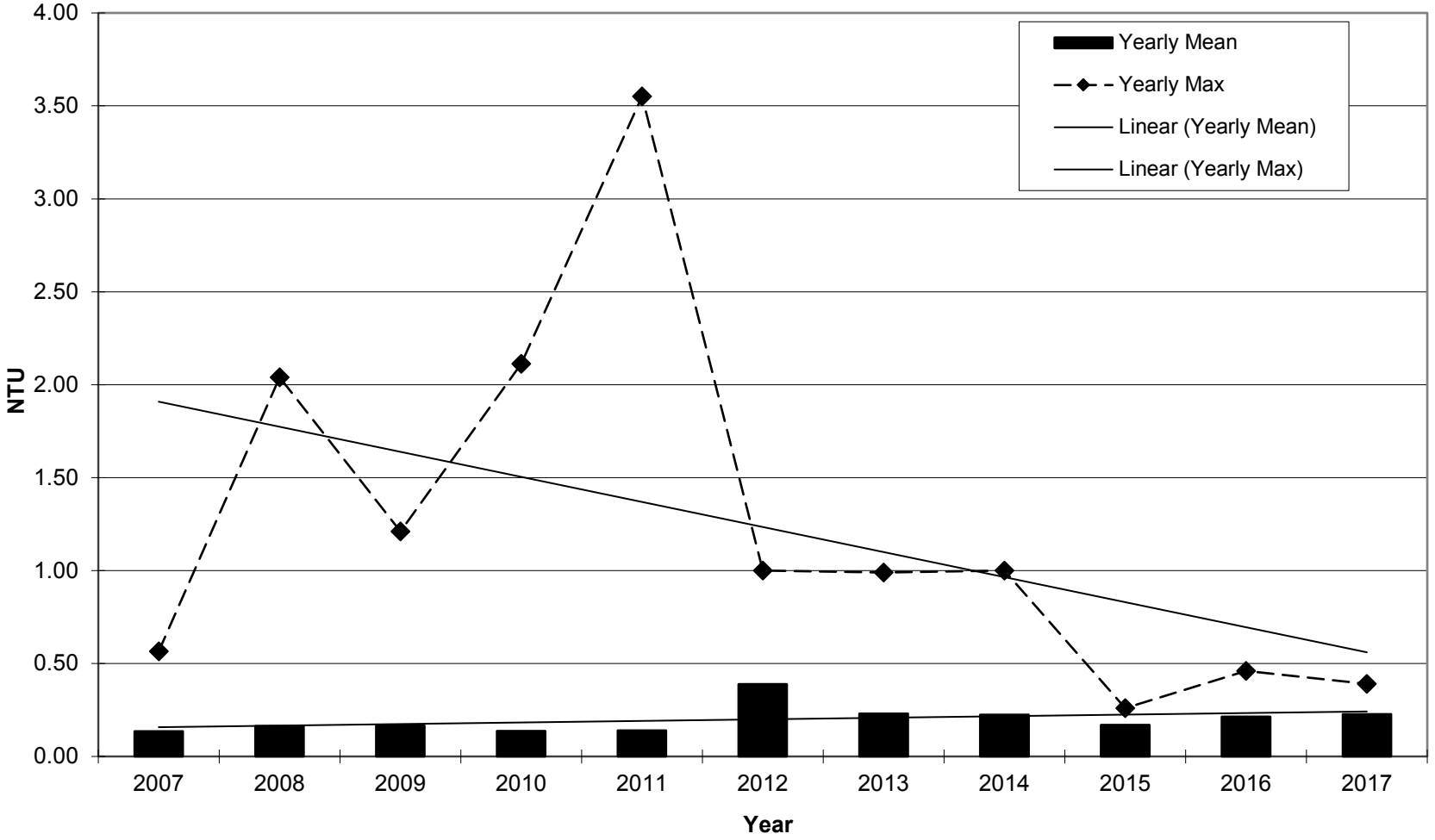


Figure 6.1: Yearly mean and max turbidity results for Cave Rock and Skyland Water Districts between July 1, 2007 and June 30, 2018.



CAVE ROCK SKYLAND
Consumer Confidence Report – 2018
Covering Calendar Year – 2017

This brochure is a snapshot of the quality of the water that we provided last year. Included are the details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. We are committed to providing you with information because informed customers are our best allies. It is important that customers be aware of the efforts that are continually being made to improve their water systems. To learn more, please attend any of the regularly scheduled meetings. **For more information please contact Greg Melandow at 775-782-9989.**

Your water comes from:

Source Name	Source Water Type
LAKE TAHOE INTAKE	Surface Water

We treat your water to protect you against microbial contaminants. The Safe Drinking Water Act (SDWA) requires states to develop a Source Water Assessment (SWA) for each public water supply that treats and distributes raw source water in order to identify potential contamination sources. The state has completed an assessment of our source water. For results of the source water assessment, please contact us.

Message from EPA

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) included rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

Microbial contaminants, such as viruses and bacteria, may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
Inorganic contaminants, such as salts and metals, can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
Pesticides and herbicides may come from a variety of sources such as storm water run-off, agriculture, and residential users.
Radioactive contaminants, can be naturally occurring or the result of mining activity
Organic contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, may also come from gas stations, urban storm water run-off, and septic systems.

In order to ensure that tap water is safe to drink, EPA prescribes regulation which limits the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Our water system tested a minimum of 2 samples per month in accordance with the Total Coliform Rule for microbiological contaminants. Coliform bacteria are usually harmless, but their presences in water can be an indication of disease-causing bacteria. When coliform bacteria are found, special follow-up tests are done to determine if harmful bacteria are present in the water supply. If this limit is exceeded, the water supplier must notify the public by newspaper, television or radio.

Water Quality Data

The tables following below list all of the drinking water contaminants that were detected during the 2017 calendar year. The presence of these contaminants does not necessarily indicate that the water poses a health risk. Unless noted, the data presented in this table is from testing done January 1- December 31, 2017. The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old. **The bottom line is that the water that is provided to you is safe.**

Terms & Abbreviations

Maximum Contaminant Level Goal (MCLG): the "Goal" is the level of a contaminant in drinking water below which there is no known or expected risk to human health. MCLG's allow for a margin of safety.
Maximum Contaminant Level (MCL): the "Maximum Allowed" MCL is the highest level of a contaminant that is allowed in drinking water. MCL's are set as close to the MCLG's as feasible using the best available treatment technology.
Action Level (AL): the concentration of a contaminant that, if exceeded, triggers treatment or other requirements that a water system must follow.
Treatment Technique (TT): a treatment technique is a required process intended to reduce the level of a contaminant in drinking water.
Maximum Residual Disinfectant Level (MRDL): the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG): the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.
Non-Detects (ND): laboratory analysis indicates that the constituent is not present.
Parts per Million (ppm) or milligrams per liter (mg/l)
Parts per Billion (ppb) or micrograms per liter (µg/l)
Picocuries per Liter (pCi/L): picocuries per liter is a measure of the radioactivity in water.
Millirems per Year (mrem/yr): measure of radiation absorbed by the body.
Million Fibers per Liter (MFL): million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.
Nephelometric Turbidity Unit (NTU): nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Testing Results for CAVE ROCK SKYLAND

Microbiological	Result	MCL	MCLG	Typical Source
No Detected Results were found in the Calendar Year of 2017				

Disinfection By-Products	Monitoring Period	RAA	Range	Unit	MCL	MCLG	Typical Source
TOTAL HALOACETIC ACIDS (HAA5)	2017	3.63	1.5 - 6	ppb	60	0	By-product of drinking water disinfection
TTHM	2017	8.45	4.1 – 10.6	ppb	80	0	By-product of drinking water chlorination

Lead and Copper	Date	90TH Percentile		Unit	AL	Sites Over AL	Typical Source
COPPER, FREE	2014 - 2016	0.097	0.011 - 0.36	ppm	1.3	0	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives.
LEAD	2014 - 2016	2	1.1 - 7.3	ppb	15	1	Corrosion of household plumbing systems; Erosion of natural deposits.

Regulated Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
ARSENIC	2017	1	1	ppb	10	0	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.

Regulated Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
BARIUM	2017	0.012	0.013	ppm	2	2	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.

Radionuclides	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
COMBINED RADIUM (-226 & -228)	10/19/2016	0.595	0.595	pCi/L	5	0	Erosion of natural deposits
GROSS ALPHA, INCL. RADON & U	10/19/2016	0.166	0.166	pCi/L	15	0	Decay of natural and man-made deposits
GROSS BETA PARTICLE ACTIVITY	10/19/2016	1.24	1.24	pCi/L	50	0	Decay of natural and man-made deposits

Secondary Contaminants	Collection Date	Highest Value	Range	Unit	SMCL	MCLG
ALKALINITY, BICARBONATE	10/19/2016	42	42	mg/L		
ALKALINITY, TOTAL	10/19/2016	42	42	mg/L		
CALCIUM	10/19/2016	8.5	8.5	mg/L		
CHLORIDE	2017	2.4	2.2-2.4	mg/L	400	
HARDNESS, TOTAL (AS CACO3)	10/19/2016	31	31	mg/L		
MAGNESIUM	10/19/2016	2.4	2.4	mg/L	150	
PH	2017	8.09	7.86-8.09	PH	8.5	
SODIUM	2017	6.5	7.1	mg/L	200	20
SULFATE	2017	1.6	1.6-1.7	mg/L	500	
TDS	2017	54	54-60	mg/L	1000	

Health Information About Water Quality

Additional Required Health Effects Language:

While your water meets the EPA's standard for Lead, *if present at elevated levels* this contaminant can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Your Water System is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Violations

During the 2017 calendar year, CAVE ROCK SKYLAND is required to include an explanation of the violation(s) in the table below and the steps taken to resolve the violation(s) with this report.

Type	Category	Analyte	Compliance Period
No Violations Occurred in the Calendar Year of 2017			

Glenbrook Water Cooperative
Water Quality Data Summary 2017-2018

During the 2017-2018 reporting year, Glenbrook Water Cooperative (Glenbrook) remained in compliance with Federal and State water quality requirements. During the same period, the Environmental Protection Agency (EPA) notes no violation to the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for Glenbrook is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, Glenbrook met Federal and State guidelines for turbidity by remaining within regulatory limits. The monthly mean and maximum turbidity measurements did not exceed 1.0 NTU (Figure 7.0). The highest turbidity reading for the 2017-2018 reporting year was 0.77 NTU and occurred on November 8, 2017, during a wind event with sustained south-southwest winds of 13-33 mph with gusts reaching 40 mph (Table 5.1). Glenbrook had an annual mean turbidity value of 0.22 NTU for the 2017-2018 reporting year. The largest monthly mean turbidity, 0.29 NTU occurred in September 2017 (Table 11.0).

Table 11.0: Glenbrook Water Company source water turbidity data summary July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the Glenbrook intake.

	Monthly Max (NTU)	Date Monthly Max	Monthly Mean (NTU)	Monthly Median (NTU)	Monthly 90% (NTU)
Jul-17	0.30	11	0.25	0.24	0.28
Aug-17	0.34	15	0.25	0.24	0.29
Sep-17	0.62	8	0.29	0.25	0.34
Oct-17	0.24	16	0.20	0.20	0.22
Nov-17	0.77	29	0.24	0.21	0.31
Dec-17	0.25	18	0.20	0.20	0.23
Jan-18	0.19	19	0.21	0.20	0.26
Feb-18	0.25	27	0.21	0.20	0.24
Mar-18	0.73	18	0.19	0.18	0.20
Apr-18	0.28	22	0.18	0.19	0.27
May-18	0.31	15	0.22	0.21	0.27
Jun-18	0.26	27	0.20	0.19	0.24

Historically, Glenbrook has maintained low turbidity measurements. The highest readings in the 10-year reporting period include 7.1 NTU in 2014, 1.37 NTU in 2015 and 1.00 NTU in 2013. Within the same 10-year period from of July 1, 2007, to June 30, 2018, turbidity values also include the lowest, including 0.10 NTU in 2008, 0.21 NTU in 2007, and 0.22 in 2010. The maximum turbidity for the 2017-2018 reporting year of 0.77 NTU is greater than the previous year's maximum reading of 0.59 NTU. The annual maximum turbidity value remained below 1.0 NTU for the second year, after a three-year period of 2012-2015 above 1.0 NTU. Turbidity values continue to show an increasing linear trend in annual mean and max turbidity (Figure 7.1).

Coliform

Glenbrook met Federal and State guidelines for total coliform during the 2017-2018 reporting year. The 2017-2018 maximum total coliform count was 29 CFU an increase from 16.40 CFU in the 2016-2017 year (Figure 7.3). The maximum total coliform reading was taken on July 25, 2017, with a maximum daily temperature of 81°F and a weekly mean temperature of 66°F. The increase in temperature paired with sustained with of 5-17 mph with gusts up to 24 mph likely impacted the maximum total coliform result (Table 5.6). As discussed in Chapter III of this report, Lake Tahoe was influenced by spring sediment wash greater than the previous five years combined after the winter of 2016-2017[1], and an increase in water temperature, caused by the storage of heat due to the absence of deep mixing for the sixth year in a row[2]. The water temperature profile provided by the UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018[3] shows the water temperature at a depth of the Glenbrook intake during July 2017 as 52^0F (Table 5.5, Figure 1.4). This combination of increased sedimentation and warm water temperatures likely provided an optimal environment for the presence of total coliform, and the maximum total coliform result recorded at Glenbrook.

The 2017-2018 mean total coliform count is 3.45 CFU, higher than previous reporting years' mean of 2.48 CFU (Tables 11.1, 11.2, Figure 7.3). The highest monthly mean total coliform was 10.79 CFU, recorded in September, similarly to maximum total coliform, water temperature at a depth of the Glenbrook intake was recorded at 63^0F (Figure 1.4). Total coliform was detected in 48% of the 81 samples analyzed, an increase from 43% the previous year. In the 2017-2018 reporting year, the total coliform results decreased throughout the cooler months and increased during the warm summer months (Figure 7.2). The yearly maximum and mean total coliform results show a decreasing linear trend over time (Figure 7.3).

Glenbrook also performed tests for E. coli coliform during the 2017-2018 reporting year. E. coli coliform was detected in three samples representing 3.7% of the samples analyzed, a decrease of 11% in the previous reporting year. For the 2017-2018 reporting year, the maximum E. Coli coliform value was 2 CFU, with an annual mean of 0.05 CFU (Table 11.1).

Table 11.1: Glenbrook annual source water total coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected from raw water at the Glenbrook intake.

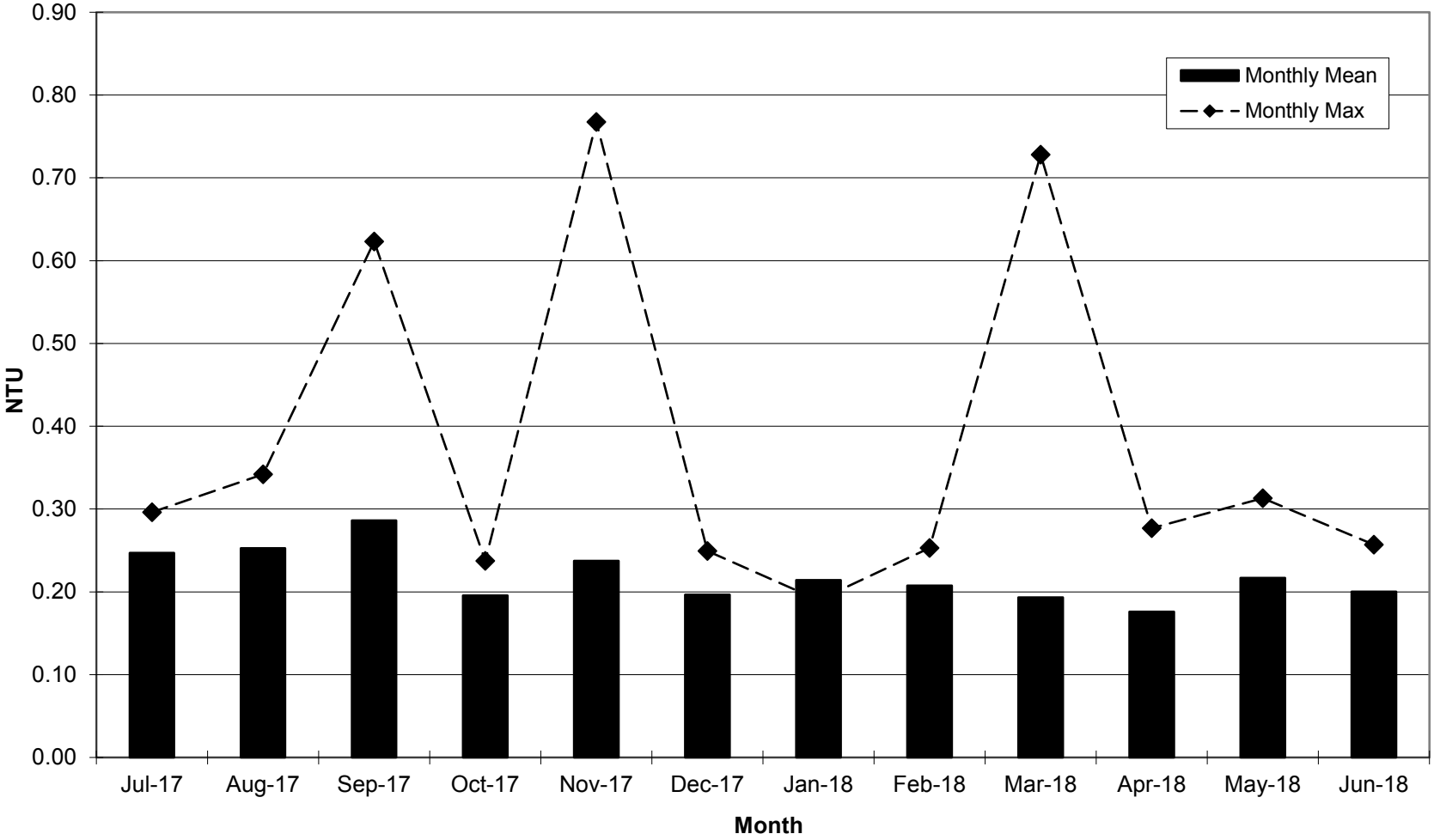
	Total coliform (# colonies/100mL)	E. coli coliform (# colonies/100mL)
Mean	3.45	0.05
Median	0.00	0.00
Max	28.80	2.00
90th Percentile	11.00	0.00
Colony- Forming Samples	39.00	3.00
Total Number of Samples	81.00	81.00

[1] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.1,
[2] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.3
[3] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3

Table 11.2: Glenbrook Water Company monthly source water Total Coliform data results from July 1, 2017, through June 30, 2018. Analyses completed on samples collected from raw water at the Glenbrook Water Company intake.

	Monthly Maximum Total Coliform (# colonies/100ml)	Monthly Mean Total Coliform (# colonies/100ml)	Monthly Maximum E.coli (# colonies/100ml)	Monthly Mean E.coli (# colonies/100ml)
Jul-17	28.80	8.76	0.00	0.00
Aug-17	16.40	7.84	0.00	0.00
Sep-17	25.40	10.79	2.00	0.38
Oct-17	14.00	3.69	0.00	0.00
Nov-17	3.10	0.78	0.00	0.00
Dec-17	2.00	0.50	0.00	0.00
Jan-18	0.00	0.00	0.00	0.00
Feb-18	2.00	0.50	0.00	0.00
Mar-18	1.00	0.25	0.00	0.00
Apr-18	1.00	0.11	1.00	0.11
May-18	2.00	0.20	0.00	0.00
Jun-18	2.00	0.38	0.00	0.00

Figure 7.0: Monthly mean and max turbidity results for Glenbrook Water Cooperative between July 1, 2017 and June 30, 2018.



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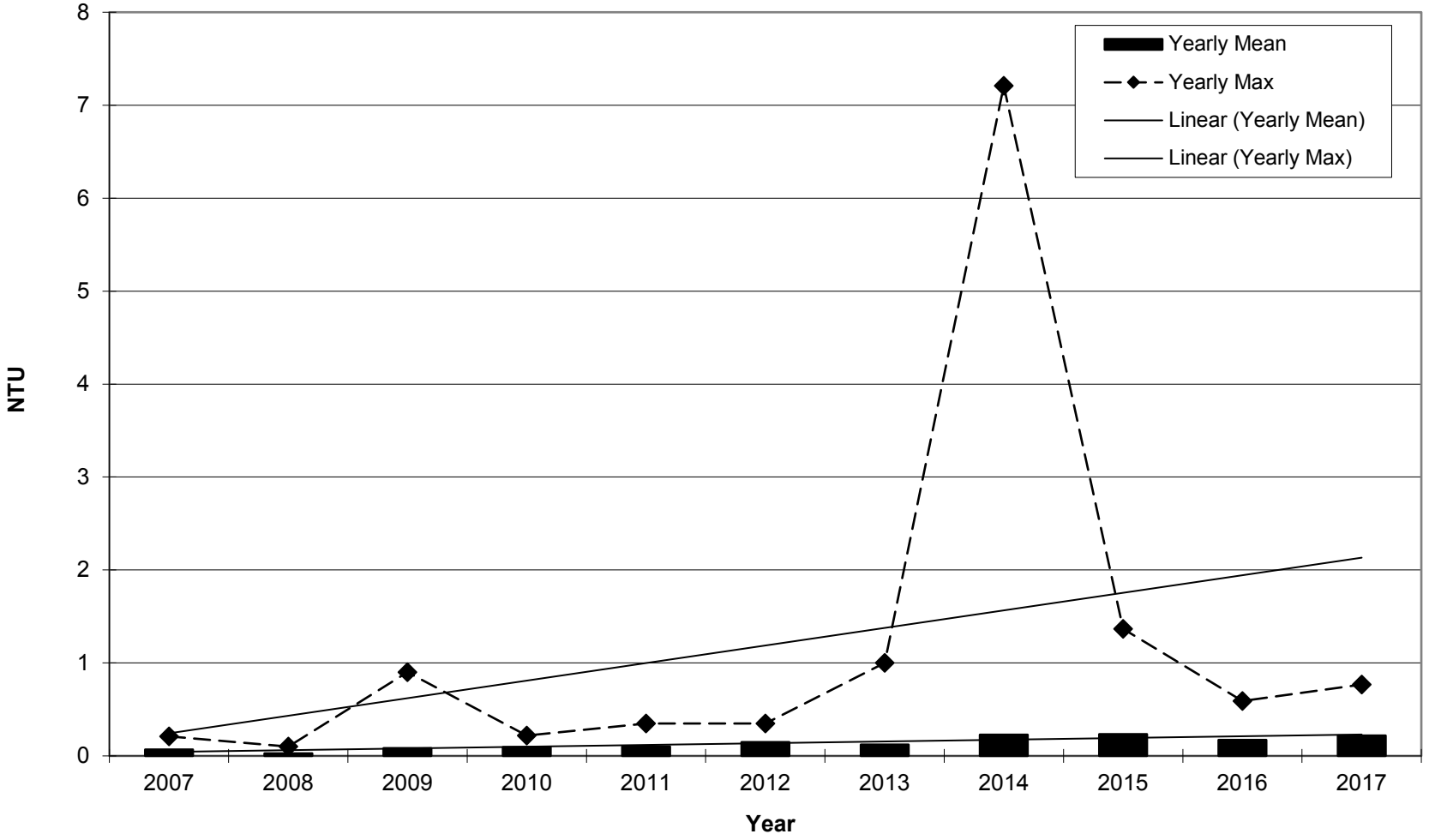
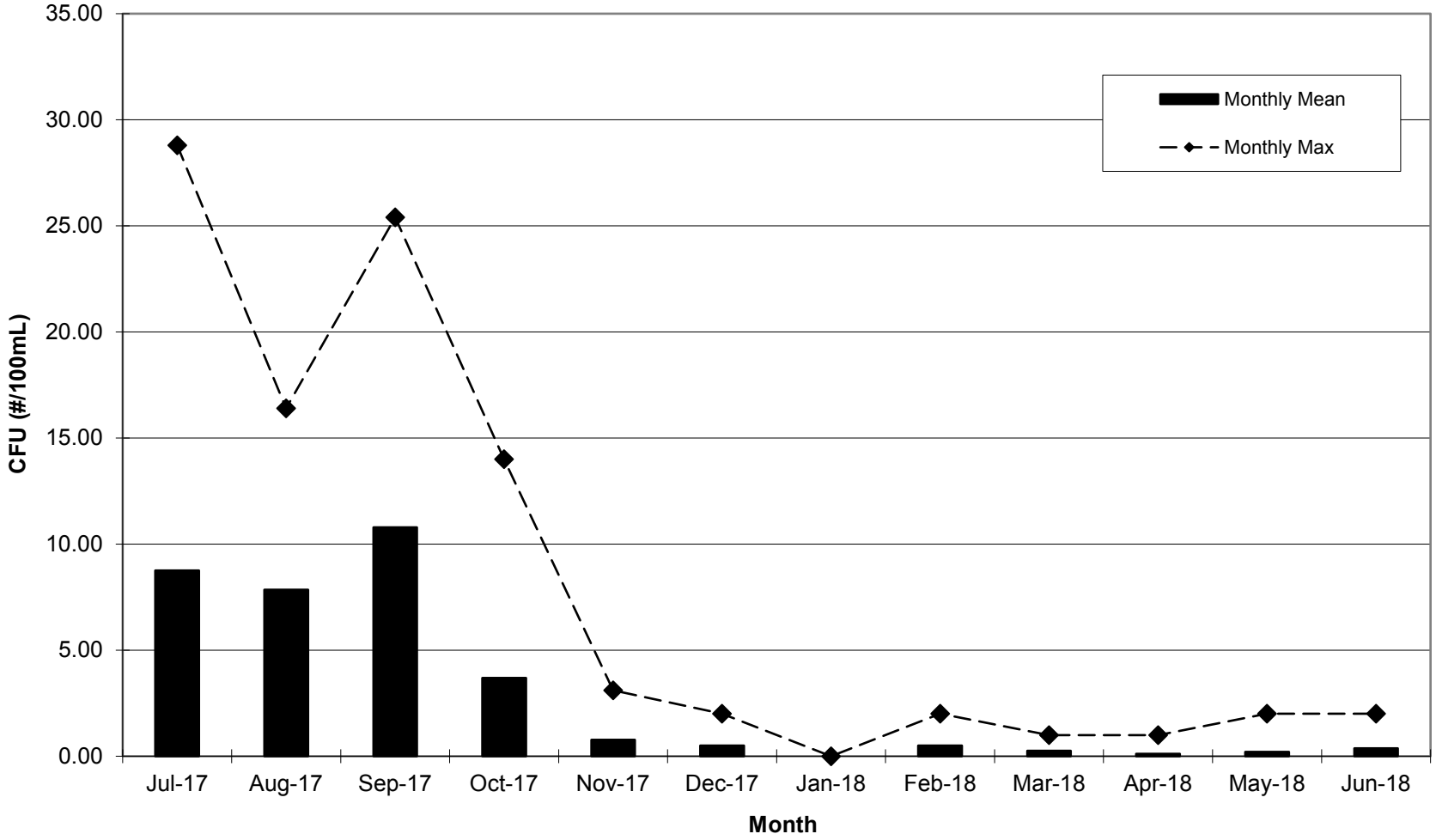


Figure 7.2: Monthly mean and max total coliform results for Glenbrook Water Cooperative between July 1, 2017 and June 30, 2018.



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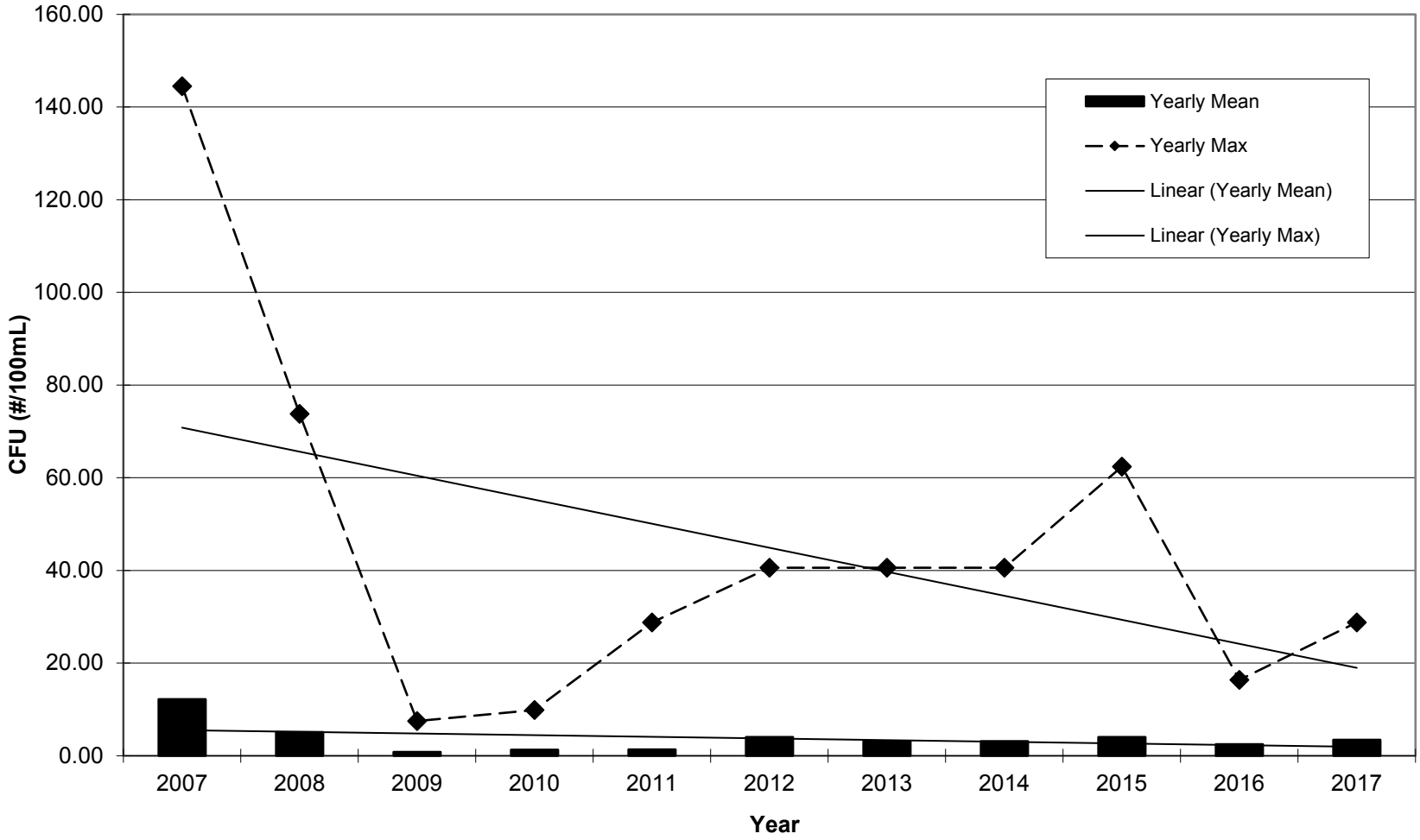

GLENBROOK WATER COOPERATIVE
Consumer Confidence Report – 2018
Covering Calendar Year – 2017

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Your water comes from:

Source Name	Source Water Type
LAKE TAHOE INTAKE	Surface Water

We treat your water to remove several contaminants and we add disinfectant to protect you against microbial contaminants. The Safe Drinking Water Act (SDWA) requires states to develop a Source Water Assessment (SWA) for each public water supply that treats and distributes raw source water in order to identify potential contamination sources. The state has completed an assessment of our source water. For results of the source water assessment, please contact us.

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Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

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The tables following below list all of the drinking water contaminants that were detected during the 2017 calendar year. The presence of these contaminants does not necessarily indicate that the water poses a health risk. Unless noted, the data presented in this table is from testing done January 1- December 31, 2017. The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old. **The bottom line is that the water that is provided to you is safe.**

Consumer Confidence Report

Terms & Abbreviations

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Picocuries per Liter (pCi/L): picocuries per liter is a measure of the radioactivity in water.
Millirems per Year (mrem/yr): measure of radiation absorbed by the body.
Million Fibers per Liter (MFL): million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.
Nephelometric Turbidity Unit (NTU): nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Testing Results for GLENBROOK WATER COOPERATIVE

Microbiological	Result	MCL	MCLG	Typical Source
No Detected Results were Found in the Calendar Year of 2017				

Disinfection By-Products	Monitoring Period	RAA	Range	Unit	MCL	MCLG	Typical Source
TOTAL HALOACETIC ACIDS (HAA5)	2017	2	1.3 - 6.2	ppb	60	0	By-product of drinking water disinfection
TTHM	2017	6	0.91 - 18	ppb	80	0	By-product of drinking water chlorination

Regulated Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
ANTIMONY	12/20/2017	1.7	2	ppb	6	0	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder; test addition.
ARSENIC	12/20/2017	1	1	ppb	10	0	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes.
CHROMUUM	12/20/2017	1.4	1.4	ppb	100	4	Discharge from steel and pulp mills; Erosion of natural deposits

Regulated Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
SELENIUM	12/20/2017	7.5	7.5	ppb	50		Discharge from petroleum and metal refineries; Erosion of natural deposits; Discharge from mines
URANIUM	12/20/2017	6	6	ppb	30	4	Erosion of natural deposits

Secondary Contaminants	Collection Date	Highest Value	Range	Unit	SMCL	MCLG
BROMATE	9/4/2017	2.0	1 - 4.3	ppb	10	1
CARBON, TOTAL	5/10/2017	7.8	1 - 7.8	ppm	4	
CHLORIDE	12/20/2017	2.8	2.8	mg/L	400	
MAGNESIUM	12/20/2017	2.4	2.4	mg/L	150	
pH	12/20/2017	7.86	7.86	pH	8.5	
SODIUM	12/20/2017	6.7	6.7	mg/L	200	20
SULFATE	12/20/2017	2.2	2.2	mg/L	500	
TDS	12/20/2017	58	58	mg/L	1000	
TEMPERATURE (CENTIGRADE)	12/20/2017	19.0	19.0	C		

Health Information About Water Quality

While your water meets the EPA's standard for Lead, *if present at elevated levels* this contaminant can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Your Water System is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Total organic carbon (TOC) has no health effects. However, total organic carbon provides a medium for the formation of disinfection byproducts. These byproducts include trihalomethanes (THMs) and haloacetic acids (HAAs). Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of getting cancer.

Violations

During the 2017 calendar year, GLENBROOK WATER COOPERATIVE is required to include an explanation of the violation(s) in the table below and the steps taken to resolve the violation(s) with this report.

Type	Category	Analyte	Compliance Period
No Violations Occurred in the Calendar Year of 2017			

Health Information About the Above Violation(s)

There are no additional required health effects violation notices.

Round Hill General Improvement District
Water Quality Data Summary 2017-2018

Round Hill General Improvement District (RHGID) is a filtering water supplier that is only required to report source water turbidity. During the 2017-2018 reporting year, RHGID remained under Federal and State water quality requirements of a filtering water supplier. During the same period, the Environmental Protection Agency (EPA) noted no violation to the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for RHGID is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, RHGID met Federal and State guidelines for turbidity by remaining below regulatory limits. The monthly mean and maximum turbidity measurements for the 2017-2018 reporting year did not exceed 0.30 NTU, slightly more than the previous reporting year (Figure 8.0, 8.1). The maximum turbidity reading for the 2017-2018 reporting year was 0.29 NTU and occurred on July 1, 2017, during a wind event with 4-13 mph sustained winds from the north-north-east with gusts up to 17 mph recorded (Table 5.1). The largest monthly mean turbidity result was 0.23 NTU that occurred in July 2017 (Table 12.0).

Table 12.0: RHGID source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the RHGID intake.

Month	Monthly max (NTU)	Date monthly max	Monthly mean (NTU)	Monthly median (NTU)	90th percentile
Jul-17	0.29	1	0.23	0.23	0.28
Aug-17	0.26	1,2,9	0.18	0.17	0.24
Sep-17	0.27	12	0.18	0.18	0.20
Oct-17	0.22	16	0.17	0.18	0.20
Nov-17	0.24	20	0.12	0.10	0.18
Dec-17	0.24	26	0.14	0.11	0.22
Jan-18	0.17	15	0.07	0.05	0.12
Feb-18	0.15	2,21	0.08	0.13	0.14
Mar-18	0.15	30	0.07	0.04	0.12
Apr-18	0.17	2,18	0.08	0.05	0.15
May-18	0.17	1,3,11,15	0.14	0.14	0.17
Jun-18	0.20	6	0.14	0.14	0.17

Historically, RHGID has maintained low turbidity measurements. In 2006, turbidity reading reached 4.89 NTU during a rain and snow event, because of this high reading in the intake was relocated and extended an additional 1,500, feet into deeper water at a total distance of 2,500 feet from shore. The next highest reading was reported in January 1997, 2.19 NTU, and occurred during a 100-year storm event. The highest maximum turbidity reading in the 10-year reporting period of July 1, 2007-June 30, 2018 is 0.66 NTU, with the following annual maximum results falling below 0.40 NTU. The annual mean and maximum turbidity measurements for 2017-2018 were similar to the previous reporting year, and the readings still show a decreasing linear trend over the 10-year reporting period (Figure 8.1).

Figure 8.0: Monthly mean and max turbidity results for Round Hill General Improvement District between July 1, 2017 and June 30, 2018.

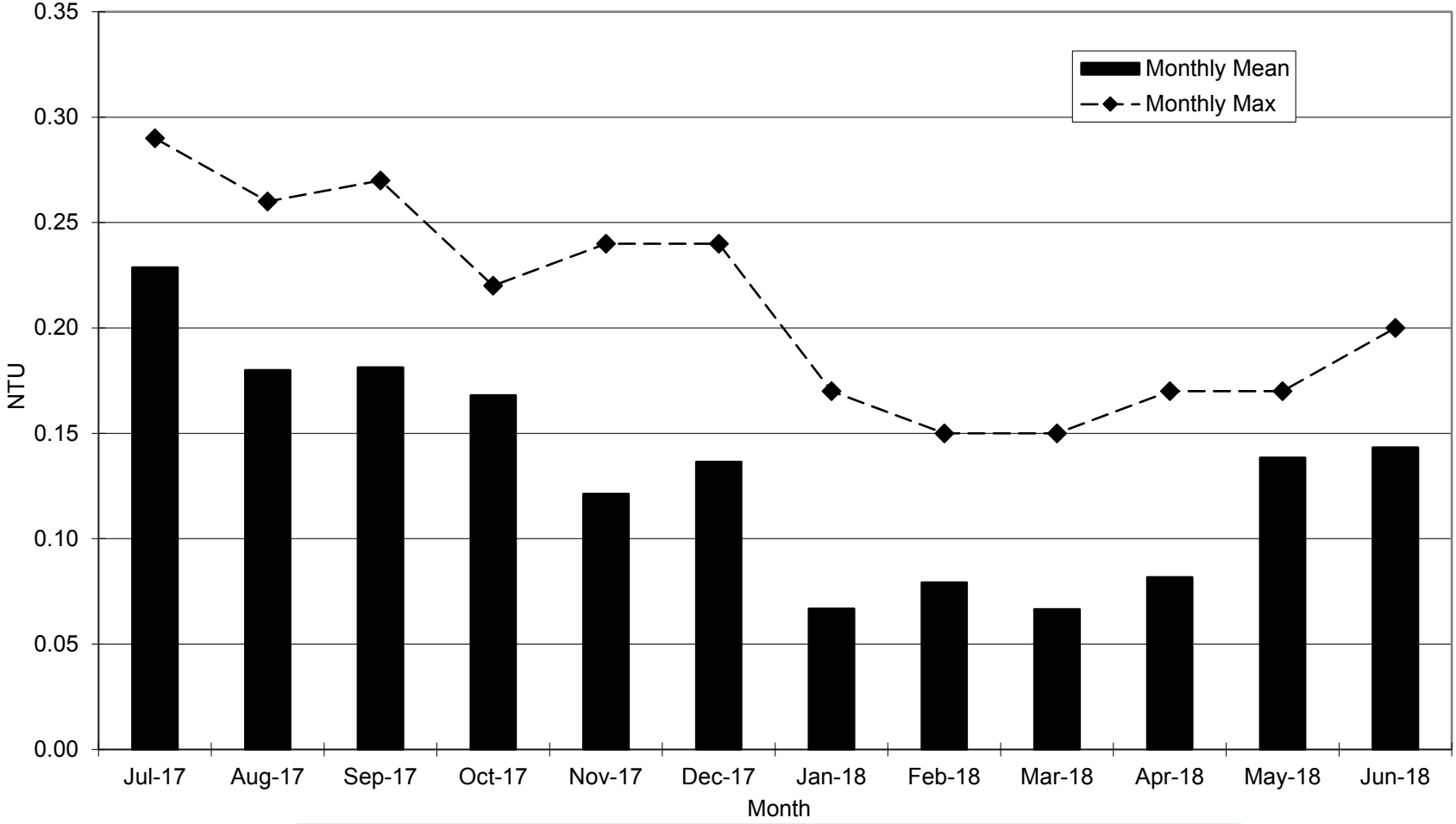
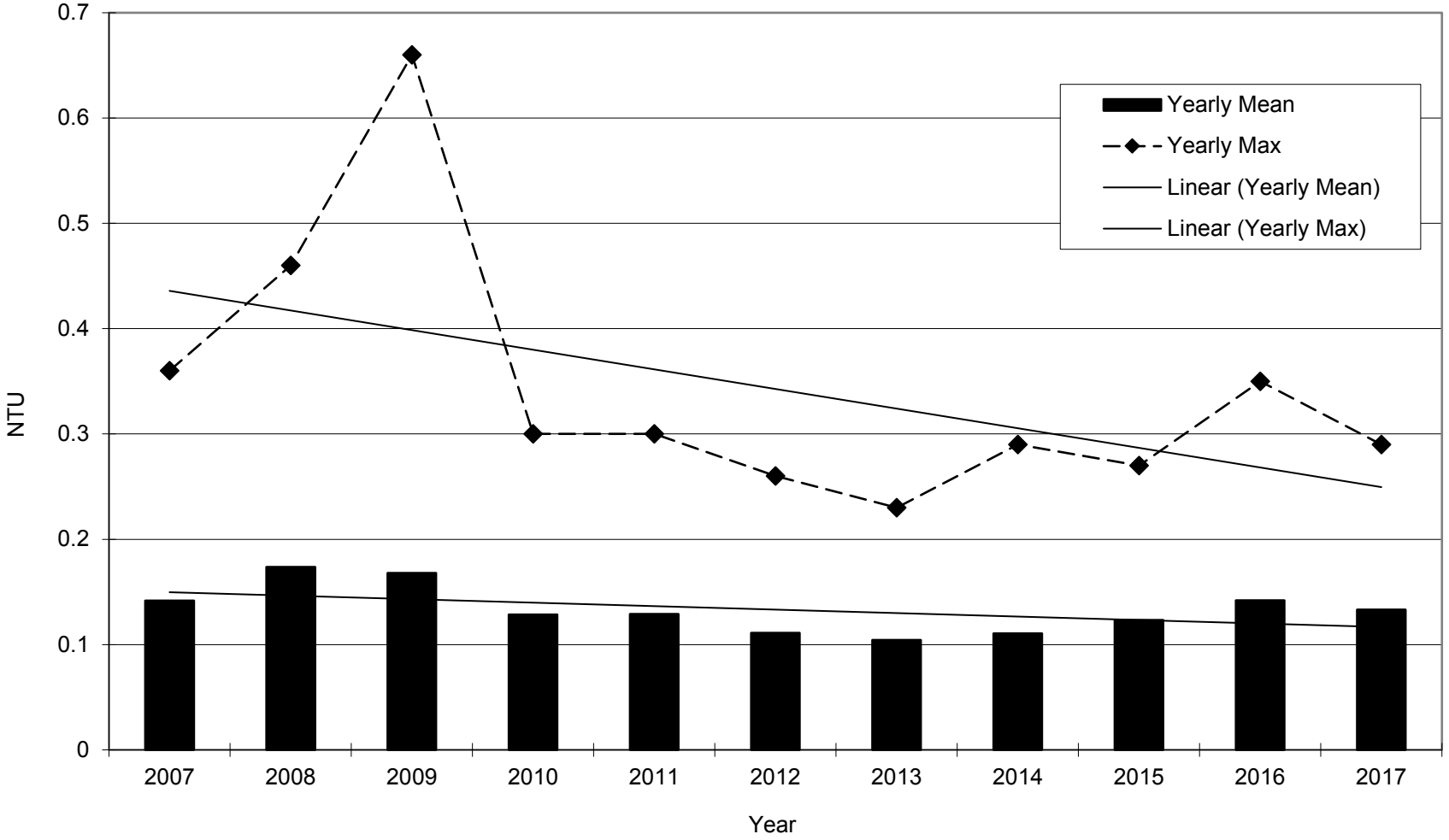


Figure 8.1: Yearly mean and max turbidity results for Round Hill General Improvement District between July 1, 2007 and June 30, 2018.



ROUND HILL GID
Consumer Confidence Report – 2018
Covering Calendar Year 2017

Your Water Meets All Drinking Water Standards.
Absolutely. Last year, as in years past, your tap water met all U.S. Environmental Protection Agency (EPA) and state drinking water health standards. Round Hill GID vigilantly safeguards its water supply and once again we are proud to report that our system has not violated a maximum contaminant or other water quality standard.

The water that you use in Round Hill comes from Lake Tahoe. Your water is treated with filtration, then it is chlorinated and delivered through a seven mile distribution system to your home. **The water from your tap meets all requirements set forth by the U.S. Environmental Protection Agency and the Nevada Division of Environmental Protection.**

This brochure is a snapshot of the quality of the water that we provided last year. Included are the details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. We are committed to providing you with information because informed customers are our best allies. It is important that customers be aware of the efforts that are continually being made to improve their water systems. To learn more, please attend any of the regularly scheduled meetings. For more information please contact John Fassmann at 775-588-2571.

We treat your water to remove several contaminants and we add disinfectant to protect you against microbial contaminants. The Safe Drinking Water Act (SDWA) requires states to develop a Source Water Assessment (SWA) for each public water supply that treats and distributes raw source water in order to identify potential contamination sources. A source water assessment has been completed by the Nevada Bureau of Safe Drinking Water and is available upon request by calling 775-687-9520.

Message from EPA
Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by Cryptosporidium and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

Microbial contaminants, such as viruses and bacteria, may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
Inorganic contaminants, such as salts and metals, can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.

Pesticides and herbicides may come from a variety of sources such as storm water run-off, agriculture, and residential users.
Radioactive contaminants, can be naturally occurring or the result of mining activity.
Organic contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, may also come from gas stations, urban storm water run-off, and septic systems.

In order to ensure that tap water is safe to drink, EPA prescribes regulations which limit the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Our water system tested a minimum of two samples per month in accordance with the Total Coliform Rule for microbiological contaminants. Coliform bacteria are usually harmless, but their presences in water can be an indication of disease-causing bacteria. When coliform bacteria are found, special follow-up tests are done to determine if harmful bacteria are present in the water supply. If this limit is exceeded, the water supplier must notify the public by newspaper, television or radio.

Water Quality Data

The following tables list all of the drinking water contaminants that were detected during the 2016 calendar year. The presence of these contaminants does not necessarily indicate that the water poses a health risk. Unless noted, the data presented in this table is from testing done January 1- December 31, 2017. The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old. ***The bottom line is that the water that is provided to you is safe.***

WATER QUALITY TERMS & DEFINITIONS

Maximum Contaminant Level Goal (MCLG): the "Goal" is the level of a contaminant in drinking water below which there is no known or expected risk to human health. MCLG's allow for a margin of safety.

Maximum Contaminant Level (MCL): the "Maximum Allowed" MCL is the highest level of a contaminant that is allowed in drinking water.

MCL's are set as close to the MCLG's as feasible using the best available treatment technology.

Secondary Maximum Contaminant Level (SMCL): the secondary standards of "Maximum Allowed" MCL allowed in drinking water.

Action Level (AL): the concentration of a contaminant that, if exceeded, triggers treatment or other requirements that a water system must follow.

Treatment Technique (TT): a treatment technique is a required process intended to reduce the level of a contaminant in drinking water.

Maximum Residual Disinfectant Level (MRDL): the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Non-Detects (ND): laboratory analysis indicates that the constituent is not present.

Parts per Million (ppm): or milligrams per liter (mg/l)

Parts per Billion (ppb): or micrograms per liter (µg/l)

Picocuries per Liter (pCi/L): picocuries per liter is a measure of the radioactivity in water.

Millirems per Year (mrem/yr): measure of radiation absorbed by the body.

Million Fibers per Liter (MFL): million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.

Nephelometric Turbidity Unit (NTU): nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

WATER QUALITY TABLE

Microbiological	Result	MCL	MCLG	Typical Source
No Detected Results were found in the Calendar Year of 2017				

Disinfection By-Products	Monitoring Period	RAA	Range	Unit	MCL	MCLG	Typical Source
TOTAL HALOACETIC ACIDS (HAA5)	2017	ND	4.7	ppb	60	0	By-product of drinking water disinfection
TTHM	2017	3.66	3	ppb	80	0	By-product of drinking water disinfection

Lead and Copper	Date	90th Percentile		Unit	AL	Sites Over AL	Typical Source
COPPER	2014-2016	0.038	0.0032-0.042	ppm	1.3	0	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives.

Regulated Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
BARIUM	9/14/2017	0.011	0.011	ppm	2	2	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.

Radionuclides	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
COMBINED URANIUM	8/27/2013	0.11	0.11	µg/L	30	0	Erosion of natural deposits

Secondary Contaminants	Collection Date	Highest Value	Range	Unit	SMCL	MCLG	
CHLORIDE	9/14/2017	2.8	2.8	mg/L	400		
MAGNESIUM	9/14/2017	2.4	2.4	mg/L	150		
ODOR	9/14/2017	0.0	0.0	TON	3		
PH	9/14/2017	8.05	8.05	PH	8.5		
SODIUM	9/14/2017	6.6	6.6	mg/L	200	20	
SULFATE	9/14/2017	1.6	1.6	mg/L	500		
TDS	9/14/2017	51	51	mg/L	1000		

Health Information About Water Quality

While your water meets the EPA's standards for Lead, *if present at elevated levels* this contaminant can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Your Water System is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 800-426-4791 or at www.epa.gov/safewater/lead.

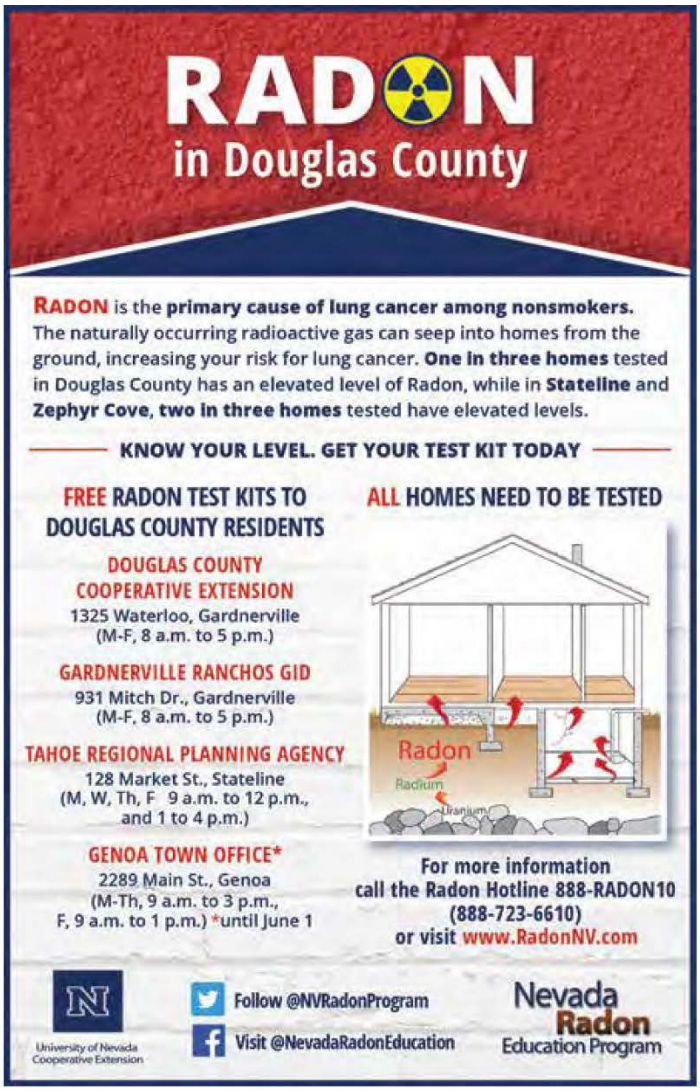
Violations

During the 2017 calendar year, ROUND HILL GID is required to include an explanation of the violation(s) in the table below and the steps taken to resolve the violation(s) with this report.

Type	Category	Analyte	Compliance Period
No Violations Occurred in the Calendar Year of 2017			

Protection of drinking water is everyone's responsibility. You can help protect your community's drinking water source in several ways:

- Eliminate excess use of lawn and garden fertilizers and pesticides — they contain hazardous chemicals that can reach your drinking water source.
- Pick up after your pets.
- Dispose of chemicals properly; take used motor oil to a recycling center.
- Volunteer in your community. Find a watershed or wellhead protection organization in your community and volunteer to help. If there are no active groups, consider starting one. Use EPA's Adopt Your Watershed to locate groups in your community, or visit the Watershed Information Network's How to Start a Watershed Team.
- Organize a storm drain stenciling project with your local government or water supplier. Stencil a message next to the street drain reminding people "Dump No Waste - Drains to Lake" or "Protect Your Water." Produce and distribute a flyer for households to remind residents that storm drains dump directly into your local water body.



Zephyr Water Utility District
Water Quality Data Summary 2017-2018

During the 2017-2018 reporting year, Zephyr Water Utility District (ZWUD), remained in compliance with Federal and State water quality requirements. During the same period, the Environmental Protection Agency (EPA) notes no violation to the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for ZWUD is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, ZWUD met Federal and State guidelines for turbidity by remaining within regulatory limits. The monthly maximum and mean turbidity measurements did not exceed 1.0 NTU (Figure 9.0). The highest turbidity reading for the 2017-2018 reporting year was 0.83 NTU and occurred on October 31, 2017. This turbidity reading coincides with southern winds of 2-10 mph, with no gusts reported, that potentially contributing to the high reading (Table 5.1). The annual mean turbidity for ZWUD for the 2017-2018 reporting year was 0.24 NTU. The highest monthly mean turbidity reading was .34 NTU occurring in October 2017 (Table 13.0).

Table 13.0: ZWUD source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the Zephyr Water Utility District water supply intake.

Month	Monthly max (NTU)	Date monthly max	Monthly Mean (NTU)	Monthly median (NTU)	Monthly 90%
Jul-17	0.33	16	0.23	0.22	0.29
Aug-17	0.43	27	0.26	0.23	0.29
Sep-17	0.54	19	0.32	0.30	0.42
Oct-17	0.83	31	0.34	0.29	0.50
Nov-17	0.72	20	0.28	0.22	0.43
Dec-17	0.60	17	0.23	0.19	0.39
Jan-18	0.75	1	0.28	0.21	0.63
Feb-18	0.50	14	0.23	0.22	0.34
Mar-18	0.36	30	0.17	0.13	0.28
Apr-18	0.44	17	0.19	0.16	0.27
May-18	0.50	5	0.20	0.17	0.27
Jun-18	0.27	30	0.18	0.17	0.22

Historically, ZWUD has maintained low turbidity measurements. The highest reading reported since 1997, 1.35 NTU, occurred in 1998. The monthly mean turbidities for the 2017-2018 reporting year were higher than the previous reporting year, as well as the annual mean turbidity. The ZWUD annual mean turbidity results show a slightly decreasing linear trend from July 1, 2007- June 30, 2018, with annual maximum results increasing (Figure 9.1).

Coliform

ZWUD met Federal and State guidelines for total coliform and E. coli coliform bacteria. The maximum total coliform count was 29 coliform-forming units (CFU), a decrease from the previous year's max of 38.40 CFU (Table 13.1, Figure 9.3). The maximum total coliform reading of 29 CFU occurred on September 20, 2017. The maximum temperature reached 59° F while the weekly mean temperature was 46° F. The increase in temperature above 50°F, paired with the strong sustained wind of 12-29 mph with gusts of 43 mph likely influenced total coliform growth (Table 5.6). As discussed in Chapter III of this report, Lake Tahoe was influenced by spring sediment wash greater than the previous five years combined after the winter of 2016-2017[1], and an increase in water temperature, caused by the storage of heat due to the absence of deep mixing for the sixth year in a row[2]. The water temperature profile provided by the UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018[3] shows the water temperature at a depth of the ZWUD intake during September 2017 as 63°F (Table 5.5, Figure 1.4). This combination of increased sedimentation and warm water temperatures likely provided an optimal environment for the presence of total coliform, and the maximum total coliform result recorded at ZWUD.

Total coliform values were variable throughout the reporting year with a spike in April 2018 likely from seasonal runoff (Figure 9.2). Total coliform was detected in 53 of the 104 samples analyzed, equaling 51%. The annual mean total coliform count was 3.07 CFU, a decrease from the 2016-2017 mean of 3.54 CFU (Table 13.1, Figure 9.3).

Historically the annual mean total coliform results have remained consistent and well below 10 CFU. While the maximum total coliform results show greater variability than annual mean, all results reported are well below regulatory limits for total coliform. The linear trendline over the 10-year reporting period of July 1, 2007- June 30, 2018, shows an increasing trend for both annual mean and maximum results (Figure 9.3).

ZWUD also completed tests for E. coli coliform on all samples tested for total coliform; no detects were reported.

[1] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.1,
[2] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.3
[3] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3

Table 13.1: Zephyr Water Utility District (ZWUD) annual source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the ZWUD intake.

	Total coliform (# colonies/100mL)	E. coli coliform (# colonies/100mL)
Mean	3.07	0.00
Median	1.00	0.00
Max	29.00	0.00
90th Percentile	10.74	0.00
Colony-Forming Samples	53	0
Total Number of Samples	104	104

Table 13.2: ZWUD monthly source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the ZWUD intake.

	Monthly maximum total coliform (# colonies/100mL)	Monthly mean total coliform (# colonies/100mL)	Monthly maximum E. coli coliform (# colonies/100mL)	Monthly mean E. coli coliform (# colonies/100mL)
Jul-17	6.40	3.68	0.00	0.00
Aug-17	16.40	8.22	0.00	0.00
Sep-17	29.00	13.90	0.00	0.00
Oct-17	19.00	4.93	0.00	0.00
Nov-17	5.30	1.28	0.00	0.00
Dec-17	3.10	1.01	0.00	0.00
Jan-18	0.00	0.00	0.00	0.00
Feb-18	0.00	0.00	0.00	0.00
Mar-18	1.00	0.13	0.00	0.00
Apr-18	12.00	1.50	0.00	0.00
May-18	3.10	0.71	0.00	0.00
Jun-18	5.30	1.58	0.00	0.00

Figure 9.0: Monthly mean and max turbidity results for Zephyr Water Utility District between July 1, 2017 and June 30, 2018.

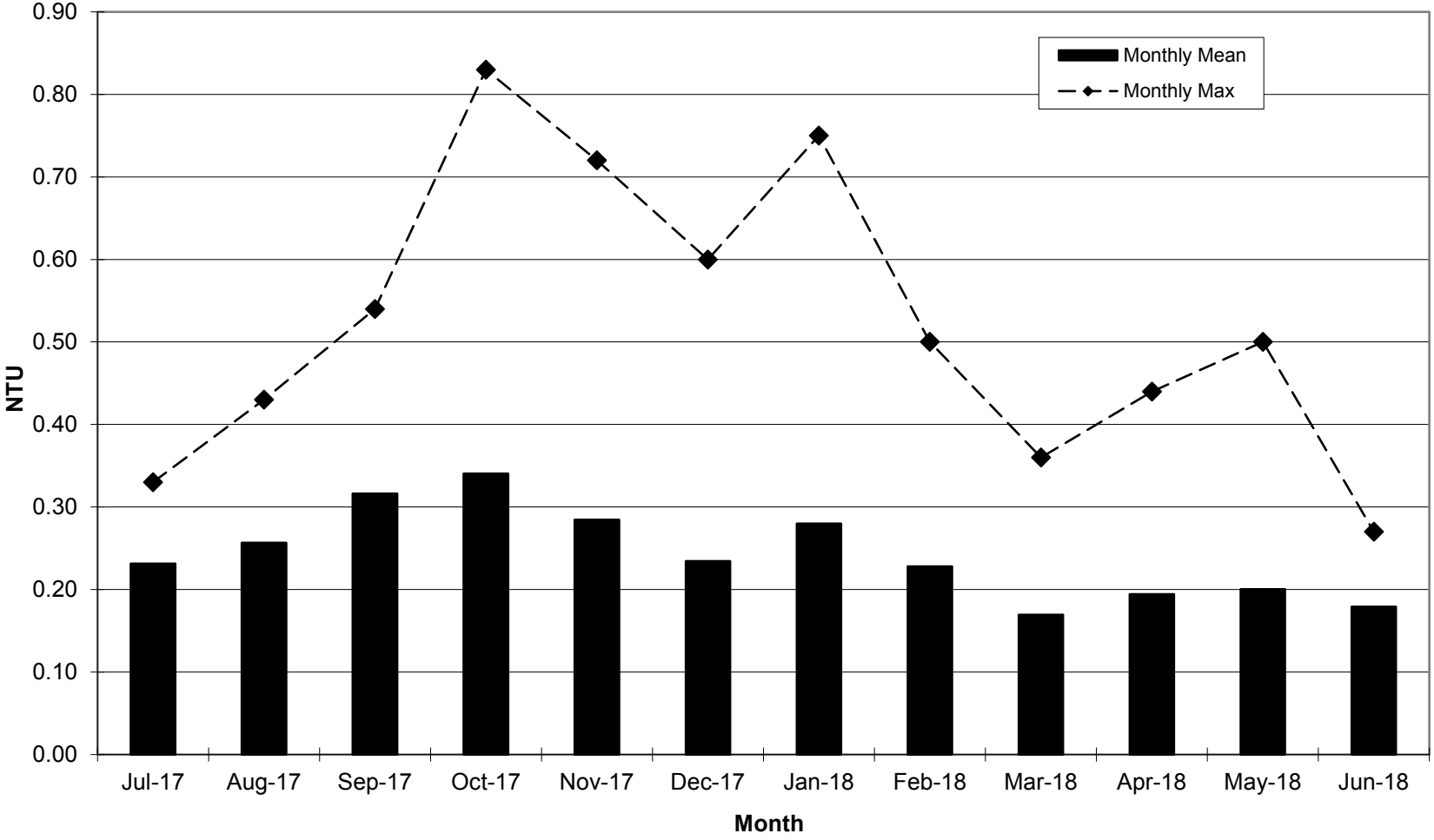


Figure 9.1: Yearly mean and max turbidity results for Zephyr Water Utility District between July 1, 2075 and June 30, 2018.

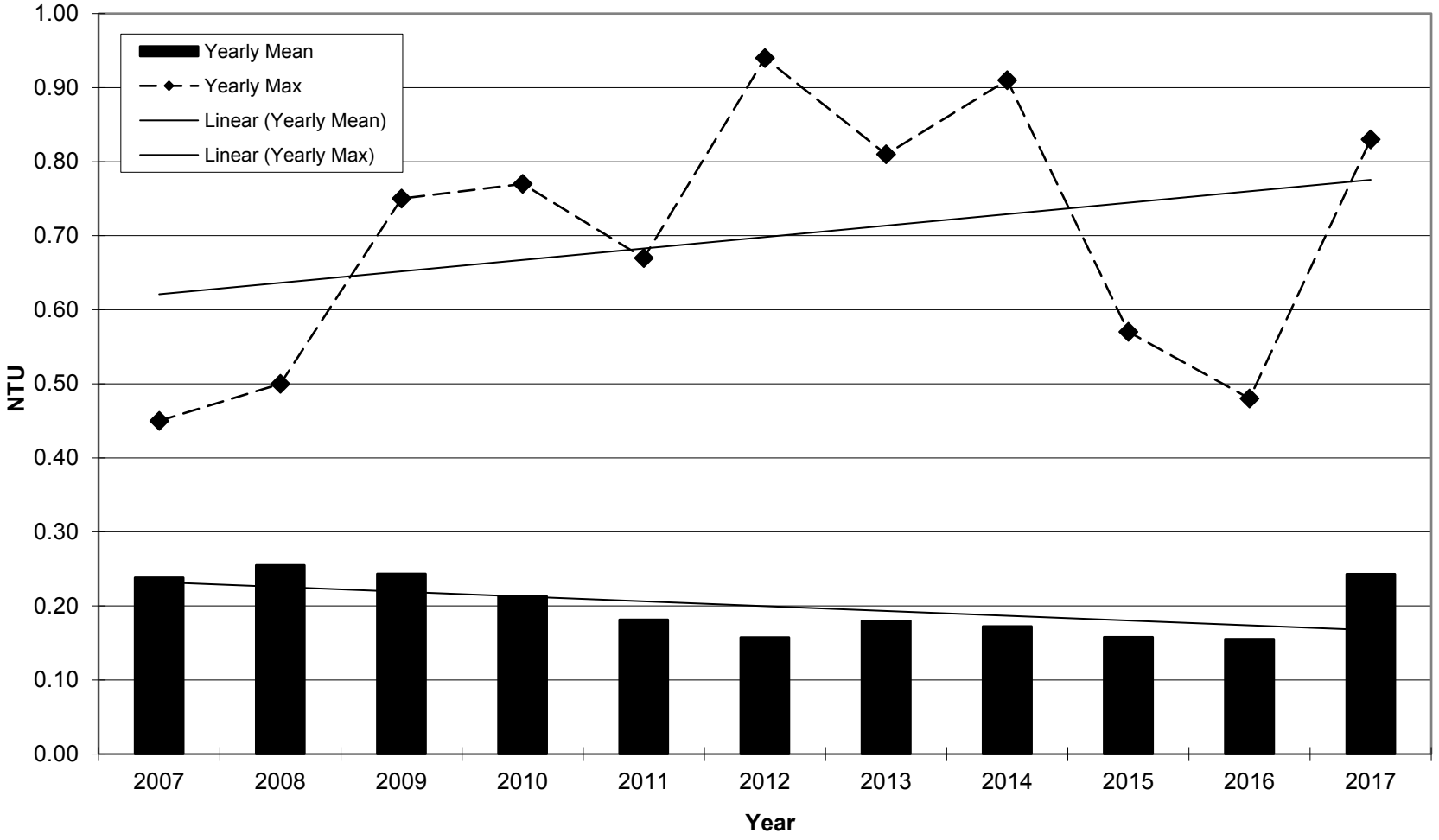


Figure 9.2: Monthly mean and max total coliform results for Zephyr Water Utility District between July 1, 2017 and June 30, 2018.

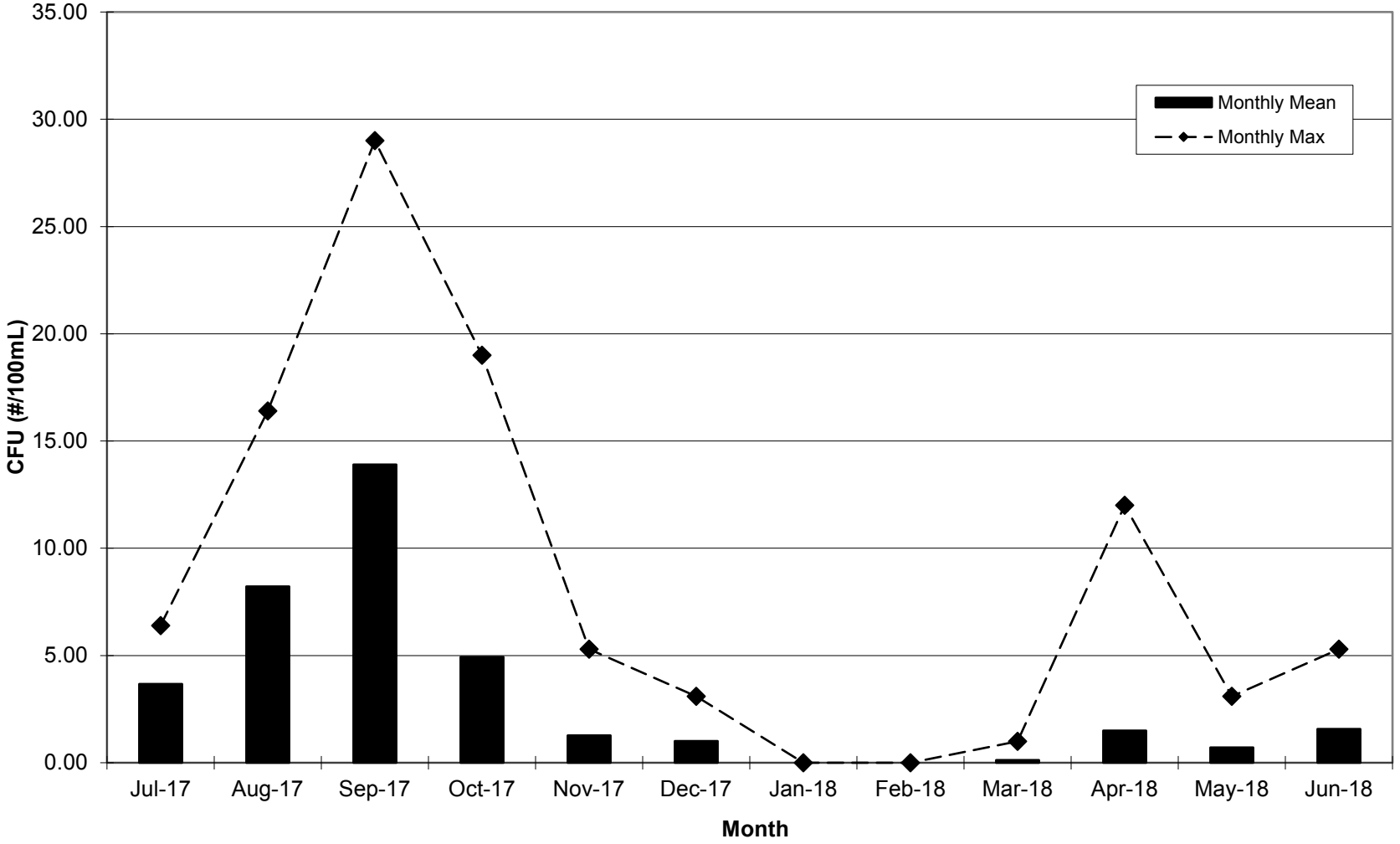
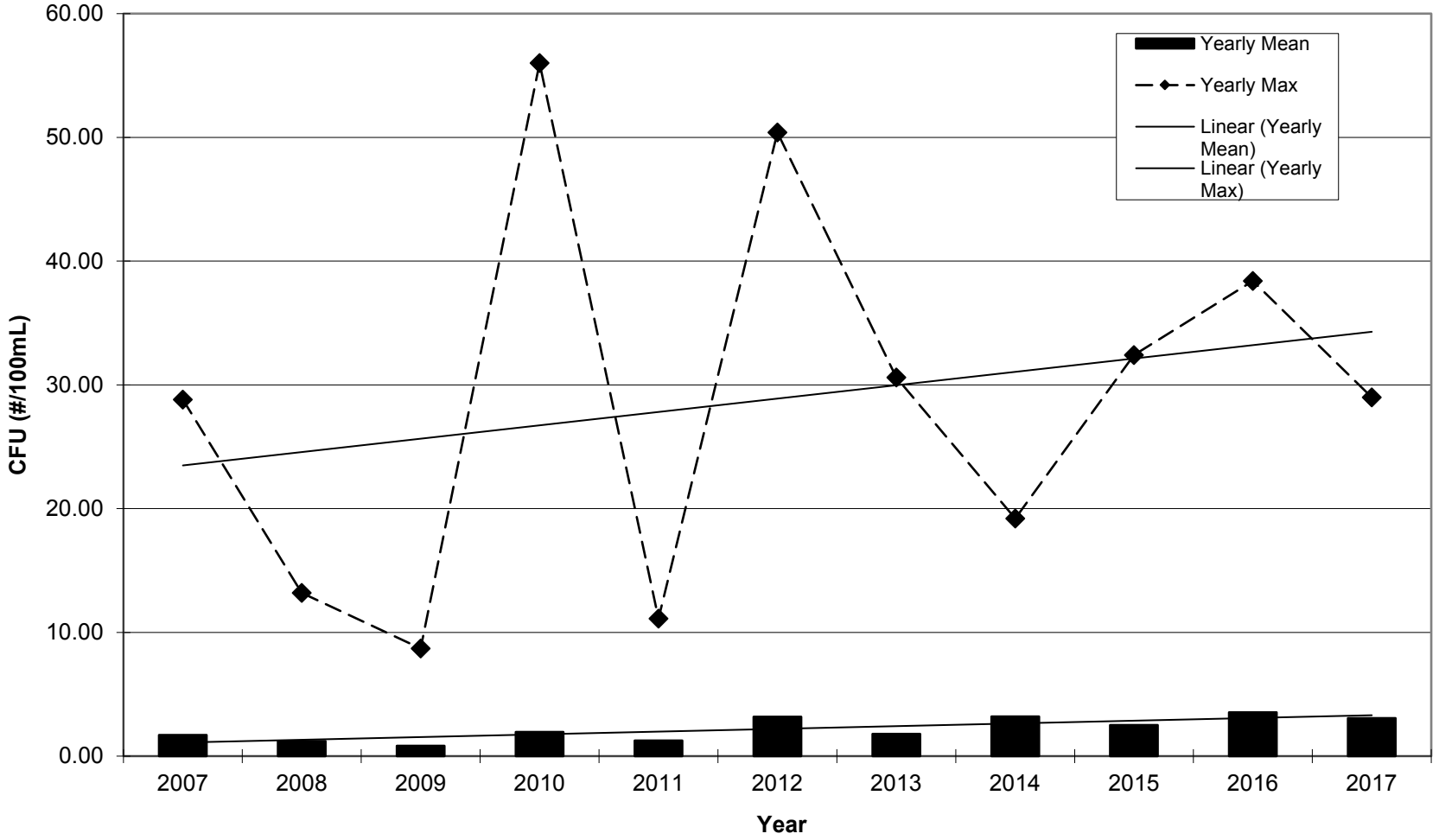


Figure 9.3: Yearly mean and max total coliform results for Zephyr Water Utility District between July 1, 2007 and June 30, 2018.



ZEPHYR COVE WATER UTILITY DISTR
Consumer Confidence Report – 2018
Covering Calendar Year – 2017

This brochure is a snapshot of the quality of the water that we provided last year. Included are the details about where your water comes from, what it contains, and how it compares to Environmental Protection Agency (EPA) and state standards. We are committed to providing you with information because informed customers are our best allies. It is important that customers be aware of the efforts that are continually being made to improve their water systems. To learn more, please attend any of the regularly scheduled meetings. **For more information please contact Greg Melandow at 775-782-9989.**

Your water comes from:

Source Name	Source Water Type
LAKE TAHOE INTAKE	Surface Water

We treat your water to remove several contaminants and we add disinfectant to protect you against microbial contaminants. The Safe Drinking Water Act (SDWA) requires states to develop a Source Water Assessment (SWA) for each public water supply that treats and distributes raw source water in order to identify potential contamination sources. The state has completed an assessment of our source water. For results of the source water assessment, please contact us.

Message from EPA

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons, such as those with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the EPA's Safe Drinking Water Hotline (800-426-4791).

The sources of drinking water (both tap water and bottled water) included rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water before we treat it include:

Microbial contaminants, such as viruses and bacteria, may come from sewage treatment plants, septic systems, agricultural livestock operations and wildlife.
Inorganic contaminants, such as salts and metals, can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining or farming.
Pesticides and herbicides may come from a variety of sources such as storm water run-off, agriculture, and residential users.
Radioactive contaminants, can be naturally occurring or the result of mining activity
Organic contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes and petroleum production, may also come from gas stations, urban storm water run-off, and septic systems.

In order to ensure that tap water is safe to drink, EPA prescribes regulation which limits the amount of certain contaminants in water provided by public water systems. We treat our water according to EPA's regulations. Food and Drug Administration regulations establish limits for contaminants in bottled water, which must provide the same protection for public health.

Our water system tested a minimum of 2 samples per month in accordance with the Total Coliform Rule for microbiological contaminants. Coliform bacteria are usually harmless, but their presences in water can be an indication of disease-causing bacteria. When coliform bacteria are found, special follow-up tests are done to determine if harmful bacteria are present in the water supply. If this limit is exceeded, the water supplier must notify the public by newspaper, television or radio.

Water Quality Data

The tables following below list all of the drinking water contaminants that were detected during the 2017 calendar year. The presence of these contaminants does not necessarily indicate that the water poses a health risk. Unless noted, the data presented in this table is from testing done January 1- December 31, 2017. The state requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants are not expected to vary significantly from year to year. Some of the data, though representative of the water quality, is more than one year old. **The bottom line is that the water that is provided to you is safe.**

Terms & Abbreviations

Maximum Contaminant Level Goal (MCLG): the "Goal" is the level of a contaminant in drinking water below which there is no known or expected risk to human health. MCLG's allow for a margin of safety.
Maximum Contaminant Level (MCL): the "Maximum Allowed" MCL is the highest level of a contaminant that is allowed in drinking water. MCL's are set as close to the MCLG's as feasible using the best available treatment technology.
Action Level (AL): the concentration of a contaminant that, if exceeded, triggers treatment or other requirements that a water system must follow.
Treatment Technique (TT): a treatment technique is a required process intended to reduce the level of a contaminant in drinking water.
Maximum Residual Disinfectant Level (MRDL): the highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
Maximum Residual Disinfectant Level Goal (MRDLG): the level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLG's do not reflect the benefits of the use of disinfectants to control microbial contaminants.
Non-Detects (ND): laboratory analysis indicates that the constituent is not present.
Parts per Million (ppm) or milligrams per liter (mg/l)
Parts per Billion (ppb) or micrograms per liter (µg/l)
Picocuries per Liter (pCi/L): picocuries per liter is a measure of the radioactivity in water.
Millirems per Year (mrem/yr): measure of radiation absorbed by the body.
Million Fibers per Liter (MFL): million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.
Nephelometric Turbidity Unit (NTU): nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Testing Results for ZEPHYR COVE WATER UTILITY DISTR

Microbiological	Result	MCL	MCLG	Typical Source
No Detected Results were Found in the Calendar Year of 2017				

Disinfection By-Products	Monitoring Period	RAA	Range	Unit	MCL	MCLG	Typical Source
TOTAL HALOACETIC ACIDS (HAA5)	2017	2.1	1.1 – 3.6	ppb	60	0	By-product of drinking water disinfection
TTHM	2017	9.85	1.91 – 9.9	ppb	80	0	By-product of drinking water chlorination

Lead and Copper	Date	90TH Percentile		Unit	AL	Sites Over AL	Typical Source
COPPER	2017	0.13	0.018 - 0.12	ppm	1.3	0	Corrosion of household plumbing systems; Erosion of natural deposits; Leaching from wood preservatives.
LEAD	2017	13	1	ppb	15	0	Corrosion of household plumbing systems; Erosion of natural deposits.

Regulated Contaminants	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
BARIUM	2017	0.013	0.01	ppm	2	2	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits.
ARSENIC	2017	0.001	0.01	ppm	10	0	Erosion of natural deposits; Runoff from orchards; Runoff from glass and electronics production wastes

Radionuclides	Collection Date	Highest Value	Range	Unit	MCL	MCLG	Typical Source
COMBINED RADIUM (-226 & -228)	6/8/2016	0.635	0.635	pCi/L	5	0	Erosion of natural deposits
GROSS ALPHA, INCL. RADON & U	6/8/2016	0.768	0.768	pCi/L	15	0	Decay of natural and man-made deposits
GROSS BETA PARTICLE ACTIVITY	6/8/2016	2.61	2.61	pCi/L	50	0	Decay of natural and man-made deposits

Secondary Contaminants	Collection Date	Highest Value	Range	Unit	SMCL	MCLG
ALKALINITY, BICARBONATE	6/8/2016	35	35	mg/L		
ALKALINITY, TOTAL	6/8/2016	35	35	mg/L		
BROMATE	2/9/2016	1.5	1.1 - 4.9	ppb	10	1
CALCIUM	6/8/2016	8	8	mg/L		
CHLORIDE	2017	2.6	2.3-2.6	mg/L	400	
HARDNESS, TOTAL (AS CACO3)	6/8/2016	28	28	mg/L		
IRON	2017	0.05	0.05	mg/L	0.6	
MAGNESIUM	6/8/2016	2	2	mg/L	150	
PH	6/8/2016	7.82	7.82	PH	8.5	
SODIUM	2017	6.7	5.2-6.7	mg/L	200	20
SULFATE	2017	1.6	1.6-2.2	mg/L	500	
TDS	2017	57	34-57	mg/L	1000	
ZINC	2017	0.02	0.02	mg/L	5	

Health Information About Water Quality

Additional Required Health Effects Language:

While your water meets the EPA's standard for Lead, *if present at elevated levels* this contaminant can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Your Water System is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your drinking water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Violations

During the 2017 calendar year, ZEPHYR COVE WATER UTILITY DISTRICT is required to include an explanation of the violation(s) in the table below and the steps taken to resolve the violation(s) with this report.

Type	Category	Analyte	Compliance Period
FOLLOW – UP OR ROUTINE TAP M/R (LCR)	MON	LEAD & COPPER RULE	1/1/2015 – 12/31/2017

Zephyr Cove Water Utility District took only nine of the ten required samples for Lead and Copper during the summer months of 2017, resulting in a violation for failure to complete all required monitoring. We will return to compliance through the Public Notification sent to our customers on January 18, 2018, and completing all monitoring as required between July and December of 2018. A representative copy of the public notification and requirements is available on request. The consumer notice of lead tap results will help occupants determine what actions to take to reduce their exposure to lead in drinking water. If you have any questions regarding the monitoring, reporting or public notification requirements, please do not hesitate to contact Douglas County Public Utilities at 775-782-9989.

North Tahoe Public Utility District
Water Quality Data Summary 2017-2018

During the 2017-2018 reporting year, North Tahoe Public Utility District (NTPUD) remained within Federal and State water quality requirements. During the same period, the Environmental Protection Agency (EPA) notes no violation to the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for NTPUD is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, NTPUD met Federal and State guidelines for turbidity by remaining within regulatory limits. The monthly maximum and median turbidity measurements did not exceed the filtration exemption maximum turbidity of 5 NTU (Figure 10.0, Table 14.0). The highest turbidity reading for the 2017-2018 reporting year was 0.65 NTU recorded on November 16, 2017, that corresponded with a storm event that produced 3.14 inches of rain paired with sustained winds from the south-southwest of 10-26 mph, and gusts up to 37 mph (Table 5.1). The annual mean turbidity was 0.27 NTU. The highest monthly mean turbidity, 0.36 NTU, occurred in both July and August of 2017 (Table 14.0).

Table 14.0: NTPUD source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the NTPUD intake.

Month	Monthly max (NTU)	Date monthly max	Monthly mean (NTU)	Monthly median (NTU)	90th percentile
Jul-17	0.52	25	0.36	0.34	0.46
Aug-17	0.48	17	0.36	0.35	0.45
Sep-17	0.48	2	0.30	0.29	0.36
Oct-17	0.38	20	0.30	0.30	0.35
Nov-17	0.65	16	0.31	0.28	0.35
Dec-17	0.38	21	0.26	0.24	0.33
Jan-18	0.37	7	0.22	0.22	0.26
Feb-18	0.35	13	0.21	0.20	0.29
Mar-18	0.37	2	0.18	0.17	0.23
Apr-18	0.49	24	0.24	0.22	0.30
May-18	0.30	7	0.24	0.24	0.26
Jun-18	0.26	19	0.21	0.20	0.23

This year's maximum turbidity reading of 0.65 NTU was lower than the previous years' maximum turbidity reading of 1.03 NTU. Yearly maximum turbidity data shows a decreasing annual linear trend (Figure 10.1). The 2017-2018 maximum turbidity reading of 0.65 NTU is the lowest maximum result over the 10-year reporting period of July 1, 2007- June 30, 2018. Maximum turbidity data is showing normalization after the 2013-2014 record-setting maximum reading of 5.01 NTU. The maximum annual turbidity was below 1 NTU in 2010 and 2012;

however, maximum turbidity rose above 2.0 NTU for the 2005-2009 reporting years, then decreased and remained below 1 NTU through the 2014-2018 reporting years (Figure 10.1).

NTPUD has historically maintained mean turbidity values below 0.5 NTU, including 0.27 NTU for 2017-2018. Annual mean turbidity shows a decreasing linear trend over the 10-year reporting period (Figure 10.1).

Coliform

NTPUD met Federal and State guidelines for total coliform for the 2017-2018 reporting year. The annual maximum total coliform reading for NTPUD of 500 CFU was recorded on October 19, 2017, when the daily maximum temperature was 53°F, with a weekly average temperature of 44°F. Winds on October 19, 2017, included wind gusts reaching 18 mph (Table 5.6, Figure 10.2). Total coliform was detected in 39% of the 146 samples analyzed, higher than the previous year's 22% detection. The mean total coliform count of 11.21 CFU was higher than the previous reporting years' reading of 2.52 CFU (Figure 10.3). Over the 10-year reporting period of July 1, 2007 – June 30, 2018 maximum and mean annual data show an increasing linear trend over time (Figure 10.3)

For the 2017-2018 reporting year, NTPUD reported three results greater than 100 CFU/100 ml, out of 146 samples analyzed, equaling 2.05%. NTPUD meet avoidance criteria because the percentage of samples over 100 CFU/100 ml was less than 10% of the total samples analyzed.

As discussed in Chapter III of this report, Lake Tahoe was influenced by spring sediment wash greater than the previous five years combined after the winter of 2016-2017[1], and an increase in water temperature, caused by the storage of heat due to the absence of deep mixing for the sixth year in a row[2]. The water temperature profile provided by the UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018[3] shows the water temperature at a depth of the NTPUD intake during October 2017 as 58°F (Table 5.5, Figure 1.4). This combination of increased sedimentation and warm water temperatures likely provided an optimal environment for the presence of total coliform, and the maximum total coliform result recorded at NTPUD.

It should be noted that during the 2015-2016 reporting year NTPUD reported three "too numerous to count" results of >1600 CFU that were attributed to high concentrations of pine pollen in suspension, as well as the rolling wave effect produced by easterly winds. These values have been omitted, due to their obtuse, non-defined nature, and the NTPUD annual maximum was reported as 50 CFU, the highest true reading for the 2015-2016 reporting year.

NTPUD also completed tests for E.coli coliform on all samples tested for total coliform. During the 2016-2017 reporting year, E. coli coliform was detected in 11 of the 146 samples (Table 14.1 and 14.2). The maximum E.coli coliform reading was 300 CFU/20mL, the annual mean was

[1] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.1,
[2] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.3
[3] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3

2.34 CFU/20mL, and the 90th percentile of the samples were 0 CFU. The maximum E.coli coliform result was taken on November 16, 2017, the water temperature at a depth of the NTPUD intake was still 55^0F and likely contributed to optimal environmental conditions for E. coli coliform (Figure 1.4).

Table 14.1: NTPUD annual source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the NTPUD intake.

	Total coliform CFU (# colonies/100mL)	E. coli coliform CFU (# colonies/20mL)
Mean	11.21	2.34
Median	0	0
Max	500	300
90th Percentile	22	0
Colony-Forming Samples	57	11
Total Number of Samples	146	146

Table 14.2: NTPUD monthly source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the NTPUD intake.

	Maximum total coliform (# colonies/100mL)	Mean total coliform (# colonies/100mL)	Maximum E coli coliform (# colonies/20mL)	Mean E coli coliform (# colonies/20mL)
Jul-17	8.00	2.92	0.00	0.00
Aug-17	80.00	15.29	2.00	0.29
Sep-17	80.00	14.91	20.00	2.00
Oct-17	500.00	69.00	4.00	1.11
Nov-17	300.00	46.75	300.00	25.33
Dec-17	4.00	0.55	0.00	0.00
Jan-18	2.00	0.15	0.00	0.00
Feb-18	2.00	0.33	2.00	0.17
Mar-18	0.00	0.00	0.00	0.00
Apr-18	0.00	0.00	0.00	0.00
May-18	8.00	0.71	0.00	0.00
Jun-18	13.00	1.58	0.00	0.00

Figure 10.0: Monthly mean and max turbidity results for North Tahoe Public Utility District between July 1, 2017 and June 30, 2018.

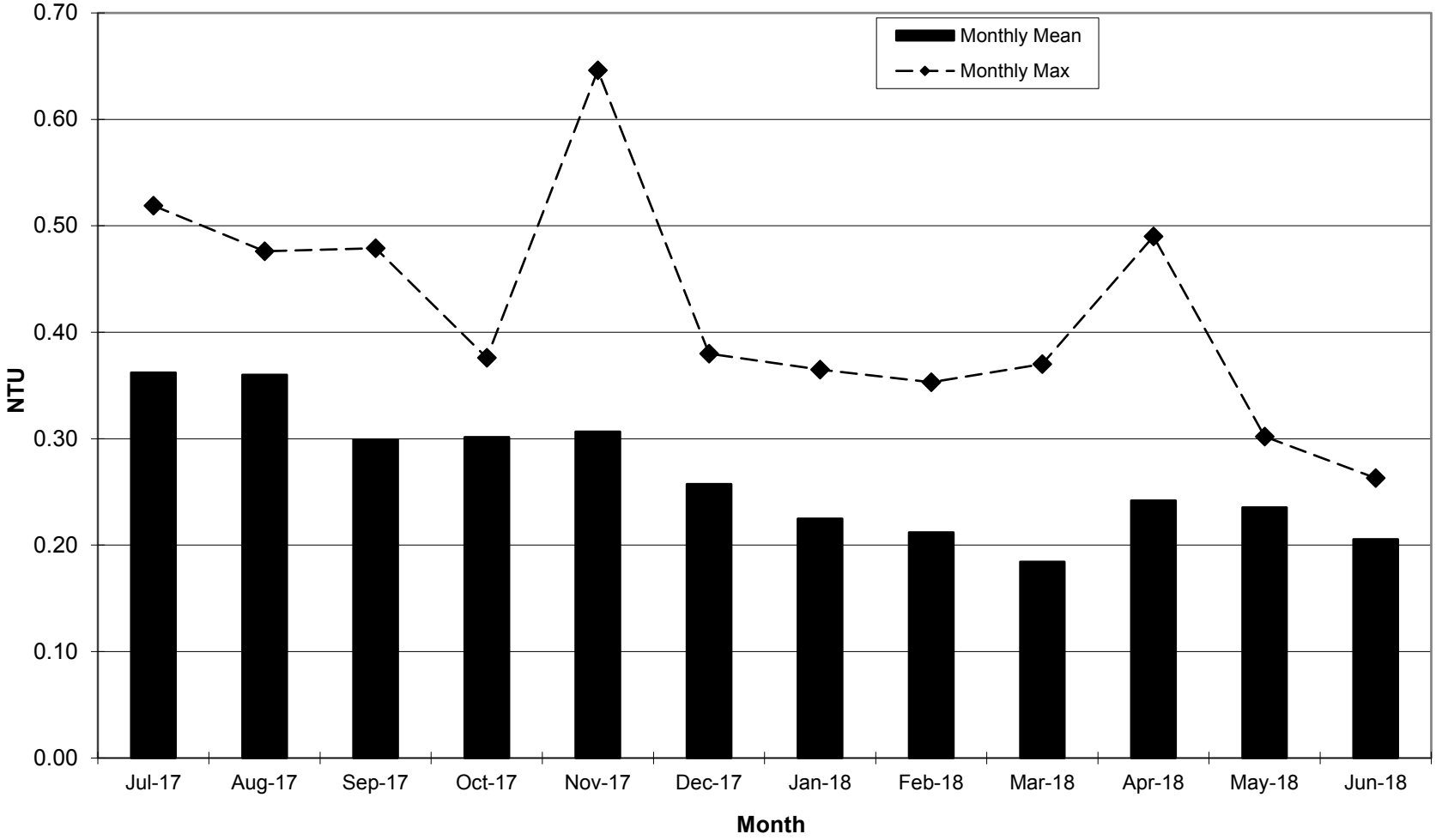


Figure 10.1: Yearly mean and max turbidity results for North Tahoe Public Utility District between July 1, 2007 and June 30, 2018.

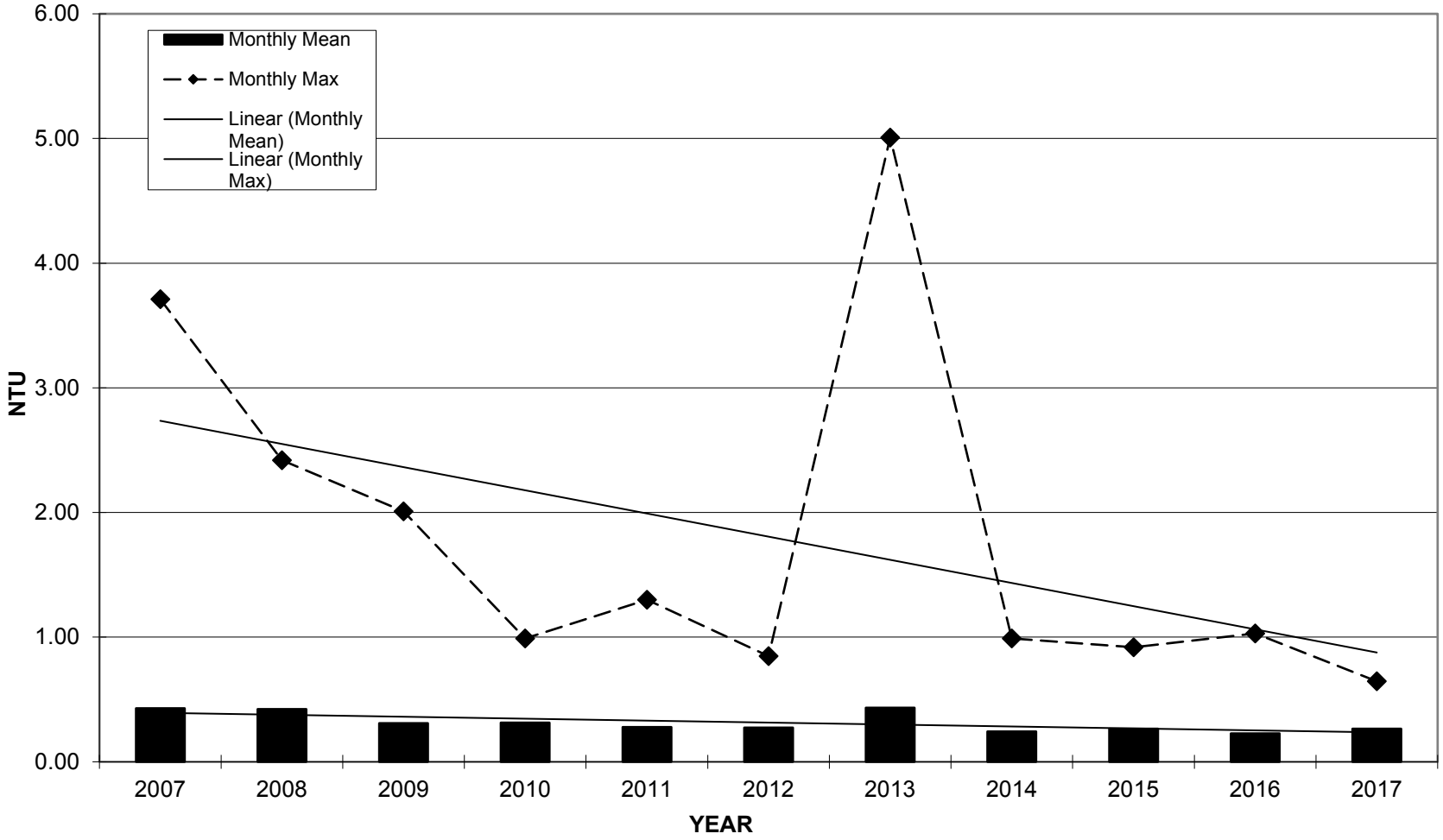


Figure 10.2: Monthly mean and max total coliform results for North Tahoe Public Utility District between July 1, 2017 and June 30, 2018.

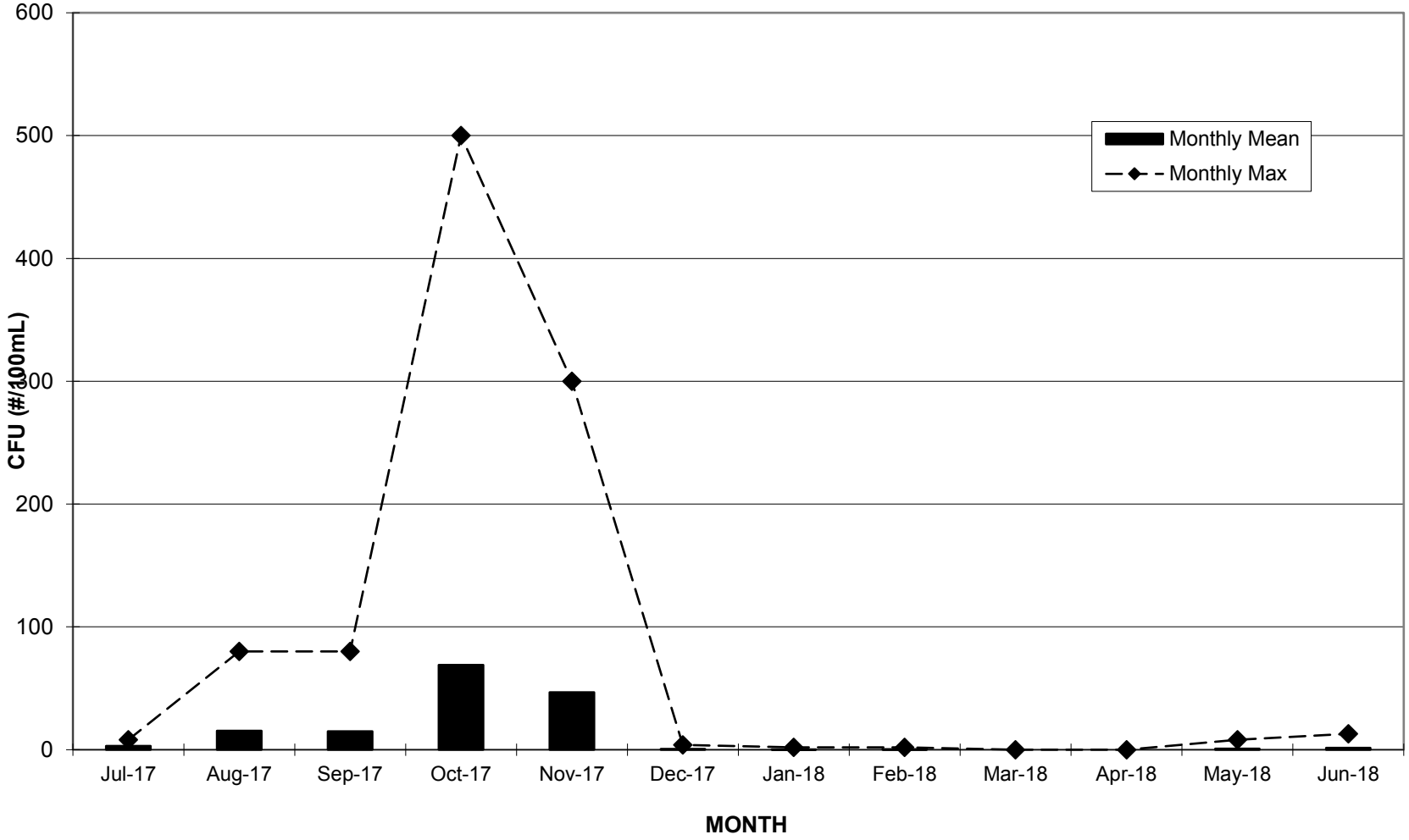
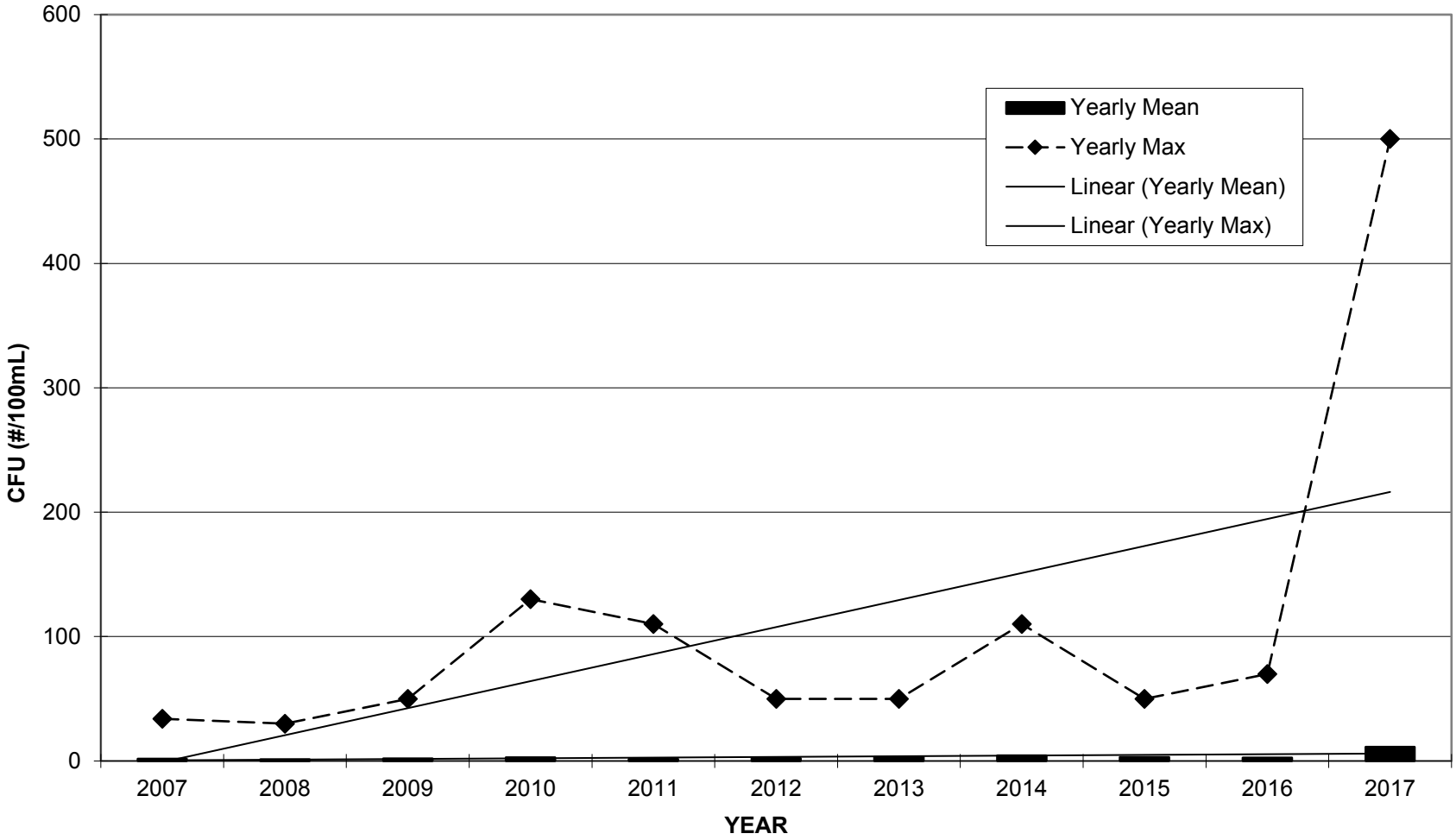


Figure 10.3: Yearly mean and max total coliform results for North Tahoe Public Utility District between July 1, 2007 and June 30, 2018.



NORTH TAHOE PUBLIC UTILITY DISTRICT
ANNUAL WATER QUALITY
CONSUMER CONFIDENCE REPORT FOR 2017

To Our Customers: This report contains important information about your drinking water.

Este informe contiene información muy importante sobre la calidad de su agua potable. Por favor lea este informe o comuníquese con alguien que pueda traducir la información.

Where does my water come from?

The North Tahoe Public Utility District services nearly 3,930 connections. These connections include single family dwellings and business establishments, as well as separate irrigation and fire systems. The District operates three separate and independent water systems: Dollar Cove, Carnelian Bay, and the Tahoe Main system, comprised of Tahoe Vista, Kings Beach, and Brockway to the Nevada State Line. Dollar Cove is currently being supplied through the Tahoe City Public Utility District's Tahoe City system, by agreement of a joint well drilling project of the two Districts that is comprised of five separate wells (groundwater sources). Carnelian Bay draws its water from a single well (groundwater source). The Tahoe main water system draws water from Lake Tahoe (surface water source) through an intake at the end of National Avenue in Tahoe Vista, as well as a single well (groundwater source) located in the North Tahoe Regional Park at the top of Donner Road. These combined sources supplied just under 391 million gallons of water to our customers in 2017.

How can I keep our drinking water safe and clean?

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the **USEPA's Safe Drinking Water Hotline (800-426-4791).** The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels in the environment it dissolves naturally occurring minerals, pick up substances from the presence of animals or human activity, and even radioactive material, in some cases. **Microbial contaminants**, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife; **Inorganic contaminants**, such as salts and metals, that can be naturally-occurring or result from urban storm water runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming. **Pesticides and Herbicides,** which may come from a variety of sources such as agriculture, urban storm water runoff, and residential uses; **Organic chemical contaminants**, including synthetic and **Volatile Organic chemicals,** that are byproducts of industrial process and petroleum production, and can also come from gas stations, urban storm water runoff, and septic systems; **Radioactive contaminants**, which can be naturally-occurring or be the result of oil and gas production and mining activities. In order to ensure that tap water is safe to drink, EPA and the Calif. Dept. of Public Health, Division of Drinking Water and Environmental Management (Department), prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. We treat our water according to their regulations. Food and Drug Administration

(FDA) regulations establish limits for contaminants in bottled water that must provide the same protection for public health.

Why are there contaminants in my drinking water?

The drinking water that the District treats and provides for its customers comes from wells as well as the open water of Lake Tahoe. Many people don't see the link between the water you drink and the items that are put into the sewer system, but when people dispose of their waste incorrectly it threatens the safety of our drinking water as well.

In the Tahoe basin, our storm drain system does not put runoff into the sewer system like so many other communities in this country. Most of the storm drains actually drain directly into the Lake! In addition to protecting our sewers, it is also extremely important that under no circumstances may substances be put directly into the storm drain.

Most liquid and automotive waste (oil, old gasoline) can be disposed of during one of the hazardous waste disposal days provided by Placer County and Tahoe Truckee Sierra Disposal at the Eastern Regional Landfill on Cabin Creek Road off Highway 89.

For Your Information

Our Board of Directors meets on the second Tuesday of each month at the North Tahoe Event Center. We encourage participation in these meetings. For meeting times and agendas please contact the District's main office, (530) 546-4212, or visit our website http://ntpud.org/

To obtain specific water quality or watershed data contact Michael Warren, Water Quality Technician at (530) 546-4212 ext. 5452, or mwarren@ntpud.org. Visit www.ntpud.org to find more information.

Source water assessment and its availability

Our most recent watershed sanitary survey (Lake Tahoe) update is 2009.

Although the North Tahoe Basin sewage flows to Truckee and is treated, domestic sewage and wastewater disposal and collection are potentially contaminating activities (PCA) of key concern. Summer recreation on the lake is another PCA of key concern. The District does not have direct regulatory control or enforcement over the Lake Tahoe watershed. We rely on the regulatory powers of the Tahoe Regional Planning Agency (TRPA) and Lahontan Regional Water Quality Control Board (RWQCB).

Water Quality Data

These system tables list all the drinking water contaminants that were tested for during the 2016 calendar year. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. Unless otherwise noted, the data presented in this table is from testing done January 1—December 31, 2017. The EPA or the State requires us to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently. See the last page for Terms and Abbreviations used in the report.

Do I need to take special precautions?

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV / AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the **Safe Drinking Water Hotline (800-426-4791**).

Lead

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The North Tahoe Public Utility District is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by running your tap for 30 seconds to 2 minutes before using water for drinking or cooking. Capture and use this water for household or garden plants. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead

Radon

Radon is a radioactive gas that you cannot see, taste or smell. It is found throughout the U.S. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water on most cases would be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can cause cancer. Drinking water containing radon may also cause increased risk of stomach cancer. If you are concerned about radon in your home, test the air in your home. Testing is inexpensive and easy. You should pursue radon removal for your home if the level of radon I your air is 4 picocuries per liter of air (pCi/L) or higher. There are simple ways to fix a radon problem that are not too costly. For additional information, call your State radon program (1-800-745-7236), the USEPA Safe Drinking Water Hotline (1-800-426-4791), or the National Safety Council on Radon Hotline (1-800-767-7236).

Conservation – A California Way of Life

In April 2017 the State of California placed permanent restrictions on wasteful water practices. The following wasteful water practices are now permanently prohibited:

- Hosing off sidewalks, driveways and other hardscapes
- Washing automobiles with hoses not equipped with a shut-off nozzle
- Using non-recirculated water in a fountain or other decorative water feature

- Watering lawns in a manner that causes runoff
- Watering within 48 hours after measurable precipitation
- Irrigating ornamental turf on public street medians

20% by 2020

The 20% by 2020 state mandate is that all water purveyors reduce their per capita water use by 20% from the average usage of our customers over 10 years in the early 2000's. The way this baseline is calculated is complicated and water leaks within our system also are included in this per capita water usage number. The waterline replacement projects and water leak detection and repair as part of our ongoing maintenance plan will also help to bring the District into compliance. If the District (or any water purveyor) fails to meet this 20% by 2020 mandate, the State has indicated that they will no longer be eligible for state grants.

The amount of water used for irrigation of outdoor landscaping is putting the District out of compliance and not on track to meet this mandate. The District is asking our customers to be vigilant on their outdoor watering and consider these useful tips.

- Don't water every day (it's not necessary!)
- Adjust your irrigation system to accommodate the cooler shoulder season
- Install weather-based smart irrigation controllers or sensors that automatically turn off your system during and after precipitation.

Visit http://ntpud.org/conservation for other helpful tips and information on rebates for water saving appliances and irrigation supplies and free conservation supplies!

North Tahoe Public Utility District 875 National Ave. P.O. Box 139 Tahoe Vista, CA. 96148 (530) 546-4212

NORTH TAHOE PUBLIC UTILITY DISTRICT
ANNUAL WATER QUALITY
CONSUMER CONFIDENCE REPORT FOR 2017

Detected Compounds The State allows us to monitor comtaminants less than once per year because the concentrations of these comtaminates do not change frequently. Some of our data, though representive, are more than one year old. If a substance or contaminant is not listed, it is either not detected limit or not required to sampled.

Contaminant (UNITS)	Sample Year	MCL	PHG (MCLG)	Tahoe Main System #33110001 Lake Tahoe Nat'l Groundwater Ave	Park Well	Carnelian Woods System #3110023 Groundwater Park Well	Dollar Cove System #3110036 Groundwater Tahoe City PUD	Violation	Major Source in Drinking Water
	Identify your system >						Tahoe City PUD water supply to NTPUD constists of Highlands Well #1 #2, T.C. Well #2 #3, Tahoe Tavern Well		
Primary Standards									
Aresenic (ppb)	2016	10	0.004	ND	NR	NR	(2014/17)3.7/2.3/ND/3.1/ND	NO	Erosion of natural deposits
Nickel (ppb)	2016	100	10	ND	ND	ND	(2014)20/20/20/21/20	NO	Erosion of natural deposits
Microbiological Monitoring									
Total Coliforms (T / A / P)	2017	1	(0)	156T / 156A / 0P		12T / 12A / 0P	156T / 156A / 0P	NO	Naturally Present in the enviroment
E-Coli (T / A /P)	2017	1	(0)	156T / 156A / 0P		12T / 12A / 0P	156T / 156A / 0P	NO	Human and Animal Fecal Waste
Radioactive									
Radon 222 (pCi/L)	2003	N/A	N/A	NR	NR	NR	547/1190/NS/1230/1120	N/A	Erosion of natural deposits
Radium 228 (pCi/L)	2012	5	0.019	ND/0.000	NR	NR	NR	NO	Erosion of natural deposits
Gross Alpha (pCi/L)	2017	15	(0)	2.32	NR	NR	NR	NO	Erosion of natural deposits
Inorganic									
Nitrate - As N (ppm)	2017	1(AS-N)	1(AS-N)	ND	ND	ND	NR	NO	Runoff & leaching from fertilizers, sepit tanks, sewage
Nitrite _ As NO3 (ppm)	2016	45 (NO3)	45 (NO3)	ND	ND	ND	NR	NO	Runoff & leaching from fertilizers, sepit tanks, sewage
Perchlorate (ppb)	2016	0.006	6	ND	ND	ND	NR	NO	Production of matches, flares, explosives, pyrotechnics
Aluminum (ug/L)	2016	1000	600	ND	ND	ND	NR	NO	Erosion of natural deposits
Antimony	2016	6	1					NO	Discharge from petroleum refineries, fire retardants
Barium (ug/L)	2016	1000	(2) mg/L	17.6	44.2	22.6	NR	NO	Oil drilling wastes, Erosion of natural deposits
Berylilum	2016	4	N/A	ND	ND	ND	NR	NO	Discharge from metal refineries, coal burning factories
Cadmium	2016	5	N/A	ND	ND	ND	NR	NO	Interanal corrosion of galvanized pipes, runoff
Chromium (ug/L)	2016	50	(100)	ND	NR	ND	NR	NO	Discharge from steel & pulp mills, chrome plating
Fluoride (F) Natural Source	2016	2	N/A	ND	ND	ND	NR	NO	Erosion of natural deposits
Mercury	2016	2	N/A	ND	ND	ND	NR	NO	Erosion of natural deposits, discharge from refineries
Selenium	2016	50	5	ND	ND	ND	NR	NO	Discharge from petroleum, glass & metal refineries
Thallium	2016	2	1	ND	ND	ND	NR	NO	Leaching from ore processing, discharge from glass
Disinfection By-Products									
Chlorine (ppm)	2017	[MRDL=4.0(as Cl2)]		0.20-2.42 Annual RAA = 0.88		NR	Range 0.20 - 0.68 RAA = 0.42	NO	Drinking water disinfectant added for treatment
Disinfection By-Products	**Tahoe Main System #311001**			**Site #1 / #2 Annual**			**Site #3 Every Three Years**		
Total Trihalomethanes (ppm)	2017	0.080	1000	14 / 32		NR	(2017) ND	NO	By products of drinking water disnefection
Haloacetic Acids (ppm)	2017	0.060	1000	5.1 / 9.8		NR	(2017) ND	NO	By products of drinking water disnefection
Secondary Standards	**Asethetic Standards Established by the State of California,Department of Health Services**								
Clarity & Taste							2014		
Turbidity (NTU) - Treated Water	2017	<0.5 NTU	NS	AVG. .074-.211	NR	NR	0.25/0.45/0.17/0.23/0.19	NO	Soil runoff (erosion)
Turbidity (NTU) - Raw Source	2017	TT/5 95%	NS	AVG. .080-.191	NR	NR	NR	NO	Soil runoff (erosion)
Bicarbonate as HCO3 (ppm)	2016	None/ppm	N/A	50.3	124	126	NR	NO	Erosion of natural deposits
Calcium (ppm)	2016	N/A	N/A	1.8	16.1	17.1	(2014) 7.6/7.5/12.3/10.2/16.7	NO	Erosion of natural deposits
Carbonates CO3 (ppm)	2016	N/A	N/A	ND	ND	ND	NR	NO	Erosion of natural deposits
Chloride (ppm)	2016	500	N/A	1.8	0.6	0.4	(2014)0.5/0.6/0.5/0.3/ND	NO	Erosion of natural deposits
Color	2016	15 Units	N/A	NR	ND	3	NR	NO	Erosion of natural deposits

Ordor (TON)	2016	1	3	N/A	ND	ND	(2014) ND/ND/ND/2/ND	NO	Naturally-occurring organic materials
Copper (ug/L)	2016	1000	160	ND	ND	ND	NR	NO	Erosion of natural deposits
Foaming Agents (MBAS)	2016	0.5	N/A	ND	ND	ND	NR	NO	Erosion of natural deposits
Hydroxide as OH	2016	N/A	N/A	ND	ND	ND	NR	NO	Erosion of natural deposits
Iron (ppb)	2016	300	N/A	ND	ND	ND	(2005)ND(1)/ND(125)/ND(1)/ND(1)/ND(1)	NO	Erosion of natural deposits
Magnesium (ppm)	2016	N/A	N/A	2.6	6.0	8.6	NR	NO	Erosion of natural deposits
Manganese (ppm)	2016	50	N/A	ND	ND	ND	(2005) ND	NO	Erosion of natural deposits
Methyl-tert-butyl-ether (ppm)	2007	0.0005	5ug/L	ND	ND	ND	NR	NO	Leaking underground fuel tanks
PH - Disired range:	2016	6.5-8.5	N/A	8.2	8.2	7.7	NR	NO	Erosion of natural deposits, Some water treatment
Silver	2016	100	N/A	ND	ND	ND	NR	NO	Erosion of natural deposits
Sodium (ppm)	2016	N/A	N/A	6.3	11.9	5.9	(2014)14.6/11.6/5.0/5.2/5.3	NO	Erosion of natural deposits
SpecificConductance [E.C.] (uS)	2016	1600	N/A	101	192	185	(2014)215/189/164/160/217	NO	Substances that form ions when in water
Sulfate (ppm)	2016	500	N/A	1.7	0.3	0.3	(2014)1.3/0.9/1.7/3.6/0.8	NO	Erosion of natural deposits
Total Alkalinity [as CaCO3] (ppm)	2016	N/A	N/A	41.2	102	103	(2014)93.5/87.3/69.3/66.7/93.7	NO	Erosion of natural deposits
Total Dissolved Solids (ppm)	2016	1000	N/A	20	112	97	(2014)72/80/83/98/125	NO	Erosion of natural deposits
Total Hardness [as CaCO3] (ppm)	2016	N/A	N/A	32	65	78	(2014)44/41/59/51/74	NO	Erosion of natural deposits
Zinc (ppm)	2016	5	N/A	ND	ND	ND	(2014) ND	NO	Erosion of natural deposits
LEAD AND COPPER		**Action Level**	**MCL**	20 Samples	90th Percentile	10 Samples 90th Percentile	10 Samples 90th Percentile		
LEAD (ug/L)	2016	15	15	ND		2.6	34		Internal corrosion-plumbing; erosion nat'rl deposits.
Copper (ug/L)	2016	1300	1300	110		289	20 Samples 0.11		Corrosion of household plumbing systems.

Terms and Abbreviations Used in this Report

MCL Maximim Contaminant Level: The highest level of a contaminant that is allowed in drinking water . Primary MLCs are set as close to the PHGs(orMCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste and appearence of drinking water.

MCLG Maximum Contaminant Level Goal: The "Goal"(MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Enviromental Protection Agency.

MRDL Maximun Residual Level:The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

PHG Public Health Goal: The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

PPB Parts Per Billion: Parts contaminant for every 1 billion parts of water.

PPM Parts Per Million: Parts contaminant for every 1 million parts of water.

T Number of tests for bacteria (Laboratory analysis)

A Number of tests absent of bacteria

P Number of tests detecting presence of bacteria

< = Less Than

> = Greater Than

TON Threshold Odor Number

RAA Running Annual Average

N/A Not Applicable

ND Not Detected: Indicates contaminant was not detected in the water source.

N/R Not Regulated or Not Required

MRDLG Maximum Residual Disinfection Level Goal: The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control of microbial contaminants.

PDWS Primary Drinking Water Standards: MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment.

ug/L Micro grams Per Liter (Parts Per Million)

pCi/L Piocuries Per Liter: Measures of radioactivity per 1 light scattering.

TT Treatment Technique: A required process intended to reduce the level of contaminant.

Units Number of units measured

uS Microsiemens: Measure of electrical currernt through a solution.

NTU Nephelometric Turbudity Unit: Measure of water clarity using light scattering.

Lakeside Park Association
Water Quality Data Summary 2017-2018

During the 2017-2018 reporting year, Lakeside Park Association (LPA) remained in compliance with Federal and State water quality requirements. During the same period, the Environmental Protection Agency (EPA) notes no violation to the health, reporting, or monitoring requirements of the Safe Drinking Water Act (Table 5.9). Additional regulatory information for LPA is provided in the Consumer Confidence Report found at the end of this section.

Turbidity

Between July 1, 2017, and June 30, 2018, LPA met Federal and State guidelines for turbidity by remaining within regulatory limits for a filtering water system. The highest turbidity reading for the 2017-2018 reporting year was 1.67 NTU and occurred on August 22, 2017, during a precipitation event that produced 0.08 inches of rain, 3-13 mph winds from the south with no gusts reported (Table 5.1). The annual mean turbidity for LPA was 0.23 NTU. The monthly mean turbidity result was highest in November 2017 at 0.44 NTU, lower than the 2016-2017 highest monthly mean turbidity of 1.54 NTU (Table 15.0 and Figure 11.1).

Table 15.0: LPA source water turbidity data results from July 1, 2017, through June 30, 2018. Turbidity analyses completed on samples collected daily from raw water at the LPA intake.

Month	Monthly Max (NTU)	Date Monthly Max	Monthly Mean (NTU)	Monthly Median (NTU)	90th Percentile
Jul-17	0.0	off line	0.00	0.00	0.00
Aug-17	1.7	22	0.29	0.22	0.36
Sep-17	0.4	23	0.16	0.15	0.24
Oct-17	0.4	18	0.22	0.21	0.35
Nov-17	1.3	2	0.44	0.40	0.62
Dec-17	0.4	29	0.25	0.24	0.34
Jan-18	0.3	30	0.19	0.19	0.22
Feb-18	0.5	7	0.25	0.24	0.31
Mar-18	0.2	15	0.16	0.15	0.18
Apr-18	0.3	13	0.20	0.20	0.26
May-18	0.3	15	0.18	0.16	0.21
Jun-18	0.3	29	0.21	0.18	0.29

Historically, LPA has maintained maximum turbidity measurements lower than the regulatory standards of 5 NTU for non-filtering purveyors and filters the water to well below 1 NTU before distribution (Figure 11.1). The highest annual mean for turbidity reported at LPA in the 10-year reporting period of July 1, 2007- June 30, 2018, is 0.77 NTU recorded in this in 2007, followed by 0.76 NTU reported in 2009. The annual mean turbidity for the 2017-2018 reporting year was the lowest in the 10-year reporting period and shows a decreasing linear trend over time (Figure 11.1). The 2017-2018 maximum turbidity reading of 1.67 NTU is more similar to annual

maximum results has seen throughout the 10-year reporting period, but due to the maximum result in 2017-2018 of 20.2 NTU the linear trendline is increasing (Figure 11.1)

Coliform

LPA met Federal and State guidelines for total and E. coli coliform for filtering systems. The maximum total coliform count was 613 coliform-forming units (CFU), an increase from the previous year's 10.9 CFU. The maximum total coliform reading was taken on October 4, 2017 Temperatures rose to 50^0F, from the weekly mean temperature of 44^0F, with sustained winds of 2-10 mph no gusts are reported for this date (Table 5.6). The 2017-2018 maximum total coliform result is the highest reported for LPA in the 10- year reporting period of July 1, 2007-June 30, 2018, producing an increasing linear trend line for annual maximum turbidity over the reporting period (Figure 11.3). The highest monthly mean total coliform results also occurred in October 2017. The total coliform CFU counts decreased the remainder of the sampling year (Table 15.2, Figure 11.2).

Total coliform was detected in 12 of the 22 samples analyzed equaling 55% (Table 15.1). The yearly mean total coliform count was 69.4 CFU, an increase from the 2016-2017 mean of 1.8 CFU, and lower than the previous eight reporting years (Table 15.1, Figure 11.3).

As discussed in Chapter III of this report, Lake Tahoe was influenced by spring sediment wash greater than the previous five years combined after the winter of 2016-2017[1], and an increase in water temperature, caused by the storage of heat due to the absence of deep mixing for the sixth year in a row[2]. The water temperature profile provided by the UC Davis, Tahoe Environmental Research Centers, State of the Lake Report 2018[3] shows the water temperature at a depth of the LPA intake during October 2017 as 58^0F (Table 5.5, Figure 1.4). This combination of increased sedimentation and warm water temperatures likely provided an optimal environment for the presence of total coliform, and the maximum total coliform result recorded at LPA.

LPA also completed tests for E. coli coliform on all samples tested for total coliform. Of the 22 samples analyzed for E. coli coliform, 1 sample had a detect for E. coli coliform. The maximum E. coli coliform result was 3.1 CFU/ 100 mL, and the annual mean was 0.14 CFU/100 mL (Table 15.1).

[1] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.1,
[2] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 2.3
[3] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3

Table 15.1: LPA annual source water total and E. coli coliform data results from July 1, 2017, through June 30, 2018. Coliform analyses completed on samples collected daily from raw water at the LPA intake.

	Total coliform (# colonies/100mL)	E coli coliform (# colonies/100mL)
Mean	69.4	0.140909091
Median	2.5	0
Max	613	3.1
90th Percentile	0	0
Colony Forming Samples	12	1
Total Number of Samples	22	22

Table 15.2: Lakeside Park Association monthly source water Total and E.coli Coliform data results from July 1, 2017, through June 30, 2018. Analyses completed on samples collected daily from raw water at the Lakeside Park Association intake.

	Maximum Total Coliform (# colonies/100ml)	Mean Total Coliform (# colonies/100ml)	Maximum Ecoli Coliform (# colonies/100ml)	Mean Ecoli Coliform (# colonies/100ml)
Jul-17	0	0	0	0
Aug-17	35.9	23.4	3.1	1.55
Sep-17	344	181.45	0	0
Oct-17	613	537	0	0
Nov-17	16	14.5	0	0
Dec-17	4	2	0	0
Jan-18	0	0	0	0
Feb-18	0	0	0	0
Mar-18	0	0	0	0
Apr-18	0	0	0	0
May-18	1	0.5	0	0
Jun-18	4.1	4.1	0	0

Figure 11.0: Monthly mean and max turbidity results for Lakeside Park Association between July 1, 2017 and June 30, 2018.

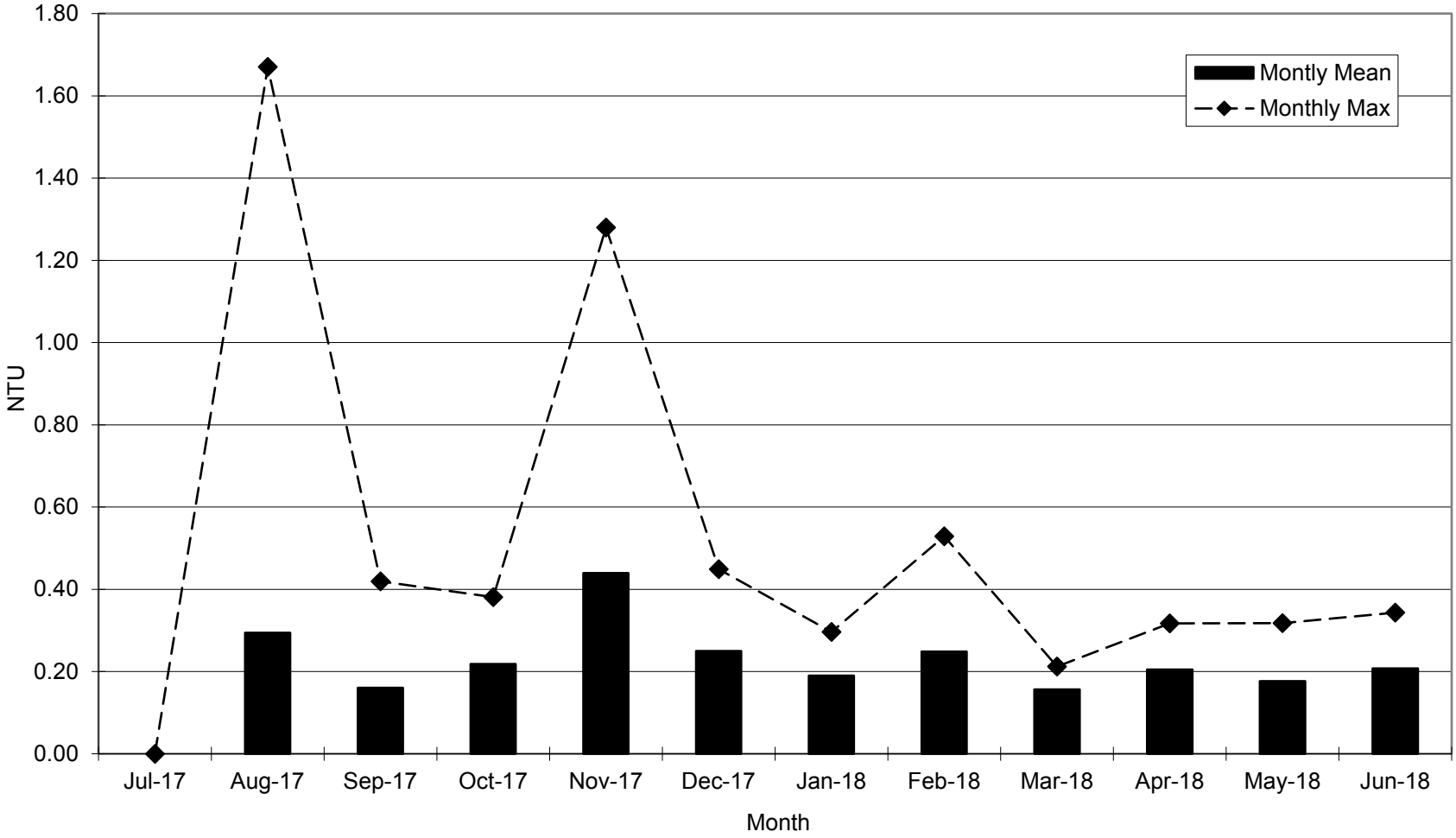


Figure 11.1: Yearly mean and max turbidity results for Lakeside Park Association between July 1, 2007 and June 30, 2018.

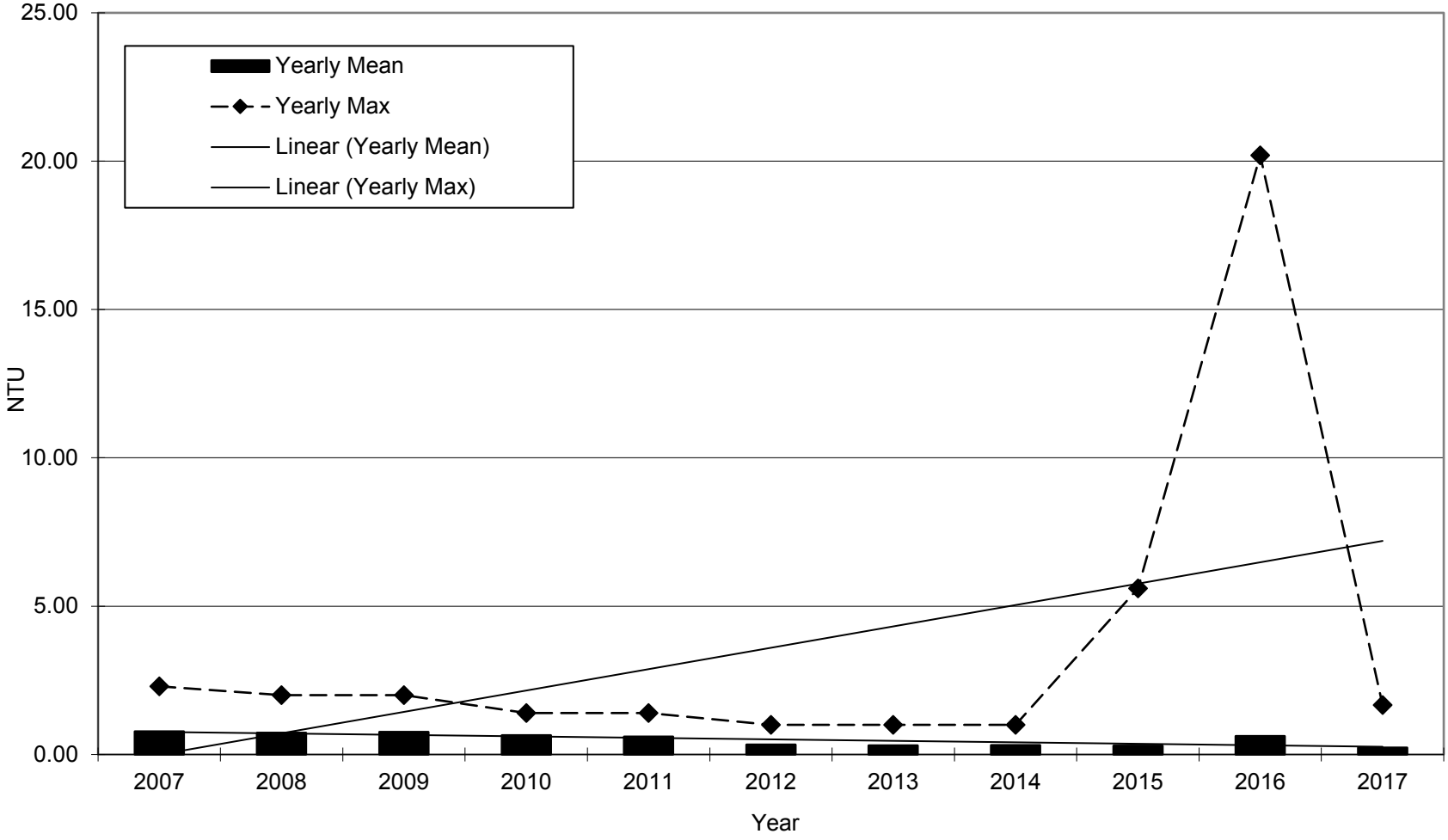


Figure 11.2: Monthly mean and max total coliform results for Lakeside Park Association between July 1, 2017 and June 30, 2018.

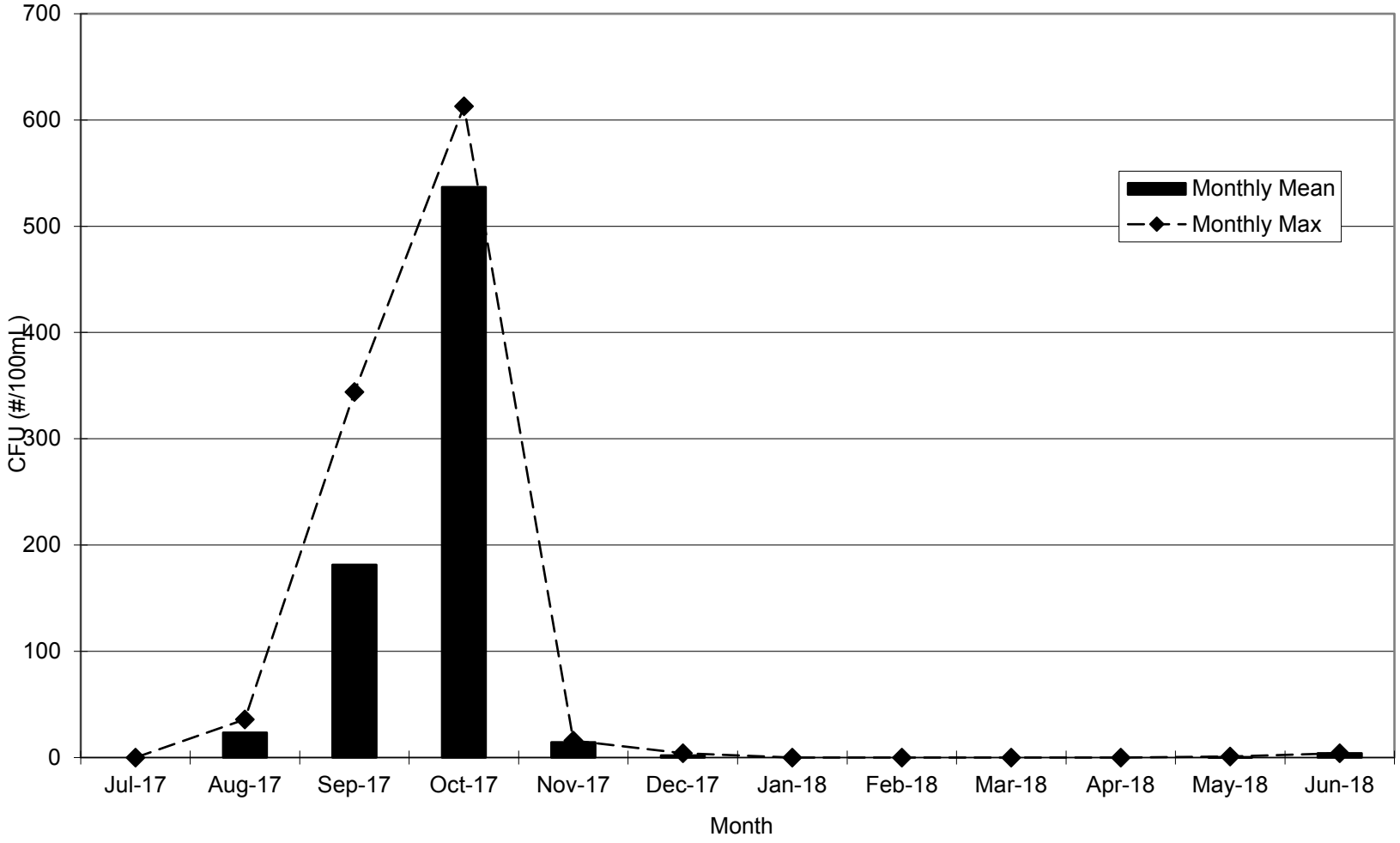
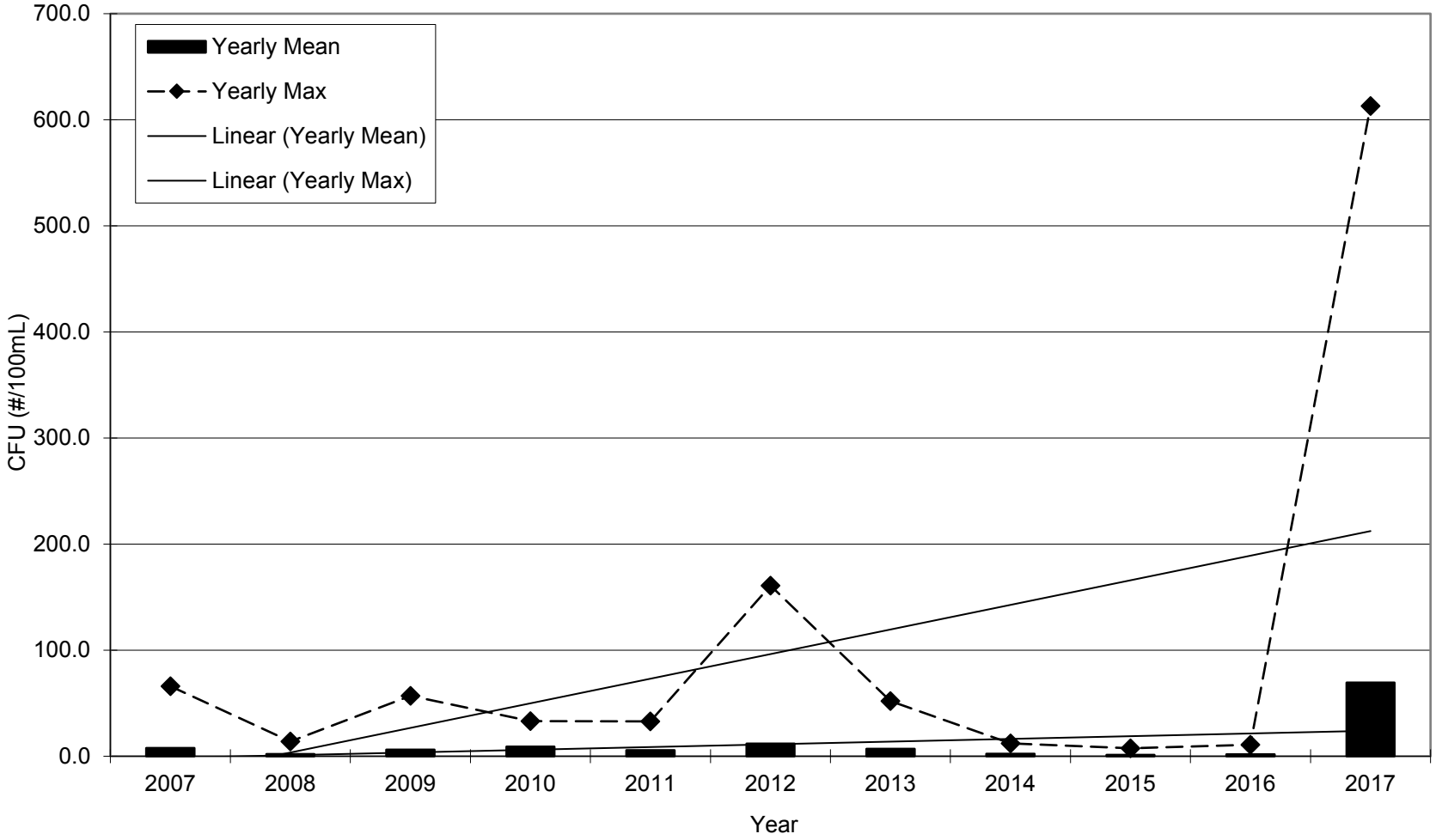


Figure 11.3: Yearly mean and max total coliform results for Lakeside Park Association between July 1, 2007 and June 30, 2018.



2017 Consumer Confidence Report

Water System Name:	**Lakeside Park Association, Inc.**	Report Date:	**June 2018**

We test the drinking water quality for many constituents as required by State and Federal Regulations. This report shows the results of our monitoring for the period of January 1, 2017 - December 31, 2017. Lakeside Park Water System is proud to supply the best quality drinking water available anywhere.

Este informe contiene información muy importante sobre su agua beber.

Tradúzcalo ó hable con alguien que lo entienda bien.

Type of water source(s) in use:	Lake and Well		
Name & location of source(s):	Primary Source - Lake Tahoe – Intake located approximately 2300 ft. offshore at a depth of about 33 ft. Source is filtered and chlorinated. Well #3 – located at 4077 Pine Blvd. Untreated, provides supplemental source during summer.		
Drinking Water Source Assessment information:	A watershed sanitary survey was completed in 2008 in conjunction with the Tahoe Water Systems Association. Watershed Control Program Reports are updated annually. Copies of these reports are available for viewing at the LPA office upon request.		
Time and place of regularly scheduled board meetings for public participation:			3rd Friday of the Month at 5pm LPA Office, 4077 Pine Blvd, SLT, CA.
For more information, contact:	Lakeside Park Association	*Phone:*	(530) 542-2314

TERMS USED IN THIS REPORT:

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Primary Drinking Water Standards (PDWS): MCLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Secondary Drinking Water Standards (SDWS): MCLs for contaminants that affect taste, odor, or appearance of the drinking water. Contaminants with SDWSs do not affect the health at the MCL levels.

ND: not detectable at testing limit

ppm: parts per million or milligrams per liter (mg/L)

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency (USEPA).

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

ppb: parts per billion or micrograms per liter (ug/L)

pCi/L: Picocurie per Liter

Variance and Exemptions: Department permission to exceed an MCL or not comply with a treatment technique under certain conditions.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in source water include:

- *Microbial contaminants*, such as viruses and bacteria that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- *Inorganic contaminants*, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- *Pesticides and herbicides*, which may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- *Organic chemical contaminants*, including synthetic and volatile organic chemicals that are byproducts of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, and septic systems.
- *Radioactive contaminants*, which can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, USEPA and the State Water Resources Control Board (State Board) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. State Board regulations also establish limits for contaminants in bottled water that must provide the same protection for public health.

The following tables list all of the drinking water contaminants that were detected during the most recent sampling for the constituent. The presence of these contaminants in the water does not necessarily indicate that the water poses a health risk. The State Board allows us to monitor for certain contaminants less than once per year because the concentrations of these contaminants do not change frequently. Some of the data, though representative of the water quality, are more than a one year old.

SAMPLING RESULTS FOR SODIUM AND HARDNESS

Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL	PHG (MCLG)	Typical Source of Contaminant
Sodium (ppm)	2016	8.3	5.8 - 8.3	none	none	Generally found in ground and surface water
Hardness (ppm)	2016	31	16-31	none	none	Generally found in ground and surface water

DETECTION OF CONTAMINANTS WITH A PRIMARY DRINKING WATER STANDARD

Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL	PHG (MCLG)	Typical Source of Contaminant
Barium (ppb)	2017	12	12	1000	2000	Discharge of oil drilling waste and from metal refineries; erosion of natural deposits
Gross Alpha Activity (pCi/L)	2017	12.6	12.6	15	0	Erosion of natural deposits
Uranium mg/L	2017	0.004	0.004	-	-	Erosion of natural deposits

Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL	PHG (MCLG)	Typical Source of Contaminant
Barium (ppm)	2017	0.012	ND - 0.012	1	2	Deposits of oil drilling wastes and from metal refineries; erosion of natural deposits
Hexavalent Chromium (ppb)	2017	<1.0	<1.0	10	0.02	Discharge from electroplating factories, leather tanneries, wood preservation, chemical synthesis, refractory production, and textile manufacturing facilities; erosion of natural deposits

DETECTION OF REGULATED CONTAMINANTS FOR SECONDARY DRINKING WATER STANDARDS

Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL	PHG (MCLG)	Typical Source of Contaminant
Calcium (ppm)	2016	8.5	8.5	-	-	Naturally-occurring organic materials
Chloride (ppm)	2017	1.8	ND - 1.8	500	-	Runoff/leaching from natural deposits; seawater influence
Sulfate (ppm)	2017	1.5	1.2-1.5	500	-	Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids (ppm)	2017	100	93 - 100	1000	-	Runoff/leaching from natural deposits
Iron (ppb)	2017	39	0 - 39	300	-	Leaching from natural deposits; industrial waste
Manganese (ppb)	2017	ND	ND	50	-	Leaching from natural deposits
Magnesium (ppm)	2017	2.2	0 - 2.2	-	-	Runoff/leaching from natural deposits; industrial waste

SAMPLING RESULTS FOR DISINFECTANTS/DISINFECTION BYPRODUCTS MONITORING

Chemical or Constituent (and reporting units)	Sample Date	Level Detected	Range of Detections	MCL	PHG (MCLG)	Typical Source of Contaminant
HAA5 (ppb)	2017	5.2	5.1 - 5.3	60	N/A	By-product of drinking water chlorination
TTHMs (ppb)	2017	6.3	5.9 - 6.8	80	N/A	By-product of drinking water chlorination
Chlorine Residual (ppm)	2017	0.59	0.33 - 0.72	4.0	N/A	Chlorination

SAMPLING RESULTS SHOWING THE DETECTION OF LEAD AND COPPER

Lead and Copper	No. of samples collected	90th percentile level detected	No. Sites exceeding AL	AL	MCLG	Typical Source of Contaminant
Lead (ppb)	10	ND	0	15	2	Internal corrosion of household water plumbing systems; discharges from industrial manufacturers; erosion of natural deposits.
Copper (ppb)	10	71	0	1300	170	Internal corrosion of household water plumbing systems; erosion of natural deposits; leaching from wood preservatives.

**Any violation of an MCL or AL is asterisked. Additional information regarding the violation is provided below:*

(There are no Violations)

Lakeside Park Association, Inc.

Additional General Information On Drinking Water

All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Some people may be more vulnerable to contaminants in drinking water than the general population. Immune-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Surface Water AS A Source of Drinking Water

SAMPLING RESULTS SHOWING TREATMENT OF LAKE TAHOE WATER	
Treatment Technique * (Type of approved filtration technology used)	Contact Clarification/ Filtration
Turbidity Performance Standards ** (That must be met through the water treatment process)	Turbidity of the filtered water must: 1 - Be less than or equal to 0.2 NTU in 95% of measurements in a month. 2 - Not exceed 1.0 NTU for more than eight consecutive hours. 3 - Not exceed 5.0 NTU at any time.
Lowest monthly percentage of samples that met Turbidity Performance Standard No. 1.	100 %
Highest single turbidity measurement during the year	0.03 NTU
The number of violations of any surface water treatment requirements	0

* A required process intended to reduce the level of a contaminant in drinking water.

** Turbidity (measured in NTU) is a measurement of the cloudiness of water and is a good indicator of water quality and filtration performance. Turbidity results which meet performance standards are considered to be in compliance with filtration requirements.

2017 CCR LPA/TWO.2018

V. DESCRIPTION OF WATER SUPPLY

The purpose of describing a watershed that affects a drinking water supply is to provide information that will help to evaluate the vulnerability of the source (EPA 1999). TWSA purveyor members are located around Lake Tahoe, in California and Nevada. Most TWSA full members takes water directly from the lake to service both a permanent and visitor population. Several have auxiliary groundwater sources. South Tahoe Public Utility District, a TWSA associate member, utilizes groundwater sources only. The watershed description briefly summarizes general location and features of the basin and source water, water system, population and land ownership, and local agreements. The Lake's location, unique physical characteristics, and national support for its protection and preservation create a distinctive political backdrop and regulatory system.

Lake Tahoe is one of the deepest and clearest lakes in the world. As such, it is a highly sought out destination for recreation, tourism and home ownership. Clarity and exceptional water quality are the basis of Lake Tahoe water quality goals. These important features give Lake Tahoe important designations. Both the federal government and California government have designated Lake Tahoe an "Outstanding National Resource Water (ONRW) Tier 3 which is the highest designation available. Nevada has designated Lake Tahoe a "Water of Extraordinary Ecological or Aesthetic Value".

Designated as a Tier III 303(d) Outstanding National Water Resource by CA Environmental Protection Agency (CAEPA) under the Clean Water Act (CWA), Lake Tahoe has been identified as an impaired body of water for not meeting applicable water quality standards established through the CWA. Along with this designation, comes the requirement to establish Total Maximum Daily Loads (TMDL) for the pollutants that contribute to the water quality impairments.

A public water system (PWS) is a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least 15 service connections or regularly serves at least 25 individuals. EPA and delegated states and tribes regulate these public drinking water systems. Public drinking water systems may be publicly or privately owned, and provide drinking water to 90 percent of Americans.

Location and Hydrology

Lake Tahoe is a high alpine lake located within both the Nevada and California state lines. It is 22 miles long and 12 miles wide, with a surface area of 122,200 acres or 193 sq. miles. Approximately two-thirds of the land area is within California and one-third within Nevada. To the west, the Sierra Nevada Mountain range borders the basin across from the Carson Range on the east side of the lake. The basin is described as a high alpine and sub-alpine ecosystem. The primary soil type is granite (USGS 2003).

Lake Tahoe is the largest alpine lake on the North American continent and the second deepest lake in the United States. Lake Tahoe is the eleventh-deepest lake in the world with a maximum depth of 1,657 feet (505 meters) and an average depth of 1,027 feet (313 meters). The source of water for Lake Tahoe is precipitation. A majority of the precipitation falls into the lake directly (USGS 2003). The Lake Tahoe Basin (USGS watershed #16050101) has 63 sub watersheds draining into the lake and one outlet, the Truckee River.

Lake Tahoe contains an estimated 39.75 trillion gallons or 122 million acre feet of water. That's enough water to cover the entire state of California to a depth of 14.5 inches. The water that evaporates daily is 1.4 million tons, enough to supply the needs of 3.5 million people on a daily basis. The water in Lake Tahoe is 99.7 percent pure, about the same as distilled water.

With one outlet, it takes an average of 650-700 years for a particle to leave the lake (CTC 2003). Historically, a white plate called a Secchi disk could be seen in the lake at depths of 100 feet. A Secchi disk is an indirect measurement of clarity. The clarity has been reduced on average by 1 foot per year over the last thirty years. The decrease in clarity was attributed to storm water runoff, urban development, air quality and erosion (EPA 2005).

Clarity levels at Lake Tahoe in 2014 showed the biggest improvements in more than a decade, according to researchers at the University of California, Davis, who have studied the lake for the last half century. The improvements are in part due to continuous work from the Lake Tahoe community to lower pollutant addition to the lake. They were also influenced by the drought, as reduced precipitation meant fewer contaminants flowed into Lake Tahoe, particularly during the summer, when clarity levels were the highest recorded since 2002. (TERC 2015)

In addition to aesthetic enjoyment, the exceptional quality of water in the Lake Tahoe Basin supports a number of beneficial uses related to human and environmental health, including drinking water supply, water contact recreation, wildlife habitat, and aquatic life and habitat. During the development of the Lake Tahoe TMDL, the plan created to reverse the decline in deep-water transparency in Lake Tahoe and to restore clarity, it was discovered that up to two thirds of the decrease in clarity of Lake Tahoe can be attributed to fine sediment particles (FSP = less than 16 microns). Also determined through the development of the TMDL was that storm water runoff originating in urban areas accounted for 72% of the FSP that eventually enters the lake.

Lake Tahoe's average annual Secchi clarity measurements since 2000 are listed below. There are winter and summer clarity variables, winter tend to have more clarity depth. The lake was clear to an average depth of 69.2 feet in 2016 (UC Davis).

- 2017*—59.7 feet (18.20 meter)
- 2016 — 69.2 feet (21.1 meter)
- 2015 — 73.1 feet (22.3 meter)
- 2014 — 77.8 feet (23.7 meter)
- 2013 — 70.1 feet (21.4 meter)
- 2012 — 75.3 feet (23 meter)
- 2011 — 68.9 feet (21 meter)
- 2010 — 64.4 feet (19.6 meter)
- 2009 — 68.1 feet (20.8 meter)
- 2008 — 69.6 feet (21.2 meter)
- 2007 — 70.1 feet (21.4 meter)
- 2006 — 67.7 feet (20.6 meter)
- 2005 — 72.4 feet (22.1 meter)
- 2004 — 73.6 feet (22.4 meter)
- 2003 — 71 feet (21.6 meter)
- 2002 — 78 feet (23.8 meter)
- 2001 — 73.6 feet (22.4 meter)
- 2000 — 67.3 feet (20.5 meter)

*Lake Tahoe's average annual clarity in 2017 was at its lowest level, 59.7 feet, since regular measurements began in 1968. This was likely due to the one-two punch of the end of a five-year drought followed by a winter of record-high precipitation levels that extended well into the spring. More sediment washed into the lake in 2017 than the previous five years combined. (Source: TERC SOTL 2017)

More than 80 percent of the watershed is vegetated (montane-subalpine type), covered predominantly by mixed coniferous forests, though bare granite outcrops and meadows are also common. About 2 percent of the watershed is impervious surface associated with urban development, which equates to over 5,000 acres (20 km2) (Minor and Cablk 2004). Much of the impervious land cover is adjacent to the lake or its major tributaries. 14 of the 63 individual watersheds have at least 10 percent impervious land area.

Most urban development exists along the lake's shoreline, with the largest concentration at South Lake Tahoe in the south, Tahoe City in the northwest, and Incline Village in the northeast. The north and west shores are less densely populated. Much of the east shore is undeveloped.
TWSA purveyors' combined service areas span 23 sub-watersheds in the Lake Tahoe Basin including: Bijou Park, Burke, Carnelian Bay, Carnelian Canyon, Cedar Flats, Dollar Creek, East Stateline Point, Edgewood, First, Glenbrook, Griff, Incline, Kings Beach, Logan House, McFaul, Mill, North Zephyr, Second, Slaughter House, Tahoe Vista, Third, Watson Creek and Zephyr creeks. The TWSA service areas are defined in [Plate 1].

TWSA service areas in California range from the City of South Lake Tahoe, (STPUD and Lakeside) north along the west side of Lake Tahoe to Tahoe City and then into North Tahoe PUD service areas, including Kings Beach, CA.

The western service and watershed boundaries of Tahoe City Public Utility District extend from north of Emerald Bay to Dollar Hill, and along the Truckee River to the Nevada County line. This service area is very large, encompassing almost 22 square miles. There are numerous small independent water companies (non-TWSA) within these areas as well. NTPUD areas include Carnelian Bay, Tahoe Vista, Kings Beach and Brockway, CA. Heading eastward into Nevada, TWSA service areas include the member agencies: Incline Village GID, Glenbrook, Douglas County (Cave Rock/Skyland/Zephyr Cove), Round Hill GID, Kingsbury GID and Edgewood Water Company.

Other water suppliers located within the Tahoe Basin include several small municipal systems and private homeowners.

Climate, Climate Change and Drought
http://terc.ucdavis.edu/stateofthelake

August 2018: After a year marked by extreme weather and plunging clarity levels, the UC Davis Tahoe Environmental Research Center today released its annual Tahoe: State of the Lake Report. The report dated 2018 summarizes data collected in 2017 as part of the Center's ongoing, decades-long measurement programs, while also presenting current research on emerging issues. This includes updates about the dramatic change in Lake Tahoe's clarity in 2017, a study to characterize the nearshore and its impacts on algae, climate change indications, forest health and restoration, and an upcoming comparative study between Lake Tahoe and Lake Geneva.

"While 2017 may be viewed as an anomalous year, it has reinforced the fact that progress toward environmental restoration of Lake Tahoe will be punctuated by extreme years in future decades," said Geoffrey Schladow, director of the UC Davis Tahoe Environmental Research Center, or TERC. "Monitoring these extreme years and applying the lessons learned will be critical to ensuring that the lake and its watershed has the resilience needed to thrive under future conditions."

Clarity readings from the first half of 2018 indicate that clarity is back in its normal range, suggesting 2017 was an outlier. Nonetheless, the report said the decline highlighted the reality that extreme climatic

and hydrologic events will become more common in the future and that current monitoring efforts need to be reviewed and upgraded to prepare for them.

An ecological approach to clarity: Past efforts to restore lake clarity primarily have focused on land-use management. The report said recent research shows a parallel ecological approach could accelerate progress. For example, a pilot project in Emerald Bay is testing whether removing invasive Mysis shrimp could restore the native food web and help sustain clarity improvements.

Record-busting weather: Winter monthly air temperatures were cooler than recent years, but average temperatures were warmer during summer. In 11 of the 12 months, air temperatures were higher than the 1910-2017 average. Lake temperature was the warmest on record. Surface water temperatures in July 2017 were the warmest ever recorded at 68.4 degrees, which was 6.1 degrees more than in 2016. Water Year 2017 (Oct. 1, 2016-Sept. 20, 2017) was the second wettest on record, with 68.9 inches compared to the long-term average of 31.6 inches.

Nitrogen and phosphorus loads were also at record levels in 2017 due to high streamflow. Suspended sediment was also high, particularly in Ward and Blackwood creeks.

Lake Tahoe's natural rim sits at 6,223 feet, but lake maximum capacity, set by a legal decree in 1915 is 6,229.1 feet, which gives the watermaster the ability to control the lake's level between those six feet. Lake Tahoe's water level peaked on July 15, 2017 only 1.2 inches from breaching the maximum legal limit.

Climate Change: TERC climate change researchers are applying downscaled future climate projections to the Tahoe basin. The results suggest air temperatures will rise by 7 to 9 degrees Fahrenheit between now and the end of the century. The watershed will also dry considerably, particularly on the north and east sides, adding to forest stress and wildfire risk.

2016-17 was unique with a record setting winter precipitation level, almost 200% of normal precipitation. Some areas revived more than 700 inches (58 feet) of snow in winter 2016-17. The transition from extreme drought to record setting precipitation resulted in the lake completely filling up in 6 months, for the first time in 11 years, and allowing for seasonal releases downstream, for the first time in years.

Winter 2014-15 was noted as the lowest recorded snowpack in 150 years, with further estimation that it was the lowest snowpack in 500 years based on tree ring records. *http://phys.org/news/2015-09-sierra-nevada-snowpack-lowest-years.html.* Yet the recent winter of 2016-17, reversed this trend to be record setting precipitation.

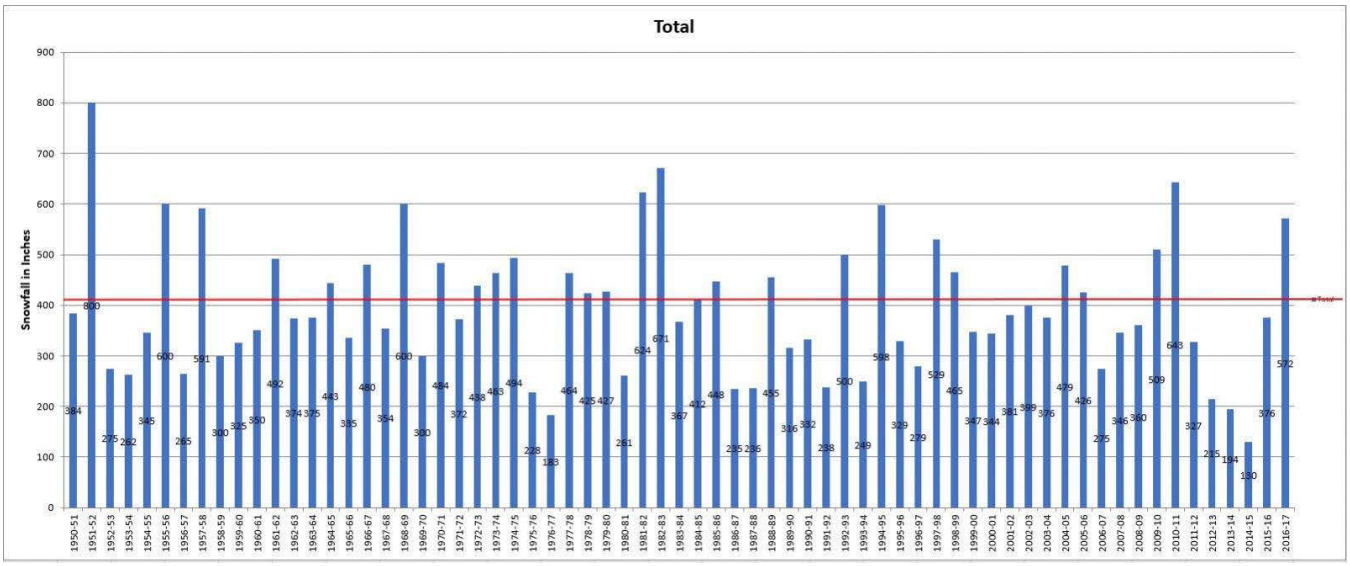
In general, Tahoe's climate is characteristic of an alpine ecosystem. Summer average daily temperatures range between 57 ^{O} and 65 ^{O} F. Annual winter temperatures vary between 40 ^{O} and 50 ^{O}F with minimums ranging between 20 ^{O} and 25 ^{O} F. Snowfall occurs generally in October through March with most snow precipitation accruing in January through March (WRCC 2005).

With air and water temperatures trending warmer, climate change is considered a major driver for ecological changes occurring in the lake, along with urbanization and invasive species. Stratification (lake mixing) has been affected by warming temperatures as well. During a typical summer the lake becomes stratified, with warmer waters on top and cooler water at depth. In the winter these layers mix, a process that refreshes the lake and keeps it healthy. The extended stratification season on Lake Tahoe has major

implications for water quality. “A longer stratification period increases the risk of losing oxygen at the bottom of the lake,” Schladow explained, “and this can release a huge, almost infinite supply of phosphorus to the lake in a process known as internal loading.” Phosphorus is the limiting nutrient in Lake Tahoe. The more there is - the more algae can grow, causing a decline in water clarity. (TERC 2012)

Precipitation as rain and snow is the single most important factor influencing pollutant delivery to Lake Tahoe. Precipitation drives the mobilization and transport of pollutants from the landscape into the tributaries or directly into the lake. The lake’s surface area, which is relatively large compared to its watershed area, is an important factor because a significant amount of precipitation (36 percent) enters the lake directly. Therefore significant amounts of airborne pollutants (fine sediment, nitrogen, and phosphorus) enter the lake directly.

The Lake Tahoe Basin has a Mediterranean-type climate characterized by wet winters and dry summers. Most precipitation in the basin falls between October and May as snow at higher elevations and as snow/rain at lake level. Over 75 percent of the precipitation is delivered by frontal weather systems from the Pacific Ocean between November and March. However, precipitation timing can vary significantly from year to year (Coats and Goldman 2001, Rowe et al. 2002). Lower elevations receive about 20 inches (51 cm) of annual precipitation, but the upper elevations on the west side of the basin receive about 59 inches (150 cm) (USDA 2000).



https://files.opensnow.com/Tahoe/2017/snowgraph.jpg

MONTHLY - WEATHER AVERAGES SUMMARY

http://www.weatherbase.com/weather/weather.php3?s=608762

MONTHLY - WEATHER AVERAGES SUMMARY [Show All Data] [°C] **°F**

Average Temperature — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
F	46.5	32.9	33.9	38	41.9	49.6	57.4	63.7	63.3	57.2	48	39.2	32.7

Average High Temperature — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
F	58.7	42.2	43.2	48.6	53.3	62.8	72.1	79.2	78.3	71.4	60.7	50	42

Average Low Temperature — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
F	34.4	23.6	24.6	27.4	30.6	36.4	42.7	48.3	48.3	42.9	35.3	28.4	23.3

Average Precipitation — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
in	12.2	0.9	1.1	1.5	1	1.3	0.5	0.9	1.3	1.4	1.2	0.7	0.5

Average Number of Days With Precipitation — Years on Record: 15

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Days	47	6	6	7	4	4	3	1	1	2	3	5	5

Highest Recorded Temperature — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
F	91.6	51.5	54.1	61.4	69.3	76.4	90	91.6	90.4	82.7	75.1	61.6	53.5

Lowest Recorded Temperature — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
F	-6.9	-3.8	3.8	9.9	18.4	25.4	29.3	36.7	35.4	25.7	14.9	8.5	-6.9

Average Length of Day — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Hours	12.7	10.3	11.2	12.5	13.7	14.8	15.4	15.1	14.1	12.8	11.6	10.5	10

Average Number of Days Above 90F/32C — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Days	0.3	---	---	---	---	---	---	0.2	0.1	---	---	---	---

Average Number of Days Below 32F/0C — Years on Record: 30

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Days	159	27.3	23.8	23.8	18.3	6.8	1.1	---	---	0.8	7.6	21.6	27.9

Average Snowfall — Years on Record: 15

	ANNUAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
in	63.5	13.5	16.1	11.8	2	1	---	---	---	0.1	1.2	4.3	13.5

The snow pack at higher elevations typically melts and runs off in May and June. However, at lower elevations near the lakeshore, the snow pack typically melts earlier in the spring and can even melt mid-winter, if temperature and solar radiation conditions are right. Commonly, the lower elevation snow pack melts completely before the tributaries crest with snowmelt from the higher, colder elevations.

Thunderstorms, especially rain-on-snow events, can lead to high runoff in a short amount of time, contributing to pollutant transport into Lake Tahoe and its tributaries. Thunderstorms in summer or fall can be intense and can generate large loads for short periods of time, typically in isolated geographic locations. However, summer thunderstorms contribute little to annual precipitation and typically are not responsible for significant pollutant loads to tributaries (Hatch et al. 2001, S. Hackley unpublished).

The effects of climate change are being studied by the Tahoe Science Consortium. Increased temperatures may shift more precipitation events to rain versus snow, which has the potential to increase runoff and affect forest health. Winter snowmelt is often occurring earlier and at a higher rate than in the recent past.

A well-defined rain shadow exists across the lake from west to east (Crippen and Pavelka 1970, Sierra Hydrotech 1986, and Anderson et al. 2004). The west shore averages about 35 inches/year (90 cm/year) of precipitation, while the east shore averages about 20 inches/year (51 cm/year).

The lake has one outlet on its northwest side, forming the start of the Truckee River, which ultimately drains to Pyramid Lake, a terminal lake in Nevada. The lake's hydraulic residence time is 650 years, which means that on average it takes 650-700 years for water that enters the lake to leave the lake. Because of its volume, depth, and geographic location, Lake Tahoe remains ice-free year-round, though Emerald Bay has frozen over during some extreme cold spells.

A concrete dam was completed in 1913 to regulate water outflow at the Truckee River outlet in Tahoe City, California. In 1988, the dam was seismically retrofitted and enlarged to its current configuration. The upper six feet of the lake forms the largest storage reservoir in the Truckee River basin, with an effective capacity of 240 billion gallons (745,000 acre-feet) (Boughton et al. 1997). The dam is under federal control.

Lake Tahoe's natural rim sits at 6,223 feet, but lake maximum capacity, set by a legal decree in 1915 at 6,229.1 feet, which gives the water master the ability to control the lake's level between those six feet.

Lake Tahoe's water level was at 6,227.83 Feet MSL on Friday, September 7, 2018 at 9:00:00 AM.

On October 16, 2014, due to drought conditions, the lake returned to its natural rim level (6,223 feet), ceasing outflow in the Truckee River. On Sept. 1, 2015 – lake level was 6,222.8 feet.
(*Source: http://tahoe.uslakes.info/Level.asp*)

The record low water level in recent history was in 1992, when the lake dropped to 6,220.26 feet.

Lake Tahoe is unique, the forces and processes that shape it are the same as those acting in all natural ecosystems. As such, Lake Tahoe is an analog for other systems both in western U.S. and worldwide.

Extensive studies are conducted on climate change's potential effects on Lake Tahoe by UC Davis and other researchers. http://tahoe.ucdavis.edu/research/climate-change/modeling-climate.html

The following parameters have research information available at the website listed above.

REAL TIME MONITORING OF LAKE TAHOE
CLARITY MONITORING
LAKE MONITORING
MEASURING THE BLUENESS OF LAKE TAHOE
REMOTE SENSING OF THE NEARSHORE
ASIAN CLAMS IN EMERALD BAY
ZOOPLANKTON IN LAKE TAHOE
METEROLOGY OF LAKE TAHOE
PERIPHYTON MONITORING
THREE-DIMENSIONAL MODELING OF LAKE TAHOE
DYNAMICS OF THE SURFACE OF LAKE TAHOE
DEEP LAKE OXYGEN
WATER CURRENT DRIFTERS
MODELING LAKE CLARITY
PHYTOPLANKTON IN LAKE TAHOE
MODELING CLIMATE CHANGE IMPACTS
NUTRIENTS IN LAKE TAHOE

Climate change is increasing the lake's water temperature and affecting regional weather patterns in ways that could change the lake's ecosystem and cause more of a decline in the lake's clarity. Warmer water provides a more hospitable environment to algae and invasive species. Lake Tahoe's water is almost one degree F warmer than it was 30 years ago, according to UC Davis researchers. The average surface temperature in July has increased 5 degrees F since 1999. Average Tahoe temperatures have risen more than 2 degrees F. Spring snowmelt occurs a week earlier than in the 1950s, according to studies by the Scripps Institute of Oceanography in San Diego and the U.S. Geological Survey. In the coming decades, UC-Davis scientists predict more rain and less snow will fall in Tahoe, and there will be more flood-causing storms where rain falls on snow. Streams and rivers will flow with greater intensity, causing more fine sediment to flow into the lake.

Water Systems Descriptions / Service Records 2017-18

TWSA full member water purveyors:

- **Maintained approximately 22,340 service connections.** **[Table 1]**
- **Supplied water to an estimated 36,736 full-time residents.** **[Table 1]**
  Note: Seasonal visitation can double or triple community occupancy.
- **Average water flows ranged between 134,000 and 2,593,000 gallons per day (gpd). [Table 2]**
- **Annual peak water flow ranged between 288,000 and 5,640,000 gpd. [Table 2]**

Table 1: Number of customers and service connections for TWSA partner agencies.

Agency	County, State	Full Time / Year Round Population Served / Customer Number *	Number of Service Connections
Kingsbury GID	Douglas, NV	3,839	2650
Round Hill GID	Douglas, NV	1,200	479
Zephyr Water Utility	Douglas, NV	1,200	514
Cave Rock / Skyland	Douglas, NV	1,235	544
Incline Village GID	Washoe, NV	9,082	8,070
Glenbrook Water Cooperative	Douglas, NV	1,000	282
Edgewood Water Company	Douglas, NV	5,695	11
North Tahoe Public Utility District	Placer, CA	6,624 ^ (utility system total)	3930 = Total 3378 – Tahoe Main System 280 – Carnelian Bay System 275 – Dollar Cove System
Tahoe City Public Utility District (*as of Jan 2, 2018)*	Placer/El Dorado, CA	6607 (utility system total) 319 (McKinney/Quail system)	5,726 (utility system total) 559 (McKinney/Quail system)
Lakeside Park Association	El Dorado, CA	254	134
Total		**36,736**	**22,340**

(*source: Water purveyor (or) ^Safe Drinking Water Information System (SDWIS): *http://iaspub.epa.gov/enviro/sdw_form_v2.create_page?state_abbr=CA*)

Table 2: Average annual flows and peak daily flow estimated from 2012 through 2018, in gallons per day (gpd) for TWSA partner agencies.

Agency	2012-13		2013-14		2014-15		2015-16		2016-17		**2017-18**	
	Average Daily Flow	Peak Daily Flow	Average Daily Flow	Peak Daily Flow	Average Daily Flow	Peak Daily Flow	Average Daily Flow	Peak Daily Flow	Average Daily Flow	Peak Daily Flow	**Average Daily Flow**	**Peak Daily Flow**
Cave Rock/Skyland Water System	344,504	562,000	290,244	915,000	627,000	798,333	305,852	974,000	461,333	663,000	**318,785**	**663,043**
Edgewood Water Company	693,234	1,385,000	700,829	1,469,300	601,715	1,612,400	551,896	1,764,100	540,377	1,454,700	**574,000**	**1,445,000**
Glenbrook Water Cooperative	325,065	1,112,500	288,700	656,000	248,300	548,000	232,233	467,161	356,850	760,400	**243,857**	**564,320**
Incline Village GID	2,989,000	6,173,000	2,914,000	6,202,000	2,690,000	5,945,000	2,540,000	5,380,000	2,560,000	5,640,000	**2,593,000**	**5,610,000**
Kingsbury GID	849,235	1,999,617	835,980	1,985,716	793,712	2,079,868	757,226	1,260,000	759,511	1,259,355	**624,595**	**1,579,400**
N. Tahoe PUD Tahoe intake withdrawals/ NTPUD full system	1,058,000 1,264,000	2,324,000 2,438,000	1,033,000/ 1,190,000	1,898,000/ 2,165,000	1,011,225/ 1,160,000	1,879,000/ 1,911,000	815,673/ 951,046	1,915,000/ 1,011,000	~~926,666~~ 851,473 (revised in 2018) 1,082,030	1,601,000 1,837,903	**815,176/ 1,016,718**	**1,607,963/ 1,891,000**
Round Hill GID	241,350	540,400	211,311	561,100	200,418	677,800	184,090	516,200	177,642	546,200	**175,915**	**455,600**
McKinney-Quail / TCPUD Tahoe intake withdrawals/ TCPUD full system	95,000 1,326,000	249,000 3,600,000	144,000 1,210,000	271,000 3,469,000	109,816 / 1,038,131	235,209 / 2,756,987	100,434/ 890,713	200,508/ 1,903,836	100,484 964,018	237,027 2,092,240	**124,000 1,210,000**	**190,000 2,470,000**
Zephyr Water Utility Company	217,301	414,000	204,644	360,000	322,735	536,000	182,745	549,500	260,321	370,032	**181,510**	**370,032**
Lakeside Park Association	125,000	283,000	140,000	285,000	100,000	424,000	97,000	424,000	70,000	288,000	**134,000**	**280,000**

Intakes
The majority of TWSA purveyors pull water directly from Lake Tahoe to service their customers. Nevada State Law provides recommendations that drinking water intakes extend 1,000 feet (ft.) from the shore, set 15 ft. below the surface, and 4 ft. from the bottom. (NAC 445A.6698, NRS 445A.860). The TWSA purveyors' intakes range from 500 ft. to 5,500 ft. long, 17 ft. to 600 ft. deep and set 3 ft. to 6.5 ft. above the lake bottom [Table 3.0].

Table 3: TWSA partner agencies' intake length (ft.), depth (ft.) and distance from Lake Bottom (ft.). Intake depth is dependent on the lake level. The depth is measured from Lake Rim.

Agency	Length (ft.)	Depth (ft.)	Bottom (ft.)
Kingsbury GID	750	60	5
Round Hill GID	2,450	52	4
Zephyr Water Utility Company	1,100	63	6.5
Incline Village GID	670	30	4
Glenbrook Water Cooperative	2,000	60	6
Edgewood Water Company *	5,500	600	4
North Tahoe PUD	1,800	28	4.75
Tahoe City PUD (McKinney/Quail System)	800	26	3
Cave Rock/Skyland ^	500 ft. 1800 (pre 9/2013)	17 ft. 65 (pre 9/2013)	4 ft. 6 (pre 9/2013)
Lakeside Park Association	2,300	37	4

^Sept. 2013: CR/S Intake was shortened with NDEP approval – to increase efficiency based on need to remove inline pumps.

*2017: Edgewood Water Company extended the lake intake an additional 3,000 feet out and 600 feet down to access water suitable for use in the heat exchangers in the Edgewood Lodge Project. EWC has also rerouted part of the raw water line and distribution line and added approximately 2 miles of distribution line to meet the demands of the Edgewood Lodge project. *(comments: J. Summers)*

Population and Land Ownership
TWSA suppliers service the needs of both a small permanent and a large, seasonal visitor population. The Tahoe Basin is home to approximately 55,000 full time, year-round residents.
More than half the full-time, year-round population is based in the South Lake Tahoe area.

Tahoe Basin Full-Time/Year–Round Population Data
(source: http://www.census.gov/popfinder, 2014)

Incline Village, NV	9,082
Placer County, CA	10,448
Douglas County, NV	5,402
South Lake Tahoe / El Dorado County, CA	30,728
Total	55,660

Note: Tahoe tourist population annual estimate = 4.5 million (2010 Lake Tahoe Basin Prosperity Plan)

Tahoe as a Tourist Destination
Lake Tahoe and the surrounding area continue to rank as a top holiday destination for both international and domestic vacationers. Heavy seasonal visitation (primarily summer and winter ski season) greatly increases the service requirements for area water providers. Tourism creates a vital part of the local economy. Visitor population estimates vary between 3 million (TERC 2012) to 5 million (LTBMU 2012) annually. Tourist population is estimated annually at 4.5 million in the 2010 Lake Tahoe Basin Prosperity Plan. This is comparable to the numbers of visitors to Grand Canyon National Park (3.2 million) and Yellowstone National Park (2.7 million).

2015 NLT Tourism Master Plan
https://www.gotahoenorth.com/wp-content/uploads/2015/09/2015-North-Lake-Tahoe-Tourism-Master-Plan1.pdf

The 2015 North Lake Tahoe Tourism Master Plan (2015 Tourism Master Plan) lays out a framework of tourism investment strategies that can work in concert to continue to transform North Lake Tahoe into a national and international destination. Visitors have historically retreated to North Lake Tahoe for its tremendous natural beauty and recreational opportunities. The combination of high mountain peaks, a 125,000 -acre lake and charming small communities make North Lake Tahoe a place loved by many.

Yet, despite the region's popularity, research shows it is falling behind comparable destinations. Travelers are looking for unique, high quality opportunities for outdoor recreation, relaxation and rejuvenation and North Lake Tahoe comes up short when measured against its competition.

Almost 45% of current visitors come from the Bay Area, Northern California and western Nevada (Over 25% of visitors come from the San Francisco/Oakland/San Jose area, 13% from Sacramento/Stockton/Modesto and almost 6% from Reno). Approximately 8% of visitors are international. 42% of visitors are day visitors with overall visitation concentrated on weekends and peak holiday periods.

Studies suggest that attracting more domestic and international visitors can move the region toward more of a year-round destination rather than the current peak season/offseason cycle. Additionally, trends indicate that to compete at the national and international levels and attain the vision outlined in the 2015 Tourism Master Plan, the communities in North Lake Tahoe need to continue to invest in tourism and visitor experience infrastructure. North Lake Tahoe relies on a tourism-driven economy and it will continue to do so for years to come. Annually, visitors spend over $500 million in North Lake Tahoe. Over 60% of employment and 51% of all earnings can be attributed to tourism. Lake Tahoe is central to the area's economy, and the health of the economy depends on a thriving local community and providing visitors a world-class experience.

2009 statistics: An estimated $361 million of visitor spending sector contributed to 4,500 local jobs with earnings of $115 million made by employees and business owners in the Lake Tahoe area. During 2008, local tax receipts of $10.3 million were collected. (Source: Dean Runyon Associates "The Economic Significance of Travel to the North Lake Tahoe area 2003-2008; Detailed Visitor Impact Estimates. Aug. 2009).

This influx creates unique potential impacts to water quality. During a busy summer weekend day, 200,000+ visitors are estimated to enter the basin. The area includes 14 ski resorts, 14 golf courses, 35 public beaches, 180.5 miles of bike paths, and 425 miles of official unpaved trails. (TRPA 2002). The basin supports an estimated 23 million visitor days per year (US Census 2000). The most current 2010 National Visitor Use Monitoring (Regional Annual Visitation Use Estimate) for the Lake Tahoe Basin Management Unit (LTBMU) shows 5,786,000 National Forest visits* to the National Forest lands here, and 8,999,000 Site Visits. (Source: LTBMU 2012)

*A "visit" is defined as the entry of one person upon a National Forest to participate in recreation activities for an unspecified period of time. A National Forest visit can be composed of multiple site visits. (Meaning that a single person doing multiple visits might be counted multiple times). *A "site visit" is the entry of one person onto a National Forest site or area to participate in recreation activities for an unspecified period of time. Local Chambers use their own estimate of around 3,000,000 visitors over the entire Lake Tahoe Basin, so you can see the numbers do vary. (Don Lane. USFS (LTMBU) pers. comm.)

Development and Growth

The Tahoe Basin is primarily "built-out". Land coverage is strictly allocated and limited. Most available land coverage is already allocated, therefore most major projects are redevelopment focused rather than expansive. Development within the basin occurs almost entirely on the low-lying, gentle slopes near the lake shore. Much of the Tahoe Basin urban area is built-out, with efforts focusing on low-impact, re-development (LID)of existing properties.

A majority of the land (~80%) in the Tahoe Basin is either owned by the US Forest Service or is state land. Approximately, 20-25% of the land in the Tahoe Basin is privately owned [Plate 2] (NTCD 2002, HDR 1992).

Land prices and housing costs in the Tahoe Basin are some of the highest in the nation. There are large fluctuations in home and property values depending on the community and neighborhood.

Lake Tahoe Real Estate Trends 2016

South Lake Tahoe Real Estate Market Overview
https://www.trulia.com/real_estate/South_Lake_Tahoe-California

Median Sale Price		$390,000
Median Sale $/Sq. Ft.	$274	
Median Rent Per Month	$1874	

Kings Beach Real Estate Market Overview
https://www.trulia.com/real_estate/Kings_Beach-California

Median Sale Price		$386,000
Median Sale $/Sq. Ft.	$296	
Median Rent Per Month		$1500

Incline Village Real Estate Market Overview
https://www.trulia.com/real_estate/Incline_Village-Nevada

Median Sale Price		$585,000
Median Sale $/Sq. Ft.	$386	
Median Rent Per Month		$3500

Agreements-Regulatory Controls

Lake Tahoe's famous clarity is a result of the unique physical environment and has gained world support for its protection and preservation. The Tahoe Basin, cradled between Nevada and California, presents a complex political backdrop for protecting Lake Tahoe as a water source. The local government includes: two states, six counties, one city and multiple special districts.

Lake Tahoe was designated a Tier III Outstanding Natural Resource Water (303d) under the Clean Water Act in 1972. Lake Tahoe has the highest level of protection as an ONRW water body and non-degradation rule applies. The effort to protect Lake Tahoe consists of the participation and development of numerous regulatory agencies and special interest groups including: the Tahoe Regional Planning Agency, Lake Tahoe Basin Management Unit, Lahontan Regional Water Quality Control Board and the Nevada Department of Environmental Protection. Historically, the focus has been on protecting its unique clarity.

The Lake Tahoe Basin is a unique system that has gained world-wide recognition. The lake location and unique status as one of two alpine lakes in the world of its character (the other is Lake Baikal, in Siberia, Russia) creates a complex political system of government, non-profit, special district, and concerned citizens.

Lake Tahoe is one of the most regulated watershed basins in the country. Much of the attention of the regulatory authorities and scientific community has been directed towards Lake Tahoe's famous clarity which does not directly address many of the concerns of the drinking water suppliers. An ongoing goal of TWSA members is to incorporate drinking water issues into basin planning and community programs through education and outreach.

The Tahoe Regional Planning Agency (TRPA), a bi-state environmental regulatory agency, is responsible for balancing human development and environmental protection in the Lake Tahoe Basin. TRPA is responsible for meeting nine environmental thresholds. The thresholds include: water quality, air quality, soil conservation, vegetation, fisheries, wildlife, scenic resources, community design, recreation, and noise (Bi-Compact 1980). TRPA addresses source water protection issues in the TRPA Code of Ordinances. Lake Tahoe's nearshore conditions are now receiving more attention in the regulatory arena. As one of its strategic initiatives, the Tahoe Regional Planning Agency is working with community members and stakeholders to update its shoreline policies and regulations in 2016 and 2017. For more information about the shoreline planning process or to get involved, visit www.shorelineplan.org/.

The Lake Tahoe Basin Management Unit (LTBMU) manages 150,000 acres of National Forest Land in the Lake Tahoe Basin. It is the largest basin landholder. LTBMU's programs include watershed management, urban lots, recreation and wildlife.

The Nevada Division of Environmental Protection and the Lahontan Regional Water Quality Control Board enforce state law and policies, respectively, to protect public health, water quality and to sustain ecosystems.

The Nevada Division of Environmental Protection Bureau of Safe Drinking Water is the regulating authority for Lake Tahoe water suppliers within Nevada.

The California Bureau of Health Protection Services regulated water suppliers within California until June 30, 2014. On July 1, 2014, the CA Drinking Water Division was transferred into the State Water Board.

The Tahoe Regional Planning Agency, USDA Forest Service, the Lahontan Regional Water Quality Control Board and the Nevada Division of Environmental Protection work together to update their agencies' resource management plans for the Lake Tahoe Basin.

The Tahoe region is undergoing development of several long term strategic plans. These include an updated Tahoe Regional Plan to serve as the guiding documents for TRPA. Because TRPA is exploring new territory in the field of environmental planning, the Regional Plan will continue to mature as we learn more about how man impacts the environment. The Code of Ordinances is the most visible of several documents that make up the Regional Plan. *http://www.trpa.org/regional-plan/code-of-ordinances*

The Code regulates, among other things: land use, density, rate of growth, land coverage, excavation and scenic impacts. The regulations are designed to bring the region into conformance with the threshold standards established for water quality, air quality, soil conservation, wildlife habitat, fish habitat, vegetation, noise, recreation and scenic resources.

At the same time, the Lake Tahoe Basin Management Unit (LTBMU) has sought public comment on the Forest Plan revision; which is designed to serve as a long term guide for managing National Forest System lands in the Tahoe Basin.
http://www.sierraforestlegacy.org/FC_ProjectsPlans/FPR_LTBMU.php

The Lahontan Regional Water Quality Control Board (LRWQCB) also revised regulations relative to pollution discharges in its region. *http://www.swrcb.ca.gov/rwqcb6/*

A revised Basin Plan passed in 2012 removes the former prohibition on direct water application of herbicides/pesticides within the LRQWCB jurisdiction, replacing it with a project review/exemption review regulation. This statutory change opens up the potential for aquatic invasive species management within Lake Tahoe using chemical methods. TWSA has been and remains a vocal opponent of the approval to allow potential project use of aquatic herbicides and pesticides in Lake Tahoe.

Details of various agency, programs, plans, policies and actions are provided in later sections of this report.

Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule/ LT2ESWTR)
http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/index.cfm
The deadline for compliance was October 1, 2014. All TWSA members achieved compliance for the deadline, were granted extensions at that time and have completed required upgrades, or were exempted due to existing treatment processes.

The USEPA developed the Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule/LT2ESWTR) to improve drinking water quality and provide additional protection from disease-causing microorganisms and contaminants that can form during drinking water treatment. Pathogens, such as Giardia and Cryptosporidium, are often found in water, and can cause gastrointestinal illness (e.g., diarrhea, vomiting and cramps) and other health risks. In many cases, water needs to be disinfected through the use of additives such as chlorine to inactivate (or kill) microbial pathogens.

Cryptosporidium is a significant concern in drinking water because it contaminates surface waters used as drinking water sources, it is resistant to chlorine and other disinfectants, and it has caused waterborne disease outbreaks. Consuming water with Cryptosporidium, a contaminant in drinking water sources, can cause gastrointestinal illness, which may be severe in people with weakened immune systems (e.g., infants and the elderly) and sometimes fatal in people with severely compromised immune systems (e.g., cancer and AIDS patients).

The purpose of LT2ESWTR is to reduce disease incidents associated with Cryptosporidium and other pathogenic microorganisms in drinking water. The rule applies to all public water systems that use surface water or ground water that is under the direct influence of surface water. The rule will bolster existing regulations and provide a higher level of protection of your drinking water supply by:

- Targeting additional Cryptosporidium treatment requirements to higher risk systems;
- Requiring provisions to reduce risks from uncovered finished water storage facilities;
- Providing provisions to ensure that systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts.

This combination of steps, combined with the existing regulations, is designed to provide protection from microbial pathogens while simultaneously minimizing health risks to the population from disinfection byproducts. This includes about 14,000 systems serving approximately 180 million people.

Requirements of the rule
Systems initially monitor their water sources to determine treatment requirements. This monitoring involves two years of monthly sampling for Cryptosporidium. To reduce monitoring costs, small filtered water systems first monitor for E. coli–a bacterium that is less expensive to analyze than Cryptosporidium and monitor for Cryptosporidium only if their E. coli results exceed specified concentration levels.

Treatment
Filtered water systems were classified in one of four treatment categories (bins) based on their monitoring results. Most systems classified in the lowest bin and will face no additional requirements. Systems classified in higher bins were required to provide additional water treatment to further reduce Cryptosporidium levels by 90 to 99.7 percent (1.0 to 2.5-log), depending on the bin. Systems will select from different treatment and management options in a "microbial toolbox" to meet their additional treatment requirements. All unfiltered water systems must provide at least 99 or 99.9 percent (2 or 3-log) inactivation of Cryptosporidium, depending on the results of their monitoring.

Unfiltered water systems required to add treatment
Previously, existing regulations did not require unfiltered systems to provide any treatment for Cryptosporidium. Although unfiltered systems maintain watershed control programs to protect water quality, recent national surveys have shown Cryptosporidium to be present in the sources of unfiltered systems. Without treatment, these Cryptosporidium will pass into the water distributed to consumers. Available data indicate that the average risk from Cryptosporidium in unfiltered systems is higher than in filtered systems, so that treatment by unfiltered systems is required to achieve comparable public health protection. Further, with available technologies like UV and ozone, treatment for Cryptosporidium is feasible for all unfiltered systems. Consequently, EPA is establishing requirements under the LT2ESWTR for all unfiltered systems to treat for Cryptosporidium, with the required degree of treatment depending on the source water contamination level.

Filtration Avoidance General Criteria
For a drinking water system to qualify for filtration avoidance under the Surface Water Treatment Rule (SWTR) the system cannot be the source of a waterborne disease outbreak, must meet source water quality limits for coliform and turbidity and meet coliform and total trihalomethane MCLs. Disinfectant residual levels and redundant disinfection capability must also be maintained. Filtration avoidance also requires that a watershed control program be implemented to minimize microbial contamination of the source water. This program must characterize the watershed's hydrology, physical features, land use, source water quality and operational capabilities. It must also identify, monitor and control manmade and naturally occurring activities that are detrimental to water quality. The watershed control program must also be able to control activities through land ownership or written agreements. (Filtration avoidance criteria are detailed in 40 CFR §141.71.)

There are 160,000 public water systems in the United States.
60 systems possess filtration avoidance permits.
6 of those systems are at Lake Tahoe; all are TWSA members.

TWSA OPERATORS UNDER FILTRATION EXEMPTION *

Ozone plus Ultra Violet Disinfection; chlorine residual for delivery:
Incline Village General Improvement District (IVGID)
Kingsbury General Improvement District (KGID)
Edgewood Water Company (Edgewood)
Zephyr Water Utility District (ZWUD)
Glenbrook Water Cooperative (Glenbrook)

Ultra-violet (UV) disinfection and chlorine residual for delivery:
North Tahoe Public Utility District (NTPUD)

TWSA OPERATORS USING FILTRATION TREATMENT

Filtration and chlorine residual for delivery:
Tahoe City Public Utility District (TCPUD); McKinney Quail System
Skyland Water Company (Skyland)
Cave Rock Water System (Cave Rock)
Round Hill General Improvement District (RHGID)
Lakeside Park Association (LPA)

*** Treatment Requirements for Filtration Avoidance**

Water Quality Parameter	SWTR	SWTR + LT2ESWTR
Giardia	3 log removal/inactivation	3 log removal/inactivation
Virus	4 log removal/inactivation	4 log removal/inactivation
Cryptosporidium		2 log removal/inactivation
Turbidity	< 5 NTU	< 5 NTU
Total Coliform	<100/100 ml	<100/100 ml
Fecal Coliform	<20/100 ml	<20/100 ml

(Source: USACE Risk Assessment Report 2008)

TWSA Member Actions to Achieve LT2 Compliance
Regulatory requirements for raw water testing preceded any LT2 treatment upgrades.
During this required testing, no Cryptosporidium detections were reported by TWSA members. As of the required deadline of October 1, 2014, the TWSA members had achieved LT2 Compliance (or had regulatory extension).

Below is a synopsis of TWSA member agency status:

- **Tahoe City PUD: LT2 Compliant**
  Completed bi-weekly E-Coli monitoring and received waiver from Dept. of Public Health (DPH) for any further LT2 Compliance monitoring or changes. No system upgrades were required.

- **Edgewood: 1 year extension granted by NDEP**
  NDEP approved the Edgewood Water Company UV treatment plant for compliance at the beginning of December 2014. At that time, the ozone treatment system was taken offline and upgraded with new ozone generators, dryers, destruct units, and analyzers. The ozone treatment system was online in mid-January 2015.

- **Skyland/Cave Rock: LT2 Compliant**
  Completed sampling for E-Coli twice a month for one year. This is for filtered systems and since average is much less than 10 mpn/100ml, Douglas County did not sample for Cryptosporidium in the Cave Rock/Skyland water system. In 2011, Douglas County installed additional baffling in the contact basin for added contact time with new intake pumps. LT2 sampling for Cryptosporidium was conducted on Cave Rock untreated water twice a month for one year.

- **Zephyr Water Utility's Treatment Plant: LT2 Compliant**
  Zephyr Water Utility's Treatment Plant Ozone system was modified to incorporate ultra-violet (UV) disinfection to provide a minimum of two disinfectants. The existing ozone generators remained in service.

- **Kingsbury GID: LT2 Compliant**
  KGID completed the process of constructing a new water treatment plant to come into compliance with LT2. The plant went online in December 2015. The 6 MGD plant utilizes UV and Ozone, as well as onsite chlorine generation. Construction began in September 2014.

- **North Tahoe PUD: LT2 Compliant**
  The North Tahoe Public Utility District is in compliance with the LT2 rules since EPA Region 9 in San Francisco accepted the entire District's grandfathered data in the fall of 2008. The District has been sampling for Total Coliform (TC), Fecal Coliform (FC), Giardia and Cryptosporidium from our raw water source tap at National Avenue for over 16 years. TC/FC – (1) sample is grabbed and sent for analysis three (3) times per week. Giardia / Cryptosporidium – (1) sample is grabbed and sent for analysis once (1) per month. NTPUD currently uses two disinfectants (UV and Chlorine).

- **Round Hill GID: LT2 Compliant**
  RHGID utilizes for water treatment process a conventional filtration plant followed by chlorination for distribution system residual disinfection. Initial testing conducted in 2009 and 2010 indicates that the District fell within the Bin 1 classification. Therefore, the District is in compliance with the requirements of LT2 and does not need to conduct any additional sampling nor make any treatment modifications.

- **IVGID: LT2 Compliant**
  IVGID began installing UV disinfection in 2011, which was followed by an upgrade to the ozone treatment facility in 2012. IVGID met the LT2 requirement for compliance at the Burnt Cedar Water Disinfection Plant in 2013. Upgrades included: demolition and construction of new facilities, and upgrades to and rehabilitation of existing facilities located at the Burnt Cedar Water Disinfection Plant. Work included installation of vertical turbine pump, valves, RVSS motor controller, UV disinfection system equipment and ozone generation, feed and destruct equipment.

- **Glenbrook: LT2 Compliant**
  Glenbrook replaced the ozone generators and installed new UV reactors.
  The Glenbrook Water Treatment Plant upgrade was completed by September, 2014.

- **Lakeside Park Association: LT2 Compliant**
  LPA utilizes a conventional filtration plant followed by chlorination for distribution system residual disinfection. The treatment system is in full compliance for LT2 requirements.

The Safe Drinking Water Information System (SDWIS)
http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/index.cfm

EPA's Safe Drinking Water Information System (SDWIS) databases store information about drinking water. The federal version (SDWIS/FED) stores the information EPA needs to monitor approximately 156,000 public water systems. The state version (SDWIS/STATE) is a database designed to help states run their drinking water programs.

SDWIS contains information about public water systems annual water quality, including any violations of EPA's drinking water regulations, as reported to EPA by the states. These regulations establish maximum contaminant levels, treatment techniques, and monitoring and reporting requirements to ensure that water systems provide safe water to their customers. This search will help you find your drinking water supplier and view its violations and enforcement history since 1993.

The online database *(http://www.epa.gov/enviro/facts/sdwis/search.html)* allows anyone to select systems either by locating systems within a geographic area or by entering the water system ID number. For more detailed information about the water you drink, contact your local water supplier directly or call your state drinking water agency. To find the phone number for your state's drinking water agency, visit: *http://water.epa.gov/drink/local/index.cfm* or call the Safe Drinking Water Hotline at 1-800-426-4791.

Consumer Confidence Reports (CCRs)

- Copies of member agency CCRs are included in Chapter 4 in this report.

All TWSA Members were well within compliance standards for drinking water quality provided to customers in the reporting year. Tahoe tap water continues to rank among the best drinking water in the nation.

Community water systems are public water systems that have at least 15 service connections or regularly serve at least 25 year-round residents. The Consumer Confidence Rule requires public water suppliers that serve the same people year round (community water systems) to provide consumer confidence reports (CCR) to their customers. These reports are also known as annual water quality reports or drinking water quality reports. CCRs summarize information regarding sources used (i.e., rivers, lakes, reservoirs, or aquifers) any detected contaminants, compliance and educational information. The reports are due to customers by July 1, annually.

Online postings of the CCRs are available by visiting the water agencies website, or by contacting the agency. New US EPA regulations allow for electronic delivery opt-out by customers. Due to the small customer base, the primary delivery method for TWSA members is printed, mailed CCRs.

Links to Member CCRs

TCPUD
http://www.tahoecitypud.com/ccr/current.pdf
NTPUD
http://ntpud.org/ccr
IVGID
https://www.yourtahoeplace.com/public-works/about-public-works/forms-documents
Douglas County, Cave Rock/Skyland
http://www.douglascountynv.gov/DocumentCenter/View/6843
Douglas County, Zephyr
http://www.douglascountynv.gov/DocumentCenter/View/6851
KGID
http://kgid.org/consumer-confidence-reports/
RHGID
http://www.rhgid.org/past_newsletters.html
LPA
http://lakesideparkassociation.org
STPUD
http://stpud.us/customers/water-quality-reports
GLENBROOK
Contact water agency for CCR information (775) 790-0711.
EDGEWOOD
CCR not required; contact water agency for information (530) 588-4111.

More information
For a detailed report on TWSA and member agency water quality sampling procedures, reporting and analysis please see "*DRINKING WATER QUALITY INDICATOR REPORTING OPTIONS FOR THE TAHOE BASIN" at this link:*
https://www.fs.fed.us/psw/partnerships/tahoescience/documents/p079_DrinkingWaterQualityIndicatorReporting.pdf

Urban Water Management Plans (UWMP)
The State of California Urban Water Management Planning Act (Act) requires each urban water supplier with 3,000 or more connections, or supplies at least 3,000 acre-feet per year (AFY) of water, to submit UWMPs to the California Department of Water Resources (DWR) every five years. The UWMP Act requires urban suppliers to report, describe, and evaluate water deliveries and uses, water supply sources, efficient water uses, and demand management measures (DMMs), including implementation schedule and strategy. The purpose of developing an UWMP is to evaluate whether a water supplier can meet the water demands of its water customers as projected over a 20 or 25 year period. The UWMP Act directs water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies are available to meet existing and future demands. This evaluation is accomplished through analysis of current and projected water supply and demand for normal or average conditions, as well as during water shortages.

NTPUD: *http://ntpud.org/master-plans*
TCPUD: *http://www.tahoecitypud.com/download/general/uwmp.pdf*
STPUD: *http://www.stpud.us/plan_documents.html*

The **Nevada State Water Plan** is designed to guide the development, management and use of the state's water resources. It assesses the quantity and quality of our water resources, identifies constraints and opportunities which affect water resource decision making, and seeks to coordinate future actions to ensure that Nevadans obtain the greatest benefit from their water resources in the years to come. The first state water plan, *Water for Nevada,* was developed in the late 1960s and early 1970s. It identified a variety of issues and contained recommendations for improved water management, many which have now been implemented. Administration and management of the state's water resources has continued to evolve much to the benefit of the state's residents and the resources themselves.
http://water.nv.gov/programs/planning/stateplan/documents/sum-es.pdf

TWSA Member Agency Capital Improvement Projects and Infrastructure Upgrades
(in addition to LT2 Compliance)

Kingsbury GID (KGID):

KGID completed replacing the 12" steel line in Hwy 50 that serves as the secondary feed for the Lakeside Inn and Casino. The replacement of the steel 12" from Kahle to the Nugget PRV is also completed, approximately 100' of pipe. A 6"FSAA with a ¾" X 2" compound bypass has been purchased to replace the Abbey Rd vault meter. A 8"FSAA with a 1" X 3" compound bypass has been purchased to replace the Kahle Community Center vault meter. These are both purchased but not installed.

Sewer rates have now been adjusted to cover future CIP costs.

The Kingsbury General Improvement District's (KGID) new $19 million water treatment plant was activated in 2015. KGID completed construction of a new, state of the art water treatment plant to come into compliance with LT2. The facility is a 6 MGD plant utilizing UV and Ozone, as well as onsite chlorine generation. Construction began in September of 2014 and the plant came online December 2015.

A new luxury development, Tahoe Beach Club will consist of 143 Luxury Condominium Residences. Plans include a 160-foot floating pier extension near the KGID intake. Construction related activities had the potential to present problems for the District due to the proximity to the intakes. Post construction activities will be assessed for the potential for contamination of the source water. KGID is working with the developer and is preparing comments. NDEP has commissioned an additional Risk Assessment Study for this intake.

Round Hill GID (RHGID):
RHGID is currently in the process of replacing meter mains at the Castle Rock subdivision, which is funded through the NDEP SRF. All precautions have been made as per contract and regulations. Our fire hydrant replacement in conjunction with STPUD grant project is complete. We are scheduled to have an assessment to begin rehabilitation and/or replacement of 2 PRV's in the lower portion of our water system.

RHGID replaced a 50 year old, dilapidated, 500,000 gallon concrete water storage tank located in the upper pressure zone with a new 500,000 gallon welded steel tank.

Edgewood Water Company (EWC):
EWC installed a second VFD for pump #2 at our pump house. Installation was completed by Arctic Electric and controls were done by Sierra Controls. The second VFD gives us the redundancy we were looking for as well as giving the #1 pump some down time. The #1 pump has been running 24/7 since May 2017.

EWC treatment plant road is in the process of being paved and will be completed by the middle of August 2018.

Edgewood Water Company was involved in the expansion/modification of the water treatment and distribution system to accommodate the 150 room Edgewood Lodge and 40 shared residences that are part of the Edgewood Lodge Project. The project was completed and opened in June, 2017.
http://www.edgewoodtahoe.com

EWC has completed the LT2 project that included new UV treatment using the Calgon Carbon UV system. Also as part of LT2, EWC upgraded the ozone system with new ozone generators, dryers, destruct systems and analyzers.

EWC constructed a lake intake extension (5,500 feet out and 600 feet down) to access water suitable for use in heat exchangers to be used by the Edgewood Lodge Project. The intake extension allowed for a unique HVAC modification, cold lake water is used in circulation on the properties for the property cooling needs

EWC rerouted part of the raw water line and distribution line in addition to adding approximately 2 miles of distribution line to meet the demands of the Edgewood Lodge Project.

Lakeside Park Association (LPA):
Ultraviolet C Pilot Test for aquatic weeds control 2017.
http://www.laketahoenews.net/2017/03/ultraviolet-light-used-kill-tahoe-weed
Year 2 monitoring continues in 2018. A final report is anticipated December 2018.
Killing aquatic invasive weeds in Lake Tahoe with ultraviolet C light was tried for the first time summer 2017. The California Tahoe Conservancy Board on March 16 agreed to spend $260,128 on the pilot project in South Lake Tahoe. The money was awarded to the Tahoe Resource Conservation District, which has been integral in working on ways to eradicate various invasive species from Lake Tahoe. John J. Paoluccio of Inventive Resources Inc. has developed a system in which the plants are killed – almost like getting a lethal sunburn. The light damages the DNA and cell structure of the aquatic invasive weeds. This stops reproduction and eliminates the weed in a few days. The CTC staff report says, "The project will help the Tahoe RCD determine the optimum intensity and duration of treatment necessary for eradication of AIS plants."
https://tahoercd.org/aquatic-invasive-species-control-projects

Cedar Water Line Replacement Project completed in 2016. This project included replacement of 760 feet of 6" and 2" steel water line with 8" c900 water main. New services and a fire hydrant were added.

Security fencing placed around water treatment site.

Glenbrook:
In 2015, volunteers in the League to Save Lake Tahoe's Eyes on the Lake program discovered a new infestation of aquatic invasive plants in Glenbrook Bay, on Lake Tahoe's eastern shore. In 2016/17 Glenbrook homeowners and League volunteers pitched in to help remove the infestation using manual methods. See how they did it: *https://www.youtube.com/watch?v=bRspQNXY4CM*

Glenbrook replaced the ozone generators and installed new UV reactors. The Glenbrook Water Treatment Plant upgrade was completed by September 2014.

In February 2016, officials from the Glenbrook Water Cooperative in Glenbrook, NV accepted the Gold Medal Award at the Great American Water Taste Test. Glenbrook was selected by a panel of judges at the GAWTT finals from thousands of entries.

Incline Village GID (IVGID)

https://www.yourtahoeplace.com/ivgid/resources/construction-updates

The Incline Village General Improvement District (IVGID) currently maintains 90 miles of watermains to deliver safe and reliable potable water to all areas of Incline Village and Crystal Bay. Unfortunately, water infrastructure doesn't last forever and, as a substantial portion of the District was developed using corrosion and leak prone thin wall steel pipe, the District has a robust annual water main replacement program. Since 1982, the District has replaced approximately 38 miles of steel water mains throughout Incline Village and Crystal Bay at a cost of $17-million, not adjusted for inflation. There is approximately six miles of steel water mains (roughly seven percent of the District's total water main inventory) still slated for replacement.

Crystal Shores AIS Treatment

A local HOA worked with Tahoe RCD on identification and bottom barrier/diver control of a small infestation of Eurasian Water Milfoil at the Crystal Shores marina. The aquatic plant removal work implemented at Crystal Shores West, Crystal Shores East, and Crystal Shores Villas is part of a multi-year lake-wide strategy to remove aquatic invasive plants from the nearshore of Lake Tahoe Basin. Together with removal and/or reduction of all aquatic invasive species (including invertebrates and warm water fish), these projects contribute to the Environmental Improvement Program (EIP # 01.04.02.06).

Key accomplishments of project:

- Acres of Invasive Species Inventoried: 1.5 acres
- Acres Treated for Invasive Species: 3 acres

https://eip.laketahoeinfo.org/Project/FactSheet/01.04.02.0051

2017 Watermain Replacement and Fire Flow Enhancement

Project scope of work included:

Sawmill Road: Replaced 1,600 linear feet of 6" steel watermain and 985 linear feet of 8" steel watermain with 8" watermain. Connect to 29 domestic service lines. Remove and replace 3 fire hydrants.

Selby Drive: Replaced 970 linear feet 6" of steel watermain with 8"watermain. Connect to 10 domestic service lines. No fire hydrants replaced.

Pine Cone Road:

Replaced 475 linear feet 6" of steel watermain with 8"watermain. Connect to 6 domestic service lines. Remove and replace 1 fire hydrant.

The work also includes: Installation and connection of air release valves as needed, abandonment of specified lines and valves; traffic control; maintain residential and business driveway access; erosion & sediment controls; pavement repair; replacement of existing features, including vegetation, concrete, and other utilities removed and/or damaged by construction activity; and working within Right of Ways in Incline Village, Washoe County, Nevada. This work will improve available fire flow capacity in these residential areas, help reduce unaccounted for water loss, and reduce service interruptions to customers and costly pavement patch penalties that result from water leak repair activities.

Burnt Cedar Water Disinfection Plant Improvement Project

This was the multi-year mandatory upgrade of IVGID's existing drinking water treatment facilities to attain LT2 compliance by 2014. Construction and start-up of the upgraded system occurred over a two year period.

2016 Watermain Replacement and Fire Flow Enhancement Project
Replacement of 1,100 linear feet of failing 6" steel water main with 8" C900 PVC pipe; installment of one new fire hydrant on North Enterprise. Replacement of 220 linear feet of failing 6"steel water main with new 6" C900 PVC pipe and installment of one new fire hydrant on Oriole. Replacement of approximately 325 linear feet of failing 6"steel water main with 8" C900 PVC pipe; installment of two new fire hydrants on Teresa Ct. and Wassou Road.

2015 Watermain Replacement and Fire Flow Enhancement Project
This project replaced approximately 2,800' of old steel watermains by means of a trenchless pipe-bursting technique. Another 270' of was replaced using standard watermain replacement methods. This project addressed Beowawie Road, Oxen Road and the commercial easement between Village Boulevard and Southwood Boulevard.

Incline & Third Creeks Restoration Project, Phase V; SR 28 Culvert Outfall
This project restored and enhanced additional sections of Incline Creek, improved water quality flowing into Lake Tahoe and improved fish passage at the point where Incline Creek crosses State Route 28. Two 66" culverts were also rehabilitated.

2014 Watermain and Fire Flow Enhancement Project
This project replaced approximately 2,600 lineal feet of watermains and related appurtenances along Dale Drive, Knotty Pine, Willow Court and Lark Court.

2014 Reline Sewer Main Project
This project rehabilitated approximately 9,485 lineal feet of sewer mains using a cast-in-place process.

Spooner Pump Station
The Spooner Pump Station has been modified to upgrade the export pumps to two 250-HP and two 350-HP, remove the existing standby generator and diesel fuel tank, create a bypass system between the discharge and suction headers, the addition of a building for the new 900-kW standby generator with a 1,600-gallon fuel base tank and construct a new access road onto State Route 28 on the south end of the site.

North Tahoe PUD:
http://ntpud.org/sites/default/files/docs/accounting/15-16%20CIP%205%20Year%20Focus%20Summary%20Sheets.xls.pdf

- Replaced National Avenue Lake Intake Pumps 1 and 2. The orientation of the pump assemblies were changed from flat on bottom to a positive slope of 22.5º.
- Replaced 37 domestic meters in the District's Zone 112.
- Continued rehabilitation of the Carnelian Main Sewer Pump Station.
- Performed emergency sewer main repair in Tahoe Vista using Cured In Place Pipe (CIPP).
- Began Loch Levon and Steelhead Water Main Replacement.
- Installed a natural gas generator at NTPUD Base Facilities. FEMA Hazard Mitigation Grant funds paid 75% of cost, including design.
- Rehabilitation of the Carnelian Woods #1 water storage tank.

Performed emergency repair to the National Avenue Lake Intake Line. On January 19, 2017 a leak was spotted in the 16" lake intake line feeding the NAWTP. The plant was shut down immediately and was offline until the repairs were made. The threat would be if the plant down the leak would allow dirty water from the shoreline to be siphoned back into the intake line. On February 14, 2017 ten feet of the 16" lake intake pipe was replaced at the conjunction of the two sections of pipe. The plant was put back online on February 15th.

Worked with Tahoe RCD on identification and bottom barrier/diver control of a small infestation of Eurasian water Milfoil at the Tahoe Vista Boat ramp.

Replaced 32 domestic meters in the District's Zone 109 & 111 areas.

Began rehabilitation of the Carnelian Main Sewer Pump Station.

The District completed construction of the National Avenue Water Treatment Plant Improvements, Phase 2.

Installed 4,070 feet of 8" water main, fire hydrants and services on Dolly Varden from SR 28 to Chipmunk St; plus 302 linear ft. on Wolf St.

Recoated/rehabilitated the Kings Beach 500,000 gallon water storage tank, including safety and water quality enhancements.

Replaced the National Avenue Treatment Plant Intake Pump # 1 due to failure.

Replaced 60 domestic meters in District zones 109,111,112.

NTPUD's Kingswood 500 Tank/120 Booster Pump Demolition and Griff Creek Restoration Project was recognized as a 2015 *TRPA Best in the Basin* project in the Water Quality Award category. North Tahoe Public Utility District removed an aging 500,000 gallon water tank, booster pump station, and access road from a Stream Environment Zone on Griff Creek and restored the floodplain and native vegetation. The project removed 10,000 square feet of coverage and restored wetland, meadow, and other riparian plant communities along Griff Creek. This project was 50% funded with USFS grant funds through SNPLMA Round 11.

The District completed the Dollar 22" Force Main Rehabilitation project.

The District made repairs to the floor of the Carnelian Sewer Pump Station dry well.

The District completed construction for the Kingwood 500 Tank and 120 Booster Station.

The District relocated various water and sewer lines as part of the Kings Beach Commercial Core Improvements project. This project is partially funded with USFS grant funds through SNPLMA Round 12.

The District continues an aggressive water conservation education and services program including a low-flow toilet rebate credit program for water customers.

Tahoe City PUD (TCPUD)
http://www.tcpud.org/capital-improvement-projects

Bunker Water Tank completed. This work included construction of a new 1.2 million gallon water steel storage tank to replace the existing undersized and aged redwood tank. The existing water tank, constructed of redwood in 1960, has a storage capacity of 500 k gallons. This project was the highest priory due to current deficiencies, including continued water leakage.

TCPUD consolidated three private water systems on January 2, 2018, adding 1,573 connections or 38% increase in water customer base. For a current map of District systems, visit: *http://tahoe.360-biz.com/sites/default/files/images/DistrictWaterServiceAreas_2018_1.pdf*

West Lake Tahoe Regional Water Treatment Plant
http://www.tcpud.org/capital-improvement-projects/west-lake-tahoe-regional-water-treatment-plant-8126
The Tahoe City Public Utility District (TCPUD) is undertaking the construction of a permanent, year round, 1 MGD, surface water, drinking water treatment plant to replace the temporary seasonal treatment plant located at Chambers Landing. The new water treatment plant will provide a reliable, drought-resistant, and safe drinking water source to the TCPUD's McKinney-Quail Water Service area and, potentially, other water systems in the West Lake Tahoe region. In October of 2015, the TCPUD Board of Directors completed the California Environmental Quality Act (CEQA) review process for the project, adopting a Mitigated Negative Declaration and Mitigation Monitoring & Reporting Program and approving the project.

The TCPUD's Board of Directors adopted a Mitigated Negative Declaration and Mitigation Monitoring & Reporting Program and approved the project on October 7, 2015. More information may be found on the Environmental Review Page.

Pending final design and permitting, TCPUD is targeting 2019 for project construction.

This would replace the seasonal interim surface water treatment plant at Chambers Landing, constructed in the spring of 2004. Currently this area is supplied by the Crystal Way Well, the seasonal plant at Chambers Landing, and the emergency interconnect to the McKinney Water District. A failure of the Crystal Way Well could cause a major disruption during the winter months, including a potential emergency boil order if untreated surface water was used. The seasonal plant was intended as an interim solution providing a backup supply to the Crystal Way Well. A permanent secondary source is required. A new surface water treatment plant has been identified as the best solution for this system. A plant capable of supplying, or being expanded to serve more regional needs is anticipated. This will allow a lower cost of service per customer as well as planning for future source needs in the broader area currently served by private water systems.

Other recent projects include:

Tahoe City Mainline Emergency Water Supply
The work consists of constructing approximately 1,400 feet of 12-inch raw water line along Grove Street from the existing Grove Street lake intake to the Tahoe City Golf Course property. The Tahoe City water system currently relies on groundwater wells for drinking water production. The waterline will provide the District with the ability to utilize the existing Grove Street lake intake as a backup

water supply source, if drought conditions continue. The waterline will provide the District with the ability to supply raw water to the golf course for irrigation.

Grouse Drive and Upper Ellis Water Line Replacement Project
The work on Grouse Drive consisted of the replacement of 1,005 feet of 6" waterline with new 12" waterline from Bald Eagle Rd to the eastern Snowbird Loop. The work will include the installation of new fire hydrants and replacing service lines to the existing meter pits. The upper Ellis Road work will consist of the replacement of approximately 1,214 feet of 4" and 6" waterline with new 12" waterline from Snowbird Loop to the valve just south of the existing PRV located near lot 100.This work will also include installation of new fire hydrants and replacing service lines to the existing meter pits.

Highway 89 Conductor Casing Crossings
Install empty conductor casing crossings at various points along Highway 89 between Tahoma and Tahoe City. These casings will allow for installation of future water line crossings for anticipated transmission system improvements. Key locations may include areas currently served by other water purveyors. For the next 2-3 years CalTrans will be constructing their environmental improvement project from Tahoma to Tahoe City. Installation of these casings prior to or during the CalTrans project will allow the casing to be installed by open cut method. After the CalTrans project is complete the same conductor would have to be installed by bore and jack, which is both costly and not always successful due to rock and soil conditions.

Tahoe City Public Utility District Water & Sewer Rate Study
HDR Engineering, Inc. (HDR) presented the draft report on the water and sewer rate study update conducted for the Tahoe City Public Utility District (District). For this update, the study objectives were to provide an independent review of the five-year financial plan, develop rate structure alternatives for Board consideration, and develop a five-year rate schedule that will result in sufficient revenue to fund the operating and capital needs of the water and sewer utilities.

Tahoe City Well Replacement Project
Tahoe City Main water system (Dollar Hill to Tavern Heights) relies primarily on the Tahoe City Wells No. 2 and 3 for source water. During the summer months both wells are required to meet maximum day demand. The loss of one of the wells may require the use of a lake intake depending on the time of year. Use of a lake intake would require heavy chlorination and the posting of a boil water advisory. The existing Well No. 1 is of good water quality, however similar to Well No. 2 was not drilled deep enough originally. The well was drilled in 1958 and was not cased below 50'. A new well will need to be drilled, however, all of the existing infrastructure can be reused saving considerable expense on other items. This project could delay the need for the development of another water source (surface water treatment plant) for the Tahoe City Main water system.

Highland and Rubicon Line Replacements
This work consisted of the replacement of the District-owned portion of approximately 139 water service lines in the Highlands subdivision and 150 in the Rubicon Water System. All of the lines in the Highlands are located in easements at the back of the properties, while all of the lines in Rubicon are in the road. The service lines located in these areas have experienced significant failures due to polybutylene pipe material becoming brittle and pipe connection methods. Over 25 laterals in each area have been repaired in the last three years. Replacing all of the services at once will save a significant amount of crew time and overall material cost, as well as limiting water loss and property damage due to failure.

2017: Manzanita water line replacement, 800 feet of 2 inch PB that had failed several times.

2017: Two tank interiors were rehabilitated, and two exteriors.

Tahoe City Sewer System Rehabilitation Project
The Tahoe City Public Utility District (District) completed a project to rehabilitate a portion of the Tahoe City sewer system. The sewer lines in the project area were constructed in 1952 and are some of the oldest in the District's system. As part of the project, the District and its consultants will be working within the neighborhood to locate and investigate the condition of existing sewer lines and laterals. Construction occurred in 2015.

TCPUD continues an aggressive water conservation education and services program including rebate credit programs for water customers.

Douglas County Water Systems (Cave Rock, Skyland, Zephyr):
PER on distribution systems.

Cave Rock evaluation for intake line replacement or upgrade was conducted in 2015-16, in the event that the lake level continues to drop due to the drought.

U V addition to ZWUD Treatment plant was competed and online spring of 2015.

Marla Bay Intake - 10" check valve was replaced fall of 2015.

Uppaway Booster Station was completed summer of 2015.

2017 TRPA Best in Basin Awards
http://www.trpa.org/trpa-recognizes-15-projects-with-best-in-basin-awards
September 28, 2017

The Tahoe Regional Planning Agency (TRPA) on Wednesday recognized 15 exceptional projects completed in 2016 with Best in Basin awards.

Now in its 27th year, TRPA's Best in Basin awards program each year showcases projects around the lake that demonstrate exceptional planning, implementation, and compatibility with Tahoe's natural environment and communities.

The 15 public and private project implementers recognized with Best in Basin awards restored streams and wetlands, cleaned contaminated properties, built bike trails and shared-use paths, improved forest health and community wildfire preparedness, reduced stormwater pollution that harms Lake Tahoe's famous water clarity, and revitalized communities.

"People are making tremendous progress to restore and conserve Lake Tahoe's natural environment, improve the vitality of our communities, and make the region more sustainable," said Joanne S. Marchetta, executive director of TRPA. "The amount of partnership and collaboration demonstrated by this year's award winners, and the number of privately funded projects, shows Lake Tahoe is working together like never before."

This year's Best in Basin award winners are:

Kingsbury Stinger Trail: The U.S. Forest Service and nonprofit Tahoe Area Mountain Biking Association partnered to build this multi-use trail that runs from the Andria Drive trailhead in upper Kingsbury to the Tahoe Rim Trail and ends at Terrace View Street in lower Kingsbury, connecting with a Class 1 bike path there. The project restored a steep and heavily-eroding old trail alignment. More than 100 people contributed to the project with 1,500 hours of volunteer work. Project partners: American Conservation Experience, State of Nevada Recreational Trails Program.

Burke Creek Highway 50 Crossing and Realignment, Phase 1: Nevada Tahoe Conservation District daylighted a portion of Burke Creek in Stateline that was previously in an underground culvert, creating 200 feet of new stream channel, functioning floodplains, and installing a new, more appropriately sized stream crossing under Highway 50. Project partners: Balance Hydrologics, Wood Rodgers, Burdick Excavating, Nevada Department of Transportation, Nevada Division of State Lands, Douglas County, U.S. Forest Service.

Edgewood Lodge and Golf Course Improvement Project: Edgewood Companies made major improvements to its golf course water features, which receive stormwater from surrounding areas and function as the final treatment area before they discharge into Edgewood Creek and Lake Tahoe. The project renewed storage capacity of ponds, created new wetlands and 32,766 square feet of new stream environment zone, and significantly reduces fine sediment, nitrogen, and phosphorus pollution into Lake Tahoe. Project partners: Nichols Consulting Engineers, Sierra Nevada Construction, Soil Tech, SMC Construction.

Tahoe Mountain Lab: Cristi and Bernard Creegan and Jamie and David Orr overhauled the Tahoe Daily Tribune building in South Lake Tahoe, turning it into a unique co-working space for startup businesses and entrepreneurs and a gathering place for the community. The project improved the building's energy efficiency by 34 percent; built upon the success of the recent Harrison Avenue upgrades; and breathed new life and vitality into an aging and under-utilized building. Project partners: Creegan Builders, Joe Ward, Gabbart and Woods, Tahoe Daily Tribune.

Sierra Tract Erosion Control Project Phases 3-4: The City of South Lake Tahoe upgraded several hundred acres of the Sierra Tract neighborhood to reduce nuisance flooding and stormwater pollution into the Upper Truckee River. The project installed curb and gutter on neighborhood roads, above- and below-ground infiltration basins and treatment facilities, and protection for road shoulders. Project partners: CDM Smith Inc.; Western Botanical Services, Burdick Excavating.

Lake Tahoe Unified School District Energy Upgrades: The district secured a $763,000 grant through the California Clean Energy Jobs Act Proposition 39 K-12 Program to update aging and energy inefficient facilities. The project installed building automation systems, upgraded 7,287 interior and exterior lights to more efficient LED lighting, installed a high-efficiency HVAC system at the district office, installed smart irrigation systems district-wide, and installed high-efficiency windows at the middle school. Investment totaled $2.7 million, with potential lifecycle savings of more than $6 million. Project partners: Climatec, Lake Tahoe Sustainability Collaborative.

Silliman Slope Stabilization: Property owners stabilized 145 feet of heavily eroding slope between Fallen Leaf Lake Road and Fallen Leaf Lake with rip-rap, boulders, and vegetation to protect the lake from erosion and improve public safety on the narrow road. Project partners: John and Rich Silliman, John Larsen, Randy M. Klitsch/TECS, Tahoe Outdoor Living.

Camp Richardson BMP Retrofit: The U.S. Forest Service and Camp Richardson Resort Inc. partnered to upgrade the popular Camp Richardson tent and RV campgrounds with paved roadways and parking areas to reduce dust, best management practices and infiltration basins to reduce stormwater pollution, new restrooms and a check-in kiosk, and bear-proof food lockers at campsites. The project reduced impervious coverage in stream environment zones and reduced overall coverage by 20 percent.

Lake Valley Wood Roof Replacement Program: Shortly after the Angora Fire, Lake Valley Fire Protection District secured a federal grant that has helped nearly 400 homeowners replace hazardous wood-shake roofs with non-combustible roofing materials and create defensible space on their properties, improving community resilience to wildfires and helping create fire-adapted communities at Lake Tahoe. Project partners: California Office of Emergency Services, Federal Emergency Management Agency, local roofing contractors, and City of South Lake Tahoe and El Dorado County building officials.

Cave Rock Tunnel Extension: Nevada Department of Transportation built a 60-foot-long, 27-foot-tall tunnel extension carefully blended into the surrounding landscape to protect the traveling public from falling rocks at Cave Rock. The project included measures to improve scenery, lighting upgrades, road repaving, and improved signage to alert motorists of icy conditions and bicyclists in the tunnel. The project also included water quality improvements along nearly four miles of U.S. Highway 50 to reduce stormwater pollution into Lake Tahoe. Project partners: Washoe Tribe of Nevada and California, Q&D Construction, CA Group Inc., Tahoe Regional Planning Agency, South Shore Transportation Management Association, Tahoe Transportation District, Lake Tahoe South Shore Chamber of Commerce, Lake Tahoe Visitors Authority, Hi-Tech Rockfall Construction, Nevada Highway Patrol, Titan Electrical, Drill Tech Drilling & Shoring, CMC Steel.

Northwood Boulevard Fuel Reduction: Property owner James Hite, North Lake Tahoe Fire Protection District, and Healthy Trees, Inc. partnered to thin 15 acres of dangerously overgrown forest in Incline Village, reducing wildfire risk and improving forest health and resilience. Project partner: Nevada Division of Forestry.

Somers Loop Water Quality Improvement: Nevada Pacific Development Corporation, David and Cheryl Duffield, and a team of partners restored the former Stack Estate, a 6.4-acre lakefront site in Crystal Bay. Working in steep and rugged terrain with near-surgical precision, the project removed seven dilapidated structures, removed five abandoned septic systems and 20 drums of hazardous household waste, restored 12,769 square feet of native vegetation, and removed 540 cubic yards of soil and rock contaminated with diesel fuel, motor oil, kerosene, or lead to achieve a clean close for the site from Nevada Division of Environmental Protection. Project partners: Midkiff & Associates, Inc.; Marlette Environmental Consulting, LLC; Resource Concepts, Inc.; Tri-State Surveying, Ltd.; Walden West Design; Olsen Engineering; Wise Consulting & Training; Cruz Construction Company, Inc.; Clean Harbors Environmental Services; Kelley Erosion Control, Inc.; Alpha Analytical, Inc.; Advance Installations, Inc.; Nelson Electric Company; High Sierra Blasting; Luke Landscape Contractors, LLC.

Tahoe Beachfront Residences: Todd Davidson and partners razed an old, lakefront hotel on state Route 28 in Kings Beach to build this new residential project, marking the first significant private investment after the Kings Beach Commercial Core Improvement Project. The project reduced the number of units on site and vehicle miles traveled, reduced impervious coverage at the site by 11 percent, installed best management practices to improve water quality, improved scenic qualities from

the lake and highway, and established a new node of vibrancy in a Kings Beach community ripe for investment and revitalization. Project partners: GLAMorris, Dale Cox Architecture, Bill Johnson, Arnett & Associates, PR Design and Engineering, Inc.

Homewood Bike and Pedestrian Trail: Tahoe City Public Utility District and partners completed this 1-mile "missing link" in the West Shore Bike Trail, which runs from Tahoe City to Sugar Pine State Park. The trail runs between Cherry Street and Fern Street in Homewood, improving on a popular community and recreation amenity, increasing safety and recreation opportunities, and helping people travel the West Shore without a motor vehicle. Project partners: Auerbach Engineering, Dokken Engineering, Vinciguerra Construction, Caltrans, Homewood Mountain Resort, Placer County, North Lake Tahoe Resort Association, California Tahoe Conservancy, California Natural Resources Agency, Tahoe Fund, Placer County Parks.

Lake Tahoe Info Website: This new website launched by TRPA and other partners in the Lake Tahoe Environmental Improvement Program (EIP) is a clearinghouse for information on all EIP projects, which entities funded them, when and where they were completed, and what they accomplished. The website puts the full story of the EIP at the fingertips of anyone with a computer, no small feat for a program with more than 50 public and private partners that have invested more than $2 billion over two decades in projects to conserve and restore Lake Tahoe's environment. Project partners: U.S. EPA, TRPA, Sitka Technology Group, Environmental Incentives.

A map of all Best in Basin projects, photos, and information about projects is available online at www.trpa.org/best-in-basin-map/.

2016 TRPA Best in Basin Awards
http://www.pressreleasepoint.com/trpa-recognizes-nine-projects-best-basin-awards
The Tahoe Regional Planning Agency (TRPA) announced and recognized nine award recipients for its annual Best in Basin program. Now in its 26th year, TRPA's Best in Basin program recognizes and showcases projects that demonstrate exceptional planning and implementation and compatibility with Lake Tahoe's environment and communities.

The nine project implementers recognized with Best in Basin awards built bike paths and a bike park, improved energy efficiency at one of Tahoe's resorts, restored streams and wildlife habitat, reduced stormwater pollution that washes into the lake and harms its famous water clarity, and restored the Angora Fire burn area.

These projects illustrate the progress our partners are making to restore and conserve our environment, improve our communities, and make our region more sustainable, "These projects illustrate the progress our partners are making to restore and conserve our environment, improve our communities, and make our region more sustainable," said Joanne S. Marchetta, ED of TRPA.

The projects recognized with Best in Basin awards are:

Granlibakken Energy Upgrades: Working with Sierra Business Council, Placer County, and the mPOWER program, Granlibakken Tahoe upgraded its heating and air conditioning systems and kitchen appliances with more energy-efficient units. The project results in an estimated 43 percent reduction in energy use and annual savings up to $44,000. The resort has also been recognized by the U.S. Department of Energy as one of its Better Buildings Challenge showcase projects.

Bijou Bike Park: South Lake Tahoe volunteers with the Tahoe Area Mountain Biking Association and Elite Trax built this highly-popular recreation site. The bike park includes a world class BMX track, two pump tracks, three slopestyle jump lines, and a perimeter of loop trail—all nestled in five acres of forested land in Bijou Community Park, a convenient location in the center of the South Lake Tahoe community.

Central Incline Village Phase II Water Quality Improvement: Washoe County and partners installed infiltration basins, sediment cans, inlets, and infiltration galleries, pervious concrete road shoulders, filters, and monitoring equipment to reduce stormwater pollution in 244 acres of Incline Village.

Sawmill 2B Bike Path and Erosion Control Project: El Dorado County and partners built 1.2 miles of Class 1 bikeway, completing an important transportation link connecting South Lake Tahoe and Meyers. The bikeway connects neighborhoods, schools, and popular recreation sites. The project included water quality improvement features to reduce erosion and stormwater pollution and also thinned thick forested areas along the bikeway to help reduce wildfire risk.

Middle Rosewood Creek Area A Stream Environment Zone Restoration: Nevada Tahoe Conservation District and its partners restored more than 2,100 feet of stream channel and floodplain to improve water quality, fish passage, and wildlife habitat. This stretch of Middle Rosewood Creek was severely degraded before the project and had the potential to deliver thousands of cubic yards of sediment into Lake Tahoe over the next two decades, making it a high-priority restoration area.

Lower Chipmunk and Outfall Water Quality Improvement: Placer County and partners completed this project to capture stormwater and reduce sediment loads from Lower Chipmunk Street, Brockway Vista East, and State Route 28.

Incline Creek Restoration, State Route 28 Culvert: Incline Village General Improvement District and its partners relined and upgraded this culvert to prolong its service life and also improve fish passage, stream habitat, and water quality. Before the project, the culvert dropped water more than four feet down on the other side. The project built a series of riffle and pool step sections to gradually raise the stream bed up to the culvert, creating low-flow fish passage for longer periods of migration.

Lake Forest Water Quality Improvement: Placer County and partners improved water quality and erosion control and restored stream environment zones in a 173-acre area around Lake Forest Beach. The project installed filters, drop inlets, sediment cans, and curb and gutter to reduce stormwater pollution, upgraded compacted dirt road shoulders with pervious concrete that allows for stormwater infiltration and roadside parking at this popular recreation site, and also restored a wet meadow area.

Angora Burn Area Restoration Phase III: Following the Angora Fire in 2007, the U.S. Forest Service Lake Tahoe Basin Management Unit took immediate steps to manage the 3,100 acre burn area to address immediate erosion risks. Over the last nine years the Forest Service, working with community and government partners, has reforested 672 acres, restored 44 acres of aspen and meadow, completed 1,400 acres of fuels reduction and forest thinning to reduce wildfire risk, relocated roads and trails out of stream zones and upgraded them with best management practices, installed new wayfinding signage for better recreation access, and restored 2,000 feet of stream channel.

Additional information about this year's award winning projects and photos are available at http://www.trpa.org/best-in-basin-map/. For additional information, contact Tom Lotshaw, Public Information Officer, at 775-589-5278.

Securing Funding for Watershed Control Programs
Appointed staff members from each participating water agency form the TWSA Board of Directors. The largest partner, IVGID, offers its Resource Conservationist as the Association's Executive Director. IVGID provides additional staff support for TWSA activities with the services of the Director of Public Works and Resource Conservation Technician. A partner agreement stipulates cost sharing of the expenses incurred by IVGID on behalf of the association. Members pay an annual fee, in part proportional to the size of their service areas and in part, in equal amounts representing common administrative costs. The annual budget averages between $140,000-$150,000.

This funding is used to support TWSA programs including: staffing costs, agency advocacy, event sponsorship, customer handouts such as dog waste campaign expenses, refillable water bottles, radio and print advertising, member staff training, school programs, scholarships and TWSA publications. Other projects such as the USACE Lake Tahoe Risk Assessment Model are cost shared above the annual budget, as needed.

Public Education
The Tahoe Water Suppliers Association has a defined public outreach and education campaign for the Lake Tahoe Basin. Our website is *www.TahoeH2O.org*. Key outreach messages included: "Drink Tahoe Tap ® ", the "Tap It"" network; "Do You Know Where Your Drinking Water Comes From?", "Protect the Source" and "They Drop It; You Drink It". Details of the various TWSA outreach campaigns are listed in the Action Plan Highlights earlier in this report.

TWSA provides referral to the Nevada Tahoe Conservation District and Tahoe Resource Conservation District free BMP landscape evaluation services. By working with partner agencies, the topic of aquatic invasive species prevention is provided to the public. Water conservation, appreciation of tap water, watershed protection and pollution prevention messages are delivered to the public. The primary means of distribution for the educational campaigns include: a website, videos, print media, web, tv and radio ads, public service announcements and personal interaction at community events. Sponsorship of refillable water bottles and pouches distributed to the public is a major outreach program.

Water Emergency Declaration for California 2014-15; restrictions eased in 2015-16
On the California side of the lake, emergency water use restrictions were declared statewide due to extended drought conditions. NTPUD, STPUD and TCPUD all enacted emergency water reduction notices, increased levels of enforcement and ramped up their water conservation/education/ rebate programs.

On the Nevada side, members promote voluntary actions such as restriction on daytime landscape watering and installation of low flow fixtures and appliances. Most have ordinances prohibiting water waste. Purveyors provide water conservation information each spring to customers via billing inserts and newspaper articles.

Water Conservation Activities
Details of actions taken by member agencies are provided in the previous chapter, Action Plan Highlights.

Water conservation plans and outreach are an integral part of the member agencies' messages to customers. Efforts concentrate on outdoor water usage rather than indoor usage. In the past 3 years, many of the TWSA members have lowered base gallon allocations, reduced tier trigger levels, and increased consumption and service rates.

The California systems are making efforts to achieve the CA 20x2020 rule (20% reduction in water use by year 2020).

Free landscape water use audits are offered to limited areas within the TWSA watersheds.

TWSA provided leak detection tablets and water conservation information in current outreach materials.

Metering
Water conservation efforts by the purveyors have increased with additional purveyors going to metered systems.

- IVGID has all metered connections, with a 3 tier increasing block rate structure.
- NTPUD is a fully metered system, with a 2 tier increasing block rate structure.
- KGID is a fully metered system, with a 3 tier increasing block rate structure.
- Glenbrook is not metered.
- Douglas County has some meters installed in the Cave Rock and ZWUD systems.
- TCPUD is fully metered and began consumption based water rates for residential customers in 2009.
- Edgewood changed out all meters in 2009-2010.
- RHGID is a fully metered system, with a 3 tier increasing block rate structure.

Leak Detection

- IVGID meter reading staff conducts monthly billing analysis and on-site leak detection assistance for customers. Distribution system leak detection is ongoing. The district has reduced system water loss to less than 10%.
- TCPUD's program includes annual leak detection. TCPUD completes a system-wide water audit program, monthly. Thirteen separate areas comprising the entire water service area are audited monthly. A running annual audit is also conducted for the entire system using

AWWA provided software. TCPUD installed a backwash recycling system at the McKinney Quail Water Treatment facility. Over 90% of backwash water is now recycled. TCPUD also started a large meter testing program.

- NTPUD has installed the next generation MLOG radio. Itron has combined the MLOG technology with their ERT series and it is called the 100W + Leak Sensor. When deployed, it monitors the segment of the distribution system around the clock, acoustically surveying the integrity of the system. The 100 Series module collects and stores up to 40 days of hourly reads from the customer-side leaks. At the same time, it is also collecting and storing the data from the leak sensor. The leak sensor samples the pipe conditions every 22.5 minutes, totaling 64 times per day. These readings are collected from the 100W at the same time the automated meter reading is done. Each sensor will cover up to 300 linear feet. The District began installing the 100W with each new meter upgrade and/or ERT replacement. Presently, the 100W + sensors are being installed in areas of habitual main leaks that warrant constant monitoring.
- KGID conducts in house detection, ongoing.
- RHGID tracks unaccounted for water.

Mapping (See maps located at end of report)
Using the 2002 Sanitary Survey updates and corresponding watershed maps as a template, the Tahoe Water Suppliers Association started a watershed mapping program in 2003. TWSA staff has developed extensive reference maps, defined by watershed, on the Lake Tahoe basin as a method to: describe the watersheds, identify land ownership and land use changes, ascertain potential sources of drinking water contamination, and locate potential areas of future monitoring. Maps have been created for the water purveyors that describe: land ownership, land use, general description and location, service boundaries, potential contaminating sources and recreation. The maps have been useful in describing the watershed features, identifying inconsistencies and areas of improvement for basin-wide mapping programs, locating potential sources of contamination, and structuring education and monitoring programs.

Fire Flow/ Emergency Interties
Beginning in 2007- 2008, TWSA members began to research the feasibility of additional infrastructure to link several district water supplies, in order to increase water availability during potential emergencies. It was determined the agencies in the southeastern section of the lake had the most potential to intertie.

- The Douglas County systems worked with JWA engineering on an intertie evaluation.
- In 2008, KGID and Edgewood completed an intertie.
- LPA completed a 10" intertie with STPUD in 2007.
- TCPUD completed an emergency intertie with Tahoe Park Water Company in 2016 proving water to Tahoe Park only.
- IVGID and NTPUD have an emergency intertie available.

TWSA/United States Army Corps of Engineers (USACE)
Lake Tahoe Source Water Risk Assessment 2008
Current research in the Tahoe Basin includes studies on the effect of shoreline activities on drinking water quality. Perri Standish-Lee of Black and Veatch completed a study on the effects of human recreation on drinking water quality in 2006. Results indicate that any activities capable of introducing contaminants to Lake Tahoe's Near Shore Zone can have a direct impact on water quality. Water quality degradation can result in a possible waterborne disease outbreak or a loss of filter avoidance; thus, putting the burden of water filtration installation costs on local residents.

The Risk Assessment Project/Model (Phase 1), primarily funded by USACE with some TWSA matching funds, was completed in the fall of 2008. This project quantified the risk of contamination from potential sources for three of the TWSA water suppliers' drinking water intakes, and provided a working spreadsheet to evaluate potential risks form spills and Shorezone development. The Risk Assessment can be used to identify potential mitigation for high risk activities and/or emergencies. Importantly, the assessment will help identify response time necessary, based on time of travel maps, to protect human health during an emergency. The development of the model provides water purveyors with a hands-on system to quantify immediate potential threats to the raw water used in the municipal water delivery systems, from proposed projects. It also helps to identify potential mitigations for a proposed activity, and it will provide water suppliers with information to react to emergency spills and/or leaks of potential contaminants within their watersheds.

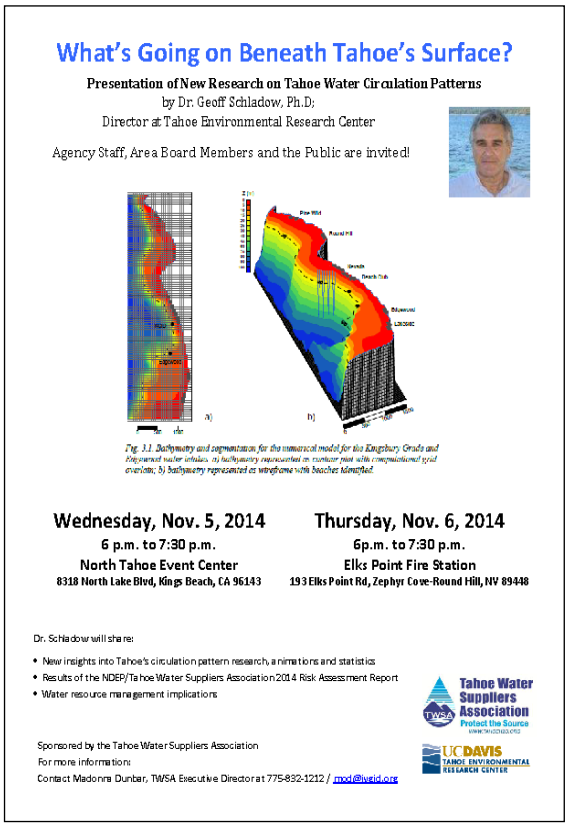
TWSA Risk Assessment / Model Projects (RAM)
Copies of the Risk Assessment Reports are available by contacting the TWSA Executive Director madonna_dunbar@ivgid.org.

2013-14 Refinements of 2008 Model
The NDEP began discussion of further refinement of the 2008 Report and initiated a contract with the Tahoe Science Consortium (TSC) through IVGID as a fiscal agent in June 2013. Working collaboratively with researchers at the TSC, the NDEP and TWSA commissioned the study to use new, more highly refined, water current data in the model and re-evaluate at a minimum the southeastern corner of Lake Tahoe (Intake areas for Edgewood/Kingsbury/Lakeside).

"2014 Lake Tahoe Flow Modeling, Potential Pathogen Transport and Risk Modeling Report"
S. Geoffrey Schladow, Andrea Hoyer, Francisco Rueda and Michael Anderson/ June 2014:

In spring 2013, NDEP initiated discussion with TWSA to fund Phase 2 of the Lake Tahoe Risk Assessment Model developed in 2008 (Black & Veatch, B&V Project No. 41717). Phase 2 was funded by NDEP ($74,000) and TWSA ($19,000) for a total of $95,000 in 2013-14.
There has been significant improvement in the data available on lake currents since 2008, so the upgrades were allowed to provide better modeling with more refined area grids based on this new data. This project re-analyzed lake water current patterns in the southeastern corner of Lake Tahoe, in the area of the Edgewood and Kingsbury intakes. The analysis is related to public water systems at Lake Tahoe and the impact that local potential contaminating activities have on the source water. In addition to new data, new potential contaminating activities have been proposed near the public water system intakes, which will also impact system specific risk models.

Flow Modeling and Pathogens (PO # S004422)



Executive Summary

Swimming and other body-contact recreational activities have been identified by the USEPA, the Nevada Division of Environmental Protection, the California Department of Health Services and other public health professionals as a potential source of microbiological contamination of recreational waters.

This study was undertaken to quantify the impacts of body contact recreation on microbial water quality at the Kingsbury General Improvement District (KGID) and Edgewood Water Company intakes on Lake Tahoe.

This study builds upon the risk assessment conducted previously (Black and Veatch, 2008), and specifically incorporates 5 new features:

(i) Findings of new 3-D hydrodynamic simulations for the nearshore southeastern portion of Lake Tahoe;

(ii) Development of a finer-scale 50 m x 50 m finite-segment pathogen fate-consumer risk model;

(iii) Additional recreational use associated with the proposed Beach Club and Edgewood Lodge/Resort developments;

(iv) Risk assessment for the Edgewood Water Company intake; and

(v) Treatment plant upgrades at KGID and Edgewood that include UV disinfection meeting the requirements of the Long Term 2 Enhanced Surface Water Treatment rule (LT2). As in the prior study, this risk assessment focused on Cryptosporidium because of its low infectious dose, environmental persistence and resistance to conventional disinfection.

Mean annual Cryptosporidium concentrations were predicted using a Monte Carlo-based pathogen fate-consumer risk model. Dose-response calculations applied to predicted concentrations following treatment provided probabilistic estimates of health risks resulting from consumption of recreationally-impacted treated drinking water.

Model simulations demonstrate that the additional recreational use at Beach Club and Edgewood Lodge/Resort beaches, in conjunction with improved understanding of transport, results in increased potential for Cryptosporidium to reach the KGID and Edgewood intakes.

For example, the median annual concentration at the KGID intake increased from 0.0018 oocysts/100 L (Black and Veach, 2008) to 0.0082 oocysts/100 L, although the additional 3-log removal achieved with UV disinfection following ozonation greatly lowered treated water concentrations and substantially lowered risk of infection. The predicted median annual risk of infection was lowered from 0.23 (Black and Veatch, 2008) to 0.0011 infections/10,000/yr (this study) for KGID, while the probability of exceeding the USEPA target of 1 infection/10,000/yr was reduced from 4.9% (Black and Veatch, 2008) to <0.02 infections/10,000/yr (the lowest probability limit based upon the number of simulations). The median predicted annual risk level for the upgraded ozone+UV Edgewood plant was 0.0007 infections/10,000/ yr, with <0.02% probability of exceeding the USEPA target (lowest probability limit).

The modeling results that underpinned these conclusions provide a number of additional insights to minimizing pathogen entrainment into drinking water intakes. Primarily, by using a technique developed under this project, it is now possible to determine the source area of pathogens (or any other contaminant) that arrive at a water intake. The results also provide insight into the complex interplay between the windfield, the strength of the lake's thermal stratification and the transport patterns of pathogens. Most notably, having an intake located below the maximum depth of the thermocline greatly reduces the frequency of pathogen arrival at the intake. This has other implications with respect to lake level and drought conditions.

With prolonged drought episodes (predicted to be more frequent under future climatic conditions), lake level will be lower and thereby reduce the depth of the water intakes. Under those conditions the period of time favorable for pathogen transport to the intakes is likely to increase significantly. Similarly, the time of water withdrawal can be used to minimize risk. Night time and early morning withdrawals seem to pose the greatest risk, as pathogens released the previous day have had little opportunity to be de-activated by solar radiation. This highlights the linkage between drinking water quality and maintenance of high water clarity, particularly in the nearshore region. Maximizing the penetration of UV radiation from solar radiation into the water column provides "free" water treatment.

The release of a surrogate for herbicide transport from the vicinity of Tahoe Keys was simulated, and showed that herbicide could be transported to the vicinity of the nearshore regions of south-east Lake Tahoe within a 24 hour period. Within that period, material did not actually arrive at any of the water intakes, but based on other results in this report, that would occur within less than 48 hours. It must be borne in mind that these results are a first estimate of the fate of herbicides. No account has been taken of the dilution that a real plume of herbicide would be subject to, and the possible breakdown into other chemicals. Likewise the toxicity (if any) of the herbicide for the case of consumption or body contact recreation has not been considered as it was beyond the scope of the study. However, should the use of herbicides be permitted at Lake Tahoe, there is a strong case that a more complete study of the fate of these products on public health should be undertaken.

A TWSA sponsored workshop on this report and the current data was offered on Nov. 5 and 6, 2014 by Dr. Schladow at both north and south Tahoe locations. The presentations were covered by local media.
http://www.laketahoenews.net/2014/11/scientists-studying-life-below-tahoes-surface/
and at
http://www.recordcourier.com/news/13714581-113/lake-tahoe-schladow-wind

2008 Phase 1:
Executive Summary - TWSA B&V Project 41717
Summary & Conclusions
Time of travel maps were developed for the watershed. Watershed travel times varied with flow; at low flow rates, the time to reach Lake Tahoe from 1 to 2 miles ((1.6 – 3.2 km) away in the watershed was less than 16 hours, while high flow resulted in travel times from anywhere in the watershed to be less than 10 hours.

Pathogen fate-consumer risk model calculations found water quality to be generally good at the Burnt Cedar, McKinney-Quail and Kingsbury Grade intakes, although body contact recreation does represent a potential threat to drinking water quality for intakes with high levels of recreation use nearby and, most importantly, limited removal at the treatment plant.

Three primary variables most directly influence the risk posed to water quality at the water supply intakes in Lake Tahoe:

- Recreational use (including the number of recreators, location of recreation and prevalence of infection within the recreator population).
- Direction and magnitude of advective currents in the vicinity of the intake.
- Effectiveness of treatment processes at the water treatment plant (WTP).

The vulnerability of the intakes to sewage and fuel spills and other contaminating events within the watershed will also be dependent upon the location and magnitude of an input, the direction and speed of advective and dispersive transport, dilution, contaminant losses within the water column.

Risk Assessment Model 2008
As part of the Risk Assessment, a model was developed. The model serves as a tool for decision making, by evaluating potentially contaminating activity within one quarter mile (1320 feet) of intakes and can help determine the level of risk of human disease, transmission, and infection. The RAM can be used to identify potential mitigation for high risk activities and/or emergencies. Importantly, the assessment will help identify response time necessary, based on time of travel maps, to protect human health during an emergency.

ARkStorm@Tahoe Project
http://tahoescience.org/arkstorm-project
Addressing social and ecological impacts of extreme winter storm events in the Lake Tahoe region. What is an ARkStorm? Atmospheric rivers (ARs) are large flows of water vapor that typically occur in fall and winter, bringing huge amounts of moisture over the Pacific to the U.S. West Coast. Landfalling ARs are storm events with the potential to deliver extreme amounts of precipitation to the West Coast, including California and Nevada, over a just a few days. The name "ARkStorm" was coined to describe large AR storm sequences, which, for instance, can produce precipitation in California that in places can exceed totals experienced only once every several hundred to 1,000 years. Scientists with the U.S. Geological Survey (USGS) Multi Hazards Demonstration Project (MHDP) designed a scientifically-plausible winter ARkStorm scenario for California emergency managers, stitching together historical AR storms from 1969 and 1986, separated by only 4 days.

This hypothetical ARkStorm would rival but not exceed the intense California winter storms of 1861 and 1862 that left the Central Valley of California flooded and the state's economy destroyed. It was designed to exceed any single storm in the 20th Century. On September 12, 2013 a meeting was facilitated at Incline Village General Improvement District (IVGID) for the TWSA members and other agency representatives to discuss the operations of water and sewer supply systems during a potential long-term storm event. A March 14, 2014 Tabletop Exercise (TTX) was run at the Regional Emergency Operations Center (REOC) in Reno, NV.

Winter 2016-17 became an 'test' ArkStorm situation, with flooding impacts in the Truckee River Corridor and Reno/Carson areas.

Water Demand and Sewer Services
TRPA: http://www.trpa.org/wp-content/uploads/18_Ch12_Implementation_FINAL_9_30_2016.pdf

Water Demand
Water rights in the Lake Tahoe Region are controlled by the Truckee River Operating Agreement (TROA), which was signed on September 6, 2008 and went into effect in 2015. The TROA formalizes, regulates and monitors water rights and water use in the Tahoe Region, the Truckee River watershed, and the final outflow areas of Pyramid Lake and the Carson River in Nevada. Under the TROA, total water extractions in the Tahoe Region are capped at 34,000 acre feet per year, limiting each state as follows:

2015 Threshold Evaluation – Implementation and Effectiveness *12-28*

California:	23,000 acre feet per year
Nevada:	11,000 acre feet per year

The Tahoe Region has numerous public water systems, including large-scale and small-scale (i.e., less than 200 households) systems. In addition, there are many single-use intake lines along Lake Tahoe's shoreline and wells. The large-scale water and wastewater treatment systems in the Tahoe Region are provided by public utility districts (PUDs) and general improvement districts (GIDs). On the California side of the Region, PUDs may acquire, construct, own, complete, use, and operate a variety of services, including water, electricity, recreational facilities, drainage facilities, street lighting, and fire protection. Similarly, Nevada GIDs oversee the development, maintenance, and use of public facilities such as water and sewer systems, streets and sidewalks, and parks and open space. Since 1968, all wastewater in the Tahoe Region has been treated and pumped out of the Region to avoid discharge into the lake. Districts are bound by service areas and directed through boards created by local governments.

The following PUDs and GIDs operate within the Tahoe Region:

Cave Rock Estates GID	Oliver Park GID
Incline Village GID	Round Hill GID
Kingsbury GID	South Tahoe PUD
Lakeridge GID	Tahoe City PUD
Logan Creek Estates GID	Zephyr Cove GID
Marla Bay GID	Zephyr Heights GID
North Tahoe PUD	Zephyr Knolls GID

The Tahoe Water Suppliers Association (TWSA, 2015) consists of public water suppliers in the Lake Tahoe Region that use Lake Tahoe as their source of drinking water. TWSA consists of:

Cave Rock Water System (Cave Rock; Douglas County)
Edgewood Water Company (Edgewood)
Glenbrook Water Cooperative (Glenbrook)
Incline Village General Improvement District (IVGID)
Kingsbury General Improvement District (KGID)
Lakeside Park Association (LPA)
Zephyr Water Utility (Zephyr; Douglas County)
North Tahoe Public Utility District (NTPUD)
Round Hill General Improvement District (RHGID)
Skyland Water Company (Skyland; Douglas County)
South Tahoe Public Utility District (STPUD)
Tahoe City Public Utility District (TCPUD)

In 2015, TWSA suppliers served approximately 20,597 service hookups, supplying water to approximately 34,410 residents. The average daily water flow for TWSA suppliers ranges from 100,000 gallons per day (gpd) to 2,690,000 gpd. Peak daily water flow ranges from 424,000 gpd to 5,945,000 gpd (TWSA, 2015).

Numerous water purveyors distribute water from groundwater sources throughout the Region, including South Tahoe Public Utility District, Lukins Brothers Water and the Tahoe Keys Water Company.

Water demand in the Lake Tahoe Region varies year to year due to changes in resident and/or visitor populations, length of summer growing seasons (for outdoor irrigation), and drought conditions (which can lead to local water restrictions imposed by local utility districts). Water conservation is encouraged by many Lake Tahoe water purveyors. The South Tahoe Public Utility District (STPUD), for example, provides a lawn turf buy-back program, water-efficient appliance rebates, leak detection assistance, and irrigation efficiency evaluations.

Sewage Disposal

The Porter-Cologne Act in California, and an executive order by the Governor of Nevada dated January 27, 1971, prohibit discharges of domestic, municipal or industrial wastewaters to Lake Tahoe, its tributaries, groundwater, or the portion of the Truckee River within the Tahoe Region.[8] As a result, Tahoe Region wastewater is generally collected, treated, and discharged to locations outside of the Region in one of the following four sewer export systems:

1. South Tahoe Public Utility District – Wastewater for the City of South Lake Tahoe and unincorporated portions of El Dorado County (south of Emerald Bay) is exported to Alpine County, California, via a sewer export line over Luther Pass (California State Route 89).
2. Douglas County Sewer Improvement District – Wastewater for Douglas County is exported to the Carson Valley in Nevada, via a sewer export line over Daggett Pass (Nevada State Route 207, Kingsbury Grade).
3. Incline Village General Improvement District – Wastewater for Washoe County is exported to the Carson City/Stewart area, Nevada, via a sewer export line over Spooner Summit (U.S. Highway 50).
4. Tahoe City and North Tahoe Public Utility Districts – Wastewater for Placer County and the portion of El Dorado County north of Emerald Bay is exported to the town of Truckee, California, via a sewer export line in the Truckee River Canyon (along California State Route 89).

Exceptions may be granted to discharges under alternative plans (for wastewater disposal authorized by state law, and approved by a state agency with appropriate jurisdiction). TRPA may also approve sewage holding tanks or other no-discharge systems in accordance with Subparagraph 60.1.3.C of the TRPA Code of Ordinances as a temporary measure, or as a permanent measure in remote public or private recreation sites, where a sewer system would create excessive adverse environmental impacts.

The California Water Quality Control Board, Lahontan Region, has authority to issue wastewater discharge waivers in the California portion of the Lake Tahoe Region. In Nevada, this authority rests with the Nevada Department of Environmental Protection (NDEP). Exceptions have been given to cabins in remote summer home tracts on the California side of the Region (including Upper and Lower Echo Lakes, Fallen Leaf Lake, Lily Lake, Glen Alpine, and Emerald Bay). Some summer homes are allowed to discharge "gray water" to leach field systems, but are also required to contain and transport "black water" sewage to an approved sewer dump station for treatment in a sewer plant.

[8] *See section 60.1, TRPA Code of Ordinances*

There are five sewer treatment plants located in the Tahoe Region, each of which exports treated sewage into one of the four export lines noted above. Existing sewage capacity for these plants, including "reserved" capacity, is summarized in Table 12-18, below. As the table indicates, none of the five Tahoe sewer treatment plants are near their total capacity. In discussions with sewer plant officials, all five sewer plants were originally designed for a much larger population than currently expected at Lake Tahoe. Excess plant capacity is a result of a number of factors, including TRPA growth controls and localized population decreases, combined with water conservation efforts, and public purchases of environmentally sensitive lands.

Table 12-18. *2015 Sewage Disposal Capacity in Millions of Gallons per Day (MGD)*

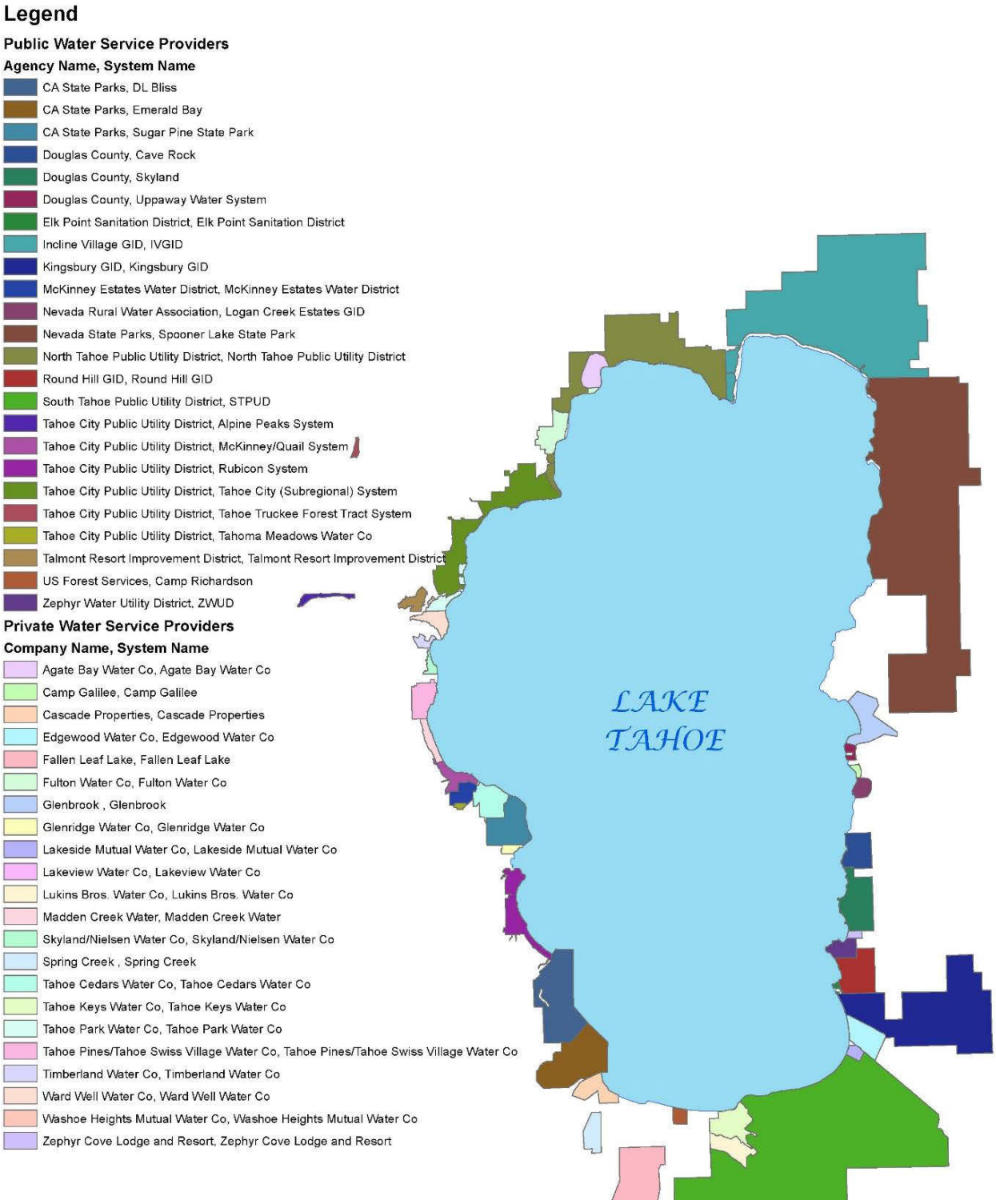
Sewer Collection District	Approximate 2015 Peak Sewer Flow	Approximate Capacity[1]	Approximate Reserve Capacity
North Tahoe PUD	0.65[3]	6.00	5.35
Tahoe City PUD[2]	1.16	7.80	6.64
South Tahoe PUD	4.93	7.70	2.77
Incline Village GID	1.61	3.00	1.39
Douglas County SID	2.31	3.75	1.44

Notes:

1. The North Tahoe and Tahoe City Public Utility Districts share a common North Shore sewer export line to Truckee, where sewage is combined with four other sewer collection districts for treatment by the Tahoe-Truckee Sanitation Agency (T-TSA). Sewer plant capacity for NTPUD and TCPUD is, therefore, a factor of export line capacity and total capacity of the T-TSA treatment facility (9.60 million gallons per day).
2. TCPUD's sewer collection is split between a North Shore and a West Shore collection system. TCPUDs portion of the shared TCPUD-NTPUD North Shore export line has a capacity of 3.5 MGD. TCPUD's West Shore collection system has a capacity of 4.3 MGD, and is "fixed" by pumping capacity at their Sunnyside pump station.
3. Equals 2015 average sewer flow. A peak flow estimate was not available from NTPUD.

Source: Tahoe Region Sewer Districts

Tahoe Basin Water Systems. Graphic courtesy of STPUD.



EPA Reference on Unfiltered Systems

EPA United States Environmental Protection Agency

Comprehensive Surface Water Treatment Rules Quick Reference Guide: Unfiltered Systems

Overview of the Rules

Title	**Surface Water Treatment Rule** (SWTR) - 40 CFR 141.70-141.75 **Interim Enhanced Surface Water Treatment Rule** (IESWTR) - 40 CFR 141.170-141.175 **Long Term 1 Enhanced Surface Water Treatment Rule** (LT1ESWTR) - 40 CFR 141.500-141.571
Purpose	Improve public health protection through the control of microbial contaminants, particularly viruses, *Giardia*, and *Cryptosporidium*.
General Description	The **Surface Water Treatment Rules**: ▸ Applies to all public water systems (PWSs) using surface water or ground water under the direct influence of surface water (GWUDI), otherwise known as "**Subpart H systems.**" ▸ Requires all Subpart H systems to disinfect. ▸ Requires Subpart H systems to filter unless specific filter avoidance criteria are met. ▸ Requires unfiltered systems to perform source water monitoring and meet site specific conditions for control of microbials.

Overview of Requirements

The purpose of this table is show how the requirements for the IESWTR and LT1ESWTR build on the existing requirements established in the original SWTR.

APPLICABILITY: PWSs that use surface water or ground water under the direct influence of surface water (Subpart H) that do not provide filtration.		**Final Rule Dates**		
		SWTR 1989	**IESWTR 1998**	**LT1ESWTR 2002**
Population Served	≥ 10,000	✓	✓	
	< 10,000	✓	N/A (except for sanitary survey provisions)	✓
Regulated Pathogens	99.99% (4-log) inactivation of viruses	✓	Regulated under SWTR	Regulated under SWTR
	99.9% (3-log) inactivation of *Giardia lamblia*	✓	Regulated under SWTR	Regulated under SWTR
	99% (2-log) removal of *Cryptosporidium* (through watershed control)		✓	✓
Residual Disinfectant Requirements	Entrance to distribution system (≥ 0.2 mg/L)	✓	Regulated under SWTR	Regulated under SWTR
	Detectable in the distribution system	✓	Regulated under SWTR	Regulated under SWTR
Unfiltered System Requirements	Avoidance Criteria	✓	✓	✓
Disinfection Profiling & Benchmarking	Systems must profile inactivation levels and generate benchmark, if required		✓	✓
Sanitary Surveys (state requirement)	CWS: Every 3 years NCWS: Every 5 years		✓	Regulated under IESWTR
Covered Finished Reservoirs/Water Storage Facilities (new construction only)			✓	✓
Operated by Qualified Personnel as Specified by State		✓	Regulated under SWTR	Regulated under SWTR

(CWS) Community Water System (NCWS) Non-community Water System

Disinfection

Disinfection must be sufficient to ensure that the total treatment process of the system achieves at least:

- 99.9% (3-log) inactivation of *Giardia lamblia*.
- 99.99% (4-log) inactivation of viruses.

Currently, *Cryptosporidium* must be controlled through the watershed control program and no inactivation credits are currently given for disinfection. Systems must also comply with the maximum residual disinfectant level (MRDL) requirements specified in the Stage 1 Disinfectants/Disinfection Byproducts Rule (Stage 1 DBPR).

Residual Disinfectant Monitoring and Reporting Requirements

Location	Concentration	Monitoring Frequency	Reporting (Reports due 10th of the following month)
Entry to distribution system.	Residual disinfectant concentration cannot be < 0.2 mg/L for more than 4 hours.	Continuous, but states may allow systems serving 3,300 or fewer persons to take grab samples from 1 to 4 times per day, depending on system size.	Lowest daily value for each day, the date and duration when residual disinfectant was < 0.2 mg/L, and when state was notified of events where residual disinfectant was < 0.2 mg/L.
Distribution system - same location as total coliform sample location(s).	Residual disinfectant concentration cannot be undetectable in greater than 5% of samples in a month, for any 2 consecutive months. Heterotrophic plate count (HPC) # 500/mL is deemed to have detectable residual disinfectant.	Same time as total coliform samples.	Number of residual disinfectant or HPC measurements taken in the month resulting in no more than 5% of the measurements as being undetectable in any 2 consecutive months.

System Reporting Requirements

Report to State:	What to report:
Within 10 days after the end of the month:	▸ Source water quality information (microbial quality and turbidity measurements). ▸ In addition to the disinfection information above, systems must report the daily residual disinfectant concentration(s) and disinfectant contact time(s) used for calculating the CT value(s).
By October 10 each year:	▸ Report compliance with all watershed control program requirements. ▸ Report on the on-site inspection unless conducted by state in which the state must provide the system a copy of the report.
Within 24 hours:	▸ Turbidity exceedances of 5 NTU and waterborne disease outbreaks.
As soon as possible but no later than the end of the next business day:	▸ Instance where the residual disinfectant level entering the distribution system was less than 0.2 mg/L.

Filtration Avoidance Criteria

Since December 30, 1991, systems must meet source water quality and site specific conditions to remain unfiltered. If any of the following criteria to avoid filtration are not met, systems must install filtration treatment within 18 months of the failure. The following table outlines the avoidance criteria established by the SWTR and later enhanced by the IESWTR and LT1ESWTR.

Filtration Avoidance Criteria

		Requirement	Frequency
SOURCE WATER QUALITY CONDITIONS	**Microbial Quality**	Monitor fecal coliform or total coliform density in representative samples of source water immediately prior to the first point of disinfectant application: ▸ **Fecal coliform density** concentrations must be ≤ 20/100 mL; **OR** ▸ **Total coliform density** concentrations must be ≤ 100/100 mL. Sample results must satisfy the criteria listed above in at least 90% of the measurements from previous 6 months.	1 to 5 samples per week depending on system size and every day the turbidity of the source water exceeds 1 NTU.
	Turbidity	Prior to the first point of disinfectant application, turbidity levels cannot exceed 5 NTU.	Performed on representative grab samples of source water every four hours (or more frequently).
SITE SPECIFIC CONDITIONS	**Systems must:**	Calculate total inactivation ratio daily and provide 3-log *Giardia lamblia* and 4-log virus inactivation daily (except any one day each month) in 11 of 12 previous months (on an ongoing basis).	Take daily measurements before or at the first customer at each residual disinfectant concentration sampling point: ▸ Temperature ▸ pH (if chlorine used) ▸ Disinfectant contact time (at peak hourly flow) ▸ Residual disinfectant concentration measurements (at peak hourly flow)
	System must comply with:	▸ MCL for total coliforms in 11 of 12 previous months (as per Total Coliform Rule). ▸ Stage 1 Disinfection Byproducts Rule requirements (as of January 1, 2002, for systems serving ≥ 10,000 or January 1, 2004, for systems serving < 10,000).	
	Systems must have:	▸ Adequate entry point residual disinfectant concentration (see disinfection requirements). ▸ Detectable residual disinfectant concentration in the distribution system (see disinfection requirements). ▸ Redundant disinfection components or automatic shut-off whenever residual disinfectant concentration < 0.2 mg/L. ▸ A watershed control program minimizing potential for contamination by *Giardia lamblia* cysts and viruses in source water; IESWTR and LT1ESWTR update this requirement by adding *Cryptosporidium* control measures. ▸ An annual on-site inspection by state or approved third party with reported findings. ▸ Not been identified as a source of a waterborne disease outbreak.	

Disinfection Profiling and Benchmarking Requirements

A **disinfection profile** is the graphical representation of a system's microbial inactivation over 12 consecutive months.

A **disinfection benchmark** is the lowest monthly average microbial inactivation value. The disinfection benchmark is used as a baseline of inactivation when considering changes in the disinfection process.

Disinfection Profiling and Benchmarking Requirements Under IESWTR & LT1ESWTR

The purpose of disinfection profiling and benchmarking is to allow systems and states to assess whether a change in disinfection practices creates a microbial risk. Systems should develop a disinfection profile that reflects *Giardia lamblia* inactivation (systems using ozone or chloramines must also calculate inactivation of viruses), calculate a benchmark (lowest monthly inactivation) based on the profile, and consult with the state prior to making a significant change to disinfection practices.

REQUIREMENT	IESWTR	LT1ESWTR
AFFECTED SYSTEMS:	Community, non-transient non-community, and transient systems.	Community and non-transient non-community systems only.
BEGIN PROFILING BY:	April 1, 2000	▸ July 1, 2003 for systems serving 500-9,999 people. ▸ January 1, 2004 for systems serving fewer than 500 people.
FREQUENCY & DURATION:	**Daily** monitoring for 12 consecutive calendar months to determine the total logs of *Giardia lamblia* inactivation (and viruses, if necessary) for each day in operation.	**Weekly** inactivation of *Giardia lamblia* (and viruses, if necessary), on the same calendar day each week over 12 consecutive months.
STATES MAY WAIVE DISINFECTION PROFILING REQUIREMENTS IF:	TTHM annual average <0.064 mg/L and HAA5 annual average <0.048 mg/L: ▸ Collected during the same period. ▸ Annual average is arithmetic average of the quarterly averages of four consecutive quarters of monitoring. ▸ At least 25% of samples at the maximum residence time in the distribution system. ▸ Remaining 75% of samples at representative locations in the distribution system.	One TTHM sample <0.064 mg/L and one HAA5 sample <0.048 mg/L: ▸ Collected during the month of warmest water temperature; **AND** ▸ At the maximum residence time in the distribution system. Samples must have been collected after January 1, 1998.
DISINFECTION BENCHMARK MUST BE CALCULATED IF:	Systems required to develop a disinfection profile and are considering any of the following: ▸ Changes to the point of disinfection. ▸ Changes to the disinfectant(s) used. ▸ Changes to the disinfection process. ▸ Any other modification identified by the state. Systems must consult the state prior to making any modifications to disinfection practices.	Same as IESWTR, and systems must obtain state approval prior to making any modifications to disinfection practices.

Office of Water (4606) EPA 816-F-04-001 www.epa.gov/safewater August 2004

VI. POTENTIAL SOURCES OF POLLUTION

Watershed Control Programs provides information on the potential sources of pollution in order to identify and control activities that may lead to the deterioration of the quality of a drinking water source (EPA 2003). General threats to source water quality are defined in federal and state regulations. Previous sanitary surveys have identified threats specific to the watersheds contributing to the purveyor's source water. Sources of pollution are identified through source water quality and land use monitoring.

This chapter is a summary of activities in the Lake Tahoe Basin, which are characterized in general, as potential sources of pollution by the U.S. Environmental Protection Agency, other regulatory agencies, previous sanitary surveys or by other means.

The popularity of Lake Tahoe as a recreation destination for 5+ million visitors a year creates unique potential impacts to water quality.

The TWSA Risk Assessment Models (2014/2008) and earlier studies for North Tahoe PUD conducted by Black & Veatch, analyzed the potential release of fecal coliform and other viral and bacteriological contaminants from swimmers on Tahoe North Shore beaches. The study indicated that intake location and water current patterns show minimal potential for contamination, but potential exists.

The Environmental Protection Agency defines general watershed characteristics and activities that are detrimental to drinking water quality as:

• Point sources of contamination such as wastewater (sewage) treatment plants, industrial discharges, barnyard feedlots, or private septic systems	• Animal populations specific to the discussion of Giardia contamination
• Effect of precipitation, terrain, soil types, and land cover	• Discharge to ground water which recharges the surface source
• Road construction	• Logging
• Pesticide usage	• Grazing animals
• Recreation activities	• Unauthorized activity in the watershed

Potential pollution sources in purveyors' watersheds have been identified in previous sanitary surveys including:

- Sewer system breaks/spills
- Recreation
- Trash disposal
- Changes in land ownership, zoning or land activities that affect water clarity
- Erosion, stream pollution, storm run-off, and urban run-off which contributes to the pathogenic contamination of source water
- Wildfire
- Wildlife

TRPA Water Quality (208) Plan

http://www.trpa.org/wp-content/uploads/Final-U.S.-EPA-Adopted-Lake-Tahoe-208-WQMP_2013.06.19.pdf

In June 2013, TRPA released the 208 Plan required for certain areas by the Federal Clean Water Act (section 208). These plans promote efficient and comprehensive programs for controlling water pollution in a defined geographic area. The Lake Tahoe 208 Plan was updated by TRPA on December 12, 2012, which initiated the need for parallel updates of the Plan by the states of Nevada and California and the U.S. Environmental Protection Agency.

The Lake Tahoe Water Quality Management Plan (also known as the 208 Plan or WQMP) is a framework that sets forth the components of the water quality management system in the Lake Tahoe Region, the desired water quality outcomes for the Tahoe Basin, and the mechanisms adopted by all the relevant entities to achieve and maintain those outcomes. The WQMP is organized to reflect the water quality management plan elements required by the U.S. Environmental Protection Agency's (U.S. EPA) regulations at 40 C.F.R. Section 130.6, which implements Sections 208 and 303(e) of the Clean Water Act, as well as the unique situation in the Lake Tahoe Region.

The following are excerpts:

CHAPTER 3: EFFLUENT LIMITATIONS

Effluent limitations are restrictions imposed on quantities, discharge rates, and concentrations of pollutants discharged into waters of the United States.[29] The CFR requires WQMPs to include water quality based effluent limitations as a plan element in accordance with CWA Section 303.[30]

3.1 NPDES PROGRAMS

Section 402 of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program to regulate discharges of pollutants into waters of the United States. An NPDES permit sets specific pollutant discharge limits, monitoring and reporting requirements, and other special conditions as appropriate. [31] The CWA allows the U.S. EPA to authorize state and other governments to implement the NPDES Program, including permit issuance and enforcement authorities. The U.S. EPA has oversight responsibilities and works closely with the authorized states and tribes on strategic planning, priority-setting and measurement of results.[32] Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to water quality in the United States.[33]

The States of California and Nevada are approved by the U.S. EPA to implement the NPDES Program in their respective states and their NPDES permits are subject to U.S. EPA review. The LRWCB administers the NPDES program for the California portion of the Lake Tahoe Region and the NDEP Bureau of Water Pollution Control administers it for the Nevada portion.

The NPDES program regulates both stormwater and non-storm discharges from point sources and issues stormwater permits for the following:

- Municipal Separate Storm Sewer Systems (MS4s) of certain sizes or as designated by the permitting authority;
- Industrial facilities in any of the 11 designated categories that discharge to an MS4 or to waters of the United States; and
- Construction activity that disturbs one or more acres of land or disturbs less than one acre but is part of a larger plan of development.[34] All eligible discharges must prepare and implement a Storm Water Pollution Prevention Plan (SWPPP) that includes a monitoring and reporting program. [35]

The following NDPES permits, which may be subject to change through the permit modification, reissuance and termination process, are currently either applicable state-wide or to the Lake Tahoe Region specifically:

California NPDES Permits

- The Lake Tahoe Municipal NPDES Permit for storm water/urban runoff discharges from El Dorado County, Placer County, and the City of South Lake Tahoe.[36]
- NPDES permit for stormwater discharges associated with construction activity in the Lake Tahoe Hydrologic Unit, Counties of Alpine, El Dorado, and Placer.[37] This permit regulates construction activities resulting in the disturbance of one or more acres of soil.
- Lake Tahoe NPDES Permit for Discharges of Storm Water Runoff Associated with Industrial Activities and Maintenance Dredging at Marinas.[38]
- NPDES for Discharges of Storm Water Associated With Industrial Activities, Excluding Construction Activities.[39]
- National Pollutant Discharge Elimination System Permit for Surface Water Disposal of Treated Ground Water[40]
- Statewide NPDES Permit for the California Department of Transportation.[41]
- NPDES General Permit for Discharges of Aquatic Pesticides to Waters of the U.S. for Vector Control[42]

Nevada NPDES Permits

- Statewide NPDES Stormwater General Permit associated with construction.[43]
- Statewide MS4 NPDES permit for the Nevada Department of Transportation[44]
- Statewide General Permit for Stormwater Discharges Associated with Industrial Activities[45]
- NPDES permit NV0023051 for the Stateline Stormwater Association. The association consisting of Mont Bleu (formerly Caesar's), Harrah's, Harvey's, Horizon, Wells Fargo Bank, Park Cattle Company, Douglas County, and the Nevada Department of Transportation for the purpose of constructing, operating, and maintaining the stormwater system.[46]

While NDEP maintains a General NPDES permit for Small Municipal Storm Sewer Systems (Small MS4s), they do not cover communities in the Lake Tahoe Region. As stated previously, the Lake Tahoe TMDL will be implemented through an agreement approach within these communities.

3.2 STATE 401 CERTIFICATION REQUIREMENTS

Under CWA Section 401, applicants for a federal license or permit for any activity which may result in a discharge to a water body under federal jurisdiction must obtain certification that the proposed activity will comply with state and federal water quality standards. The certification must be obtained from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over the affected waters at the point where the discharge would originate. States may grant a certification with conditions to ensure compliance with water quality standards; states may also waive or deny certification as appropriate.

Therefore, a federal permit, such as the CWA Section 404 permit issued by the Army Corps of Engineers that is further discussed in Chapter 7below, must comply with CWA Section 401.

LRWQCB administers the State Water Quality Certification process for proposed activities with the potential to discharge pollutants to California Lake Tahoe waters.[47]

NDEP administers the State Water Quality Certification process for proposed activities with the potential to discharge pollutants to Nevada Lake Tahoe waters.[48]

3.3 TRPA STANDARDS

The TRPA Regional Plan Water Quality Subelement includes goals and policies to reduce or eliminate point sources of pollutants. The TRPA Code of Ordinance Chapter 60 outlines concentration-based stormwater effluent limits that apply to all stormwater discharges.[49] A discharge occurs when a project cannot meet TRPA infiltration requirements for stormwater treatment, which are discussed in Chapter 5 below.

TRPA's concentration-based standards are not directly comparable with the more contemporary particle number- and mass-based standards used to assess water quality compliance with the TMDL. They are based on two different approaches to measuring water quality. Hence, when a TMDL load reduction plan and program is in place for a catchment, the TMDL plan and program supersede the TRPA requirements. Where a TMDL load reduction plan and program are not in place, the TRPA concentration-based standards remain in effect. For project review and conformance review of area plans, TRPA will utilize the pollutant load reduction plan standards for TMDL registered catchments or TRPA default standards for projects and activities outside of registered catchments.

Sewer Systems and Wastewater Treatment

Wastewater treatment is a major area of concern for water quality. In 1966, a significant control action (Porter-Cologne Act) took place to protect the pristine quality of Lake Tahoe when Nevada and California acted to prohibit the discharge of treated wastewater effluent into the lake. Treatment plants were retrofitted with export pipelines and pump stations to transport the effluent out of the basin. Sewage systems were expanded to export untreated wastewater to the Town of Truckee, California, for treatment and disposal for the north and west shores. In 1971, both states prohibited septic tanks and required that all sewage generators be connected to an existing sewage system.
In Nevada, these programs are administered by the Lahontan Regional Water Quality Control Board (LRWQCB) and the Nevada Department of Environmental Protection (NDEP).

All treatment and collection facilities participate in local and county spill notification programs.

The Lake Tahoe Wastewater Treatment Infrastructure Partnership (LTWIP) was formed in 2007, as an association of local agencies providing wastewater services. Group activities are referenced in detail in later sections of this report.

CHAPTER 4: MUNICIPAL AND INDUSTRIAL WASTE TREATMENT

The CFR requires WQMPs to identify municipal and industrial waste treatment operations in accordance with Section 208 of the CWA.[50]

California prohibited the discharge of treated wastewater into Lake Tahoe through enactment of the Porter-Cologne Act, and Nevada did the same through the Executive Order by the Governor of Nevada dated January 27, 1971.[51] Both states prohibited septic tanks and required that all sewage generators be connected to an existing sewage system.[52]

The TRPA Regional Plan Public Services and Facilities Element includes goals and policies that provide for adequate level of public services while the Water Quality Subelement includes provisions that protect Lake Tahoe's water quality.

The TRPA Code of Ordinances Chapter 60 – Water Quality prohibits the discharge of domestic, municipal, or industrial wastewater to Lake Tahoe and its tributaries.[53] Chapter 32 of the Code of Ordinances includes wastewater service requirements for projects proposing construction of a new structure or reconstruction or expansion of an existing structure.[54]

The TRPA BMP Handbook includes technical guidance on best practices for waste management and material pollution prevention.[55]

4.1 LARGE UTILITIES, PUBLIC UTILITY DISTRICTS AND GENERAL IMPROVEMENT DISTRICTS

Wastewater treatment in the Tahoe Region is provided by public utility districts (PUDs) and general improvement districts (GIDs). Districts are bound by service areas and directed through boards created by local governments.

On the California side of the Region, PUDs may acquire, construct, own, complete, use, and operate a variety of services, including water, electricity, recreational facilities, drainage facilities, street lighting, and fire protection. The following Public Utility Districts operate various wastewater collection and treatment operations in the California portion of the Lake Tahoe Region in accordance with federal, state and regional law:

North Tahoe Public Utility District (NTPUD) provides sewer services to the residents of the north shore of Lake Tahoe. The District's boundary ranges from the Nevada state line in Crystal Bay to Dollar Hill in California and includes the communities of Kings Beach, Tahoe Vista, Brockway Vista, Carnelian Bay, Cedar Flat and Agate Bay.[56]

South Tahoe Public Utility District provides sewage collection, treatment, and export to protect Tahoe's delicate ecosystem for portions of El Dorado County within the Tahoe Region.[57]

Tahoe City Public Utility District (TCPUD) provides sewer services for a 31 square mile area within both Placer and El Dorado Counties, extending from Emerald Bay to Dollar Hill, and along the Truckee River to the Nevada County line.[58]

In Nevada, maintenance of public facilities including sewers within private developments is the responsibility of the property owners within the development. Under the authority of NRS, a county may establish a General Improvement District (GID) for this purpose.[59] Nevada GIDs oversee the development, maintenance, and use of public facilities such as water and sewer systems, streets and sidewalks, and parks and open space.[60] The following GIDs operate various wastewater collection and treatment operations in the Nevada portion of the Lake Tahoe Region in accordance with federal, state and regional law:

Cave Rock Estates GID serves approximately 80 properties in Douglas County adjacent to Lake Tahoe Cave Rock formation.[61]

Douglas County Sewer Improvement District operates a sewer treatment facility for portions of Douglas County within the Lake Tahoe Region.[62]

Kingsbury General Improvement District (KGID) provides sewer collection services to Stateline Nevada residences off of State Route 207 or Kingsbury Grade.[63]

Incline Village General Improvement District (IVGID) is responsible for processing and removing sewage and wastewater for communities of Incline Village and Crystal Bay, Nevada.[64]

Lakeridge GID[65] and Logan Creek Estates GID[66] serve portions of Douglas County.

Marla Bay GID serves residents of Marla Bay, Nevada.[67]

Oliver Park GID serves a portion of Douglas County, Nevada off of Kahle Drive.[68]

Round Hill General Improvement District provides wastewater collection service to 470 private residential customers and 50 commercial customers in Zephyr Cove, Nevada.[69]

Zephyr Heights GID[70], Zephyr Cove GID[71] and Zephyr Knolls GID[72] serve portions of Douglas County.

Treatment plants of four local districts (Tahoe-Truckee Sanitation Agency, IVGID, Douglas County Sewer Improvement District #1, and STPUD) are retrofitted with export pipelines and pump stations to transport treated effluent out of the Region.[73] Since

1968, all wastewater in the Tahoe Region is pumped from treatment plants out of the Region to avoid discharge into the Lake.[74]

LOCAL SOLID WASTE COLLECTION AND DISPOSAL

South Tahoe Refuse (STR) provides refuse and recycling service within the City of South Lake Tahoe, the unincorporated El Dorado County areas and the Tahoe Township area of Douglas County.[75] STR collects more than 100,000 tons of waste each year. This waste is collected and sorted for recycling at the South Tahoe Refuse Materials Recovery Facility (MRF) located at STR's transfer station in South Lake Tahoe, California. The MRF initiates or improves separation of aluminum cans, glass, plastics, cardboard, different grades of paper, tin, metals, appliances, milled wood, green waste, stumps, construction debris (concrete, asphalt), and tires.[76]

Incline Village General Improvement District (IVGID) with Waste Management, Tahoe Truckee Sierra Disposal (TTSD)[77], and the WASTE NOT program provides trash and recycling services for communities of Incline Village and Crystal Bay, Nevada.[78]

The Tahoe-Truckee Sierra Disposal Company, Inc. (TTSD) provides waste removal services for the Lake Tahoe Region from Emerald Bay to Crystal Bay. The company handles approximately 63,000 tons of solid waste per year. All materials collected by TTSD, including garbage and recyclables, are hauled to the Eastern Regional Materials Recovery Facility (MRF), located between Truckee and Squaw Valley in Placer County, where they are sorted in an effort to meet California's mandatory solid waste diversion requirements. The MRF, which was built in 1994–1995, handles household recyclables, including plastics, aluminum, tin, glass, cardboard, newspaper, carpet, and computers. Also, the facility recycles "white goods," such as refrigerators and freezers, and waste wood, which includes dimensional wood (e.g., construction remnants) and lot clearing debris. Material that is not recyclable is treated as solid waste and taken to the Western Regional Sanitary Landfill in Roseville or to the Lockwood landfill in Nevada.[79]

Trash or Hazardous Waste Spills

No trash or hazardous waste spills from solid waste collection or transportation companies have been reported to the EPA during the past year (EPA 2013). All solid waste is collected and transferred out of the basin.

There are no active landfill sites within TWSA member boundaries or the Tahoe Basin.

Household Hazardous Waste (HHW) collection sites and collection days are located throughout the basin, in order to provide an easy way for homeowners to drop off small quantities of home-generated wastes, potentially harmful to water quality if disposed on improperly. HHW Sites are maintained at Incline Village GID (NV), Tahoe Douglas Fire Protection District (NV) and the Cabin Creek and South Tahoe Refuse Transfer Stations (CA). These programs offer a valuable service to water quality protection, by offering services for proper disposal of toxic substances. The IVGID site handles approximately 50 tons of combined HHW/electronic waste materials annually.

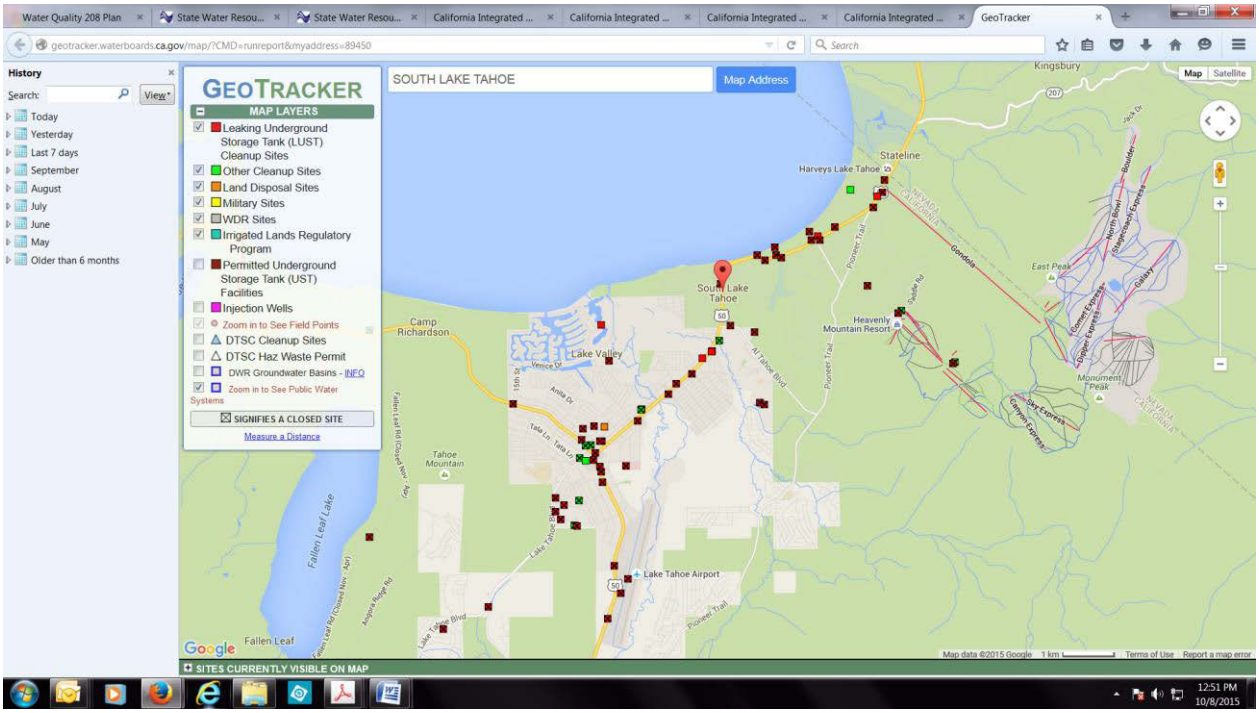
Spill Incidents for the Reporting Year
The following information is compiled annually from the Nevada Division of Environmental Protection Spill Reporting Program and the Lahontan Regional Water Quality Control Board records. The list includes incidents occurring on the Nevada and California sides of the lake. The list is not comprehensive to include all incidents.

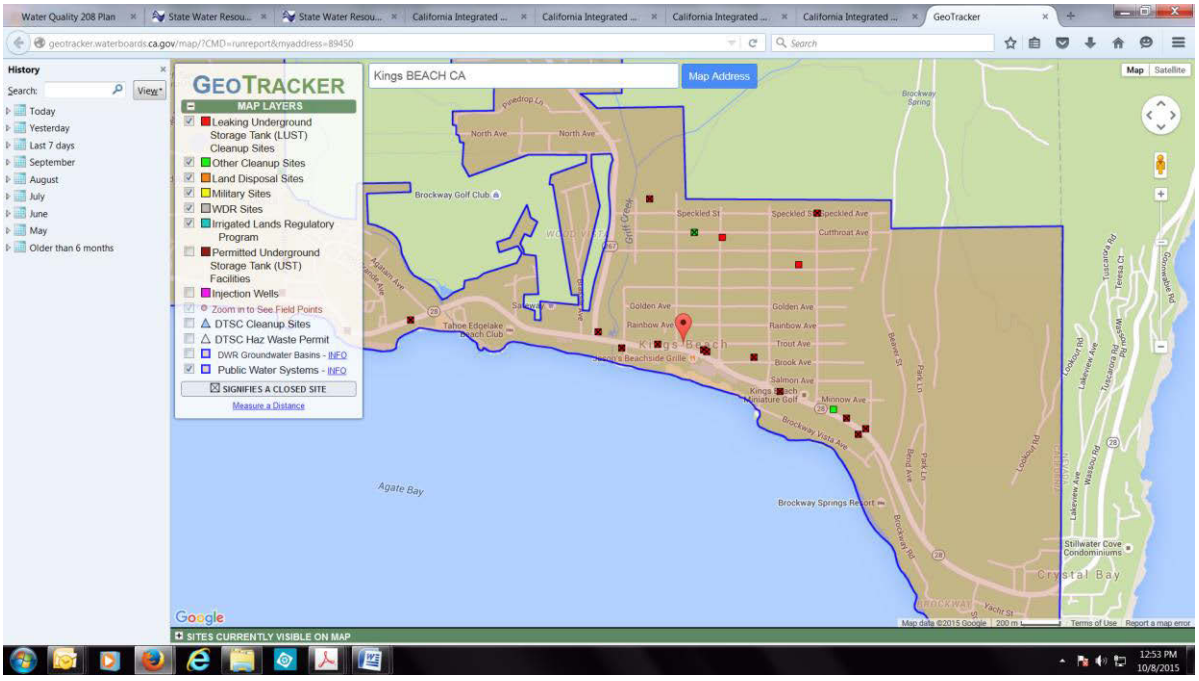
In California, there are new resources available to track hazardous waste spills, including an annual state-wide sanitary sewer overflow compliance report:
http://www.waterboards.ca.gov/water_issues/programs/sso/docs/compliance_report_fy1314.pdf

Sanitary Sewer spills are reported via the California Water Board Web Portal:
http://www.waterboards.ca.gov/water_issues/programs/ciwqs/publicreports.shtml#sso
This portal focuses on sanitary sewer overflow reports. The reports are logged on an interactive map by discharge type.

Discharge Types:
Category 1: Discharges of untreated or partially treated wastewater of **any volume** resulting from an enrollee sanitary sewer system failure or flow condition that:
Reach surface water and/or reach a drainage channel tributary to a surface water; or
Reach a municipal separate storm sewer system and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly.
Any volume of wastewater not recovered from the municipal separate storm sewer system is considered to have reached surface water unless the storm drain system discharges to a dedicated storm water or ground water infiltration basin (e.g., infiltration pit, percolation pond).
Category 2: Discharges of untreated or partially treated wastewater of **1,000 gallons or greater** resulting from an enrollee sanitary sewer system failure or flow condition that **do not** reach surface water, a drainage channel, or a municipal separate storm sewer system unless the entire SSO discharged to the storm drain system is fully recovered and disposed of properly.
Category 3: Any discharge of sewage of less than 1000 gallons that does not reach surface water or a drainage channel.

In addition, the CA Water Board operates an extensive, interactive database on former and current hazardous waste sites using at:
http://geotracker.waterboards.ca.gov/map/?CMD=runreport&myaddress=89450





2017-18 Nevada Tahoe area spill report compiled by NDEP staff. Source: Rebecca Bodnar (Rebecca.bodnar@ndep.nv.gov)
For zipcodes: 89448, 89449, 89413, 89402, 89450, 89451

Tahoe Area Spills reported to the NDEP Spill Hotline (07/01/17 to 6/30/18)

INC_DATE	Rep Agency	City	County	Amt.	Media	Cause	Action
7/5/2017	Tahoe Douglas District	Glenbrook	Douglas County	20 gallons		Rags in sewer line hung up on roots in the line causing overflow-about 20 gallons surfaced at the manhole common area of the townhomes. Overflow was confined to grass around the manhole and did not flow away, spill did not reach storm sewer or lake.	TDD crew were onsite shortly after the report and unclogged and TV'd the line to ensure it was clear. HDH placed on affected grass/soil around the manhole.
7/21/2017	USCG - Station Lake Tahoe	Incline Village	Washoe County	Unknown		From NRC Incident Report #1184803, minimal information. A vessel that sank on it's mooring ball discharged gasoline into Lake Tahoe. Amount of discharged gasoline and responsible party unknown at this point.	Booms are being deployed. Commercial salvage is en route to refloat and a trailer is standing by to pull the boat out of the water.
8/5/2017	Cruise Tahoe	Zephyr Cove	Douglas County	Unknown		Caller reported seeing an oil sheen from a catamaran called "Gone Again". Allegedly blown engine (unconfirmed). Sheen is 20 by 10 feet.	None.
8/10/2017	Kingsbury GID	Stateline	Douglas County	100,000 gallons		At this location of the water line, the pipe is comprised of old steel - likely pipe fatigue caused rupture. Surfaced to pavement and flowed to storm drain, likely got to Lake Tahoe. Highway 50 closed briefly due to the water.	Shut down water within 25 minutes of call reporting the breakage. Currently contemplating options, may relocate the line entirely if it makes more sense than repairing the old line.
9/3/2017	Tahoe Douglas Sanitary District	Glenbrook	Douglas County	Undeter mined		Water is flowing behind the sewer lift station off access from Glenbrook Road. Reporter states that he works for the Tahoe Douglas Sewer District and he was directed by his supervisor to investigate potential sewer leak.(Continued Remedial Action below)	TDSD representative states he determined it was not sanitary sewer. He describes the water as 3" to 4" wide flowing towards the lake. Called back to add that TDSD personnel suspect it's irrigation H2O.(Continued in Comments section below)
9/6/2017	DCSID		Eureka County	50,000-100,000 gallons		There was a blowout in the pipeline at the location, 38°58'43"N and 119°54'40"W.	Robert Hopkins-DICSD, Manager, stated the pipeline was shut off immediately at 9:00 am. The hole allowed 50,000-100,000 gallons of treated wastewater effluent to travel downhill hill on USFS property. DICSD was able to contain the spill at Stateline, NV.
10/26/2017	Kingsbury GID	Stateline	Douglas County	250 - 300 gallons		Blockage in sewer main - discovered spill at 0930.	Contacted sewer contractor immediately. Contractor had flow from blockage stopped at 1020 and blockage

							cleared at 1145.
11/4/2017	Kingsbury GID	Stateline	Douglas County	Approximately 30 gallons		Backup, clogged lateral caused sewage to exit cleanout onto lawn.	Joe called Summit Plumbing to come and clear the blockage.
10/28/2017	Kingsbury GID	Stateline	Douglas County	900 gallons		Same MH that had reported spill on 10/26/17. Blockage in sewer main found to be an article of clothing. KGID answering service notified at 11:25 am.	Contractor called and on scene nearly immediately at 12:29 pm. Blockage cleared at 1 pm. Contractor inspected the line with a camera and found a sag in an old repair. Affected area disinfected with sodium hypochlorite.
1/21/2018	Tahoe Douglas District	Logan Creek Estates	Douglas County	1 gallon	Pavement	Blockage, overflow manhole.	Remove rootball, less than a gallon of sewage seeped out. Vactor Truck.
1/5/2018	Kingsbury GID	Stateline	Douglas County	255 Gallons	Surface Water including Storm Drains, Pavement	Blockage in main caused manhole #N24-1 to overflow into a storm drain.	Vacuum truck contained flow and removed sewage from storm drain. Approximately 25,000 gallons of chlorinated potable water was used to flush the area and storm drain. Leak reported at 0825, leak contained at 0916.
3/9/2018	DCSID	Kings bury GID	Douglas County	1500 gallons	Pavement	Pin hole leak on treated effluent force main	Contained and recovered. Repair patch completed by noon on March 10
4/26/2018	Incline Village GID, Public Works	Incline Village	Washoe County	50 gallons	Soil	Sanitary sewer overflow occurred most likely overnight and was reported at 2:30 pm today. Cause appears to be a high wet well in the sewer pump station. Release of overflow went to surrounding sand.	Affected sand was removed. Area was disinfected with HPH. Native material was replaced in the excavation.
5/5/2018	I.V.G.I.D	Incline Village	Washoe County	50 gal	Pavement	Sanitary sewer was overwhelmed by above ground infiltration from a water main break no cross connction between the two other than water running above ground to a MH connected to the SS sewer system.	Vacumed out storm interceptors and washed down street. Disinfected storm drains and interceptors with HTH. No waterways were efected.ins and washed down pavement. treaed contaminated drains with HTH .

5/26/2018	North Lake Tahoe Fire Protection District	Incline Village	Washoe County	200 gallons	Surface Water including Storm Drains, Pavement	Vehicle fire on State Route 28. 200 gallons of water and foam were used to extinguish the fire and ran into storm drain.	Booms were not deployed. Fire Department indicated no fuel released into the storm drain and inspection of outfall in Lake Tahoe showed the foam was dispersed in the water and could not be captured.
6/4/2018	Tahoe Regional Planning Agency	Stateline	Douglas County		Surface Water including Storm Drains, Pavement	TRPA staff issued a cease & desist (verbal) to Danny Olsen. TRPA staff witnessed truck operator washing out a paving truck with a water hose to wash debris off of a jammed auger screw. The hose had been on for about 30 min. when it was turned off. Asphalt, sealcoat and other debris ran off the site and allegedly discharged into the storm drain.	
6/5/2018	I.V.G.I.D	Incline Village	Carson City County	50 gal	Soil		Cleared blockage in sewer line with hydroflushing equipment.

Media Release

Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Boulevard, South Lake Tahoe, California 96150
Phone (530) 542-5400 □ Fax (530) 544-2271
http://www.waterboards.ca.gov/lahontan

Lahontan Water Board Issues Cleanup Order for Dry Cleaning Chemical at Lake Tahoe Laundry Works Site

FOR IMMEDIATE RELEASE
May 12, 2017

Contact: Patty Kouyoumdjian
Phone: (530) 542-5412

SOUTH LAKE TAHOE, Calif. – Today the Lahontan Regional Water Quality Control Board issued a Cleanup and Abatement Order to the responsible parties of the Lake Tahoe Laundry Works site to identify and clean up a tetrachloroethylene (PCE) plume that has contaminated groundwater sources in the community of South Lake Tahoe.

The Lahontan Water Board issued the order in response to PCE impacting drinking water wells for two public water systems in the South Lake Tahoe area. The pollutant, commonly used in dry cleaning operations, is a regulated contaminant in drinking water that can cause adverse health effects, including an increased risk for cancer after long-term exposure.

"Protecting Lake Tahoe's pristine drinking water supplies is a top priority for the Lahontan Water Board," said Water Board Executive Director Patty Kouyoumdjian. "So understanding the full extent of this PCE plume is a big step in making sure this chemical doesn't contaminate more drinking water sources, and that cleanup is done in a timely manner by the responsible parties."

A laundry facility from the 1970s until 2011, the Lake Tahoe Laundry Works site, located at 1024 Lake Tahoe Blvd., likely spilled the PCE during delivery of the chemical. The responsible parties for the site, which is once again home to a laundromat, are Seven Springs Limited Partnership, Fox Capital Management Corporation, Bobby Pages, Inc., and Connolly Development.

Lahontan Water Board staff believe the PCE plume emanating from the site is not fully defined, and it is unknown if all the contamination is from the Lake Tahoe Laundry Works site, or other responsible parties. Because of this, the Lahontan Water Board issued its order to require the Laundry Works' responsible parties to investigate and determine the complete extent of the PCE groundwater contamination and to cleanup and abate its effects.

For more information on the order see the Lahontan Water Board webpage.

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URS Corporation Americas reported five of 42 water samples taken in a nine-block area of the South Shore showed concentrations of tetrachloroethylene, or PCE, at levels less than what is legally allowed in drinking water by the U.S. Environmental Protection Agency. The remaining samples contained PCE in concentrations less than the reporting limit for public drinking water systems, according to the report. The site investigated by URS is bounded by 11th Street to the northwest, Roger Avenue to the south-southwest, Patricia Lane to the northeast and 5th Street to the southeast.

"We expected to find widespread PCE all over that area, and we didn't," said Lisa Dernbach, a senior engineering geologist for the Lahontan Regional Water Quality Control Board.

PCE is normally associated with dry cleaning, but can also be used for metal degreasing and is an ingredient in paint strippers. The compound is classified as a probable carcinogen that has the potential to increase the risk of cancer after consumption over many years, potentially depress the central nervous system and increase the risk of Parkinson's disease, according to a statement from the Lahontan Water Board.

Businesses that use or may have used PCE have been researched by Lahontan. In its report, URS recommended additional sampling to further investigate possible sources of PCE. It's possible the PCE contaminating wells in the area is deeper in the ground than what was sampled during the URS investigation, Dernbach said. The Water Board expects to request funding for additional testing from the California State Water Resources Board, although that funding is still subject to approval.

The two municipal wells where PCE contamination was discovered in 2014 are located within the Lukins Brothers Water Company. Both wells have been offline since July 2014. The water company is working with the state on funding the construction of a granulated activated carbon system to treat contamination in the wells, said Lukins spokeswoman Jennifer Lukins in an email. The system would be very similar to a plant installed in the Tahoe Keys, she added.

"Pending the release of State funding, we hope to have the system constructed during 2016 and in operation as soon as we have met all testing requirements from the Department of Water Resources," Lukins said. How the treatment plant could impact rates for Lukins customers isn't known and will depend on what grants and loans are used to pay for the treatment facility. "We, of course, aim to minimize the burden to the customers as much as possible," Lukins said.

The water company will remain connected to South Tahoe Public Utility District to provide supplemental water supply, Lukins added.

2018 PCE Plume Update of 9/25/2018

STPUD update on the PCE groundwater contamination in South Lake Tahoe:

72% of the water supply in South Lake Tahoe is under threat from PCE contamination (see map). Immediate steps are necessary to protect South Lake Tahoe's drinking water supply. While Lahontan Regional Water Quality Control Board (Lahontan) is working to hold the polluters accountable, the water suppliers are taking a parallel track to protect South Lake Tahoe's community water supply from further contamination. In August /Sept., the South Lake Tahoe water suppliers (South Tahoe Public Utility District, Lukins Brothers Water Company and Tahoe Keys Water Company) have met with Lahontan staff, State Water Resources Control Board staff and presented during the public comment period at the Lahontan Board meeting on September 13, 2018 on the immediate steps necessary to protect South Tahoe's drinking water supply.

As of August 2018, the following progress has been made:

1. The State Water Board Division of Financial Assistance is moving forward with processing Lukins Brothers Water Company application to install granular activated carbon (GAC) treatment to restore 750 gpm of lost water supply.

2. The State Water Board Division of Drinking Water requested South Lake Tahoe water suppliers develop an Emergency Response Plan to address the possible use of impaired sources for emergency response. A multi-agency Emergency Response Plan was identified as a priority by the water suppliers to ensure the continued availability of potable water. The water suppliers are applying for a planning grant through the Division of Financial Assistance to develop this plan. The Division of Drinking Water will help fast track the application.

3. Lahontan received SB445 funding to start a groundwater contaminant investigation (spring 2019) which would involve: regional plume delineation; installation of sentinel wells to monitor contaminant movement; and contaminant source area identification.

Lahontan staff and the water suppliers plan to meet monthly to identify next steps and secure additional funds to address the PCE groundwater contamination. Lahontan plans to work with the water suppliers to host quarterly public meetings to keep the public up to date on the PCE groundwater contamination clean-up process. Thank you to Senator Ted Gaines office, Tahoe Resource Conservation District and Tahoe Regional Planning Agency for attending the Lahontan Board meeting to show your support on this issue and to Assemblyman Frank Bigelow's office for contacting Lahontan and the State Water Board on the status of pending grant applications.

Map Courtesy of South Tahoe PUD 9/25/18

South Lake Tahoe PCE Groundwater Contamination

ISSUE:
• 72% of the water supply in South Lake Tahoe is under threat from PCE contamination
• Immediate steps are necessary to protect South Lake Tahoe's drinking water supply
• The community of South Lake Tahoe should not bear the cost to clean up the groundwater contamination caused by the polluters. Simply consolidating the three water companies does not solve the PCE contamination issue.

REQUEST:
1. The water suppliers of South Lake Tahoe request from Lahontan Regional Water Quality Control Board a written commitment of resources with a timeline to accomplish the needs and actions identified below.
2. Funding assistance that does not require matching funds from the local community.

Listed below are immediate and interim actions that must be taken to address the PCE contamination. Please note that these items are not intended to, and do not represent the full extent of the impact of the ongoing PCE contamination and the resulting harm to South Lake Tahoe's water supply. In addition, these measuresare not listed in order of priority, but with the understanding that limited funds might be available to address the PCE contamination in the South Lake Tahoe region. These measures do not represent a comprehensive list of South Lake Tahoe water suppliers' damages for past and current contamination and this list could change depending on the current state of contamination affecting the community's water supply.

IMMEDIATE PLANNING NEEDS:
1. Fund multi-agency Emergency Response Plan ~$50,000
2. Multi-agency water system modeling to identify system deficiencies, including waterline improvements for adequate emergency supply ~$100,000
3. Approve Lukins Brothers Water Company (LBWC) application to install granular activated carbon (GAC) treatment for LBWC 5 well to restore 750 gpm of lost water supply $1,7500,000
4. Well siting plan for a replacement well for Tahoe Keys Water Company (TKWC) ~$120,000
5. Approve LBWC's application for Source Replacement Feasibility Study $1,500,000
6. Replacement water costs for TKWC and LBWC when forced to purchase wholesale water from South Tahoe Public Utility District (STPUD).

IMMEDIATE ACTIONS:
1. TKWC 1 well piping modification to be able to hook-up to a portable GAC unit for when the PCE contamination exceeds the MCL ~$120,000
2. Well destruction for LBWC 2 well and LBWC 4 well to remove possible contaminant pathways ~$100,000
3. Site, permit, design and construct 3 sentinel wells to monitor movement of PCE contamination toward existing public water sources ~$100,000 per well
4. Zone testing for TKWC 2 well to determine the extent of contamination at differing elevations at the well ~$75,000
5. Test hole for possible replacement water supply well at Colorado Court ~$150,000

INTERIM ACTIONS:
1. Conduct long term pilot test using existing shallow extraction wells to remove PCE from groundwater
2. Water line improvements to STPUD main distribution system to be able to provide adequate emergency water supply
3. Provide replacement water sources including well head treatment and new wells for LBWC and TKWC to replace water supply already lost to PCE contamination

LONG TERM ACTIONS:
1. Operational and maintenance costs for PCE treatment facilities

South Lake Tahoe PCE Groundwater Contamination

BACKGROUND:
• South Lake Tahoe water suppliers (South Tahoe Public Utility District, Lukins Brothers Water Company, and Tahoe Keys Water Company) rely wholly on groundwater.
• In 1989, PCE was discovered in groundwater. PCE is a manmade chemical used from the 1960s to 1980s as a solvent for dry cleaning clothes and degreasing metal. Federal and State agencies listed PCE as a carcinogen and toxic pollutant in 1980s.
• The PCE plume continues to grow from its original location at a dry-cleaning business located at the intersection of Highways 50 and 89. As of March 2018, groundwater monitoring documented the plume at approximately 400 acres.
• In the decades since PCE was discovered, the plume has contaminated 7 wells. STPUD and TKWC have installed treatment systems. LBWC stopped using impacted wells and is temporarily supplementing the lost capacity with water purchased from STPUD. LBWC is in the process of installing a treatment facility at one of its impacted well sites.
• The impact of the plume poses a serious human health threat. Rate payers have already paid to study, monitor, and mitigate some of the contamination.
• The financial burden of studying, monitoring, and cleaning up the pollution should fall on the polluters, not the community of South Lake Tahoe.
• Holding the polluters accountable is important, but must be done in parallel with protecting South Lake Tahoe's community water supply from further contamination.
• For more info on South Lake Tahoe's groundwater go to www.stpud.us/groundwater

Shorezone Recreation and Boating Activity
As one of its strategic initiatives, the Tahoe Regional Planning Agency worked with community members and stakeholders to update its shoreline policies and regulations. Significant changes to regulations, enforcement and monitoring on the impacts of watercraft recreation, both on the water and associated land developments/structures, are proposed.

The shoreline of Lake Tahoe is of both local and national significance. The 72 miles of Lake Tahoe's shoreline offers a diversity of views that range from sandy beaches to isolated coves, rocky shorelines, and steep cliffs. While Lake Tahoe's clarity goals, measured near the center of the lake, are of utmost importance, the shoreline is where most locals and visitors interact with Tahoe's blue waters.

Lake Tahoe Shoreline Plan
http://shorelineplan.org/

Adoption of the Shoreline Plan occurred Oct. 24, 2018. by the TRPA Governing Board.

Since 2015, the Tahoe Regional Planning Agency (TRPA), along with critical stakeholder partners, has developed the Shoreline Plan to develop guidelines for appropriate uses along the shore of Lake Tahoe. This Shoreline planning initiative will update the shorezone element goals and policies in TRPA's Regional Plan and the shorezone chapters in the TRPA Code of Ordinances.

The overarching goal of the Shoreline Plan is to enhance the recreational experience along Lake Tahoe's shores while protecting the environment and responsibly planning for the future. Docmunts are posted at the website *http://shorelineplan.org/* .

Environmental documents were prepared in 2017. See *http://shorelineplan.org/wp-content/uploads/2017/09/Shoreline-EIS-Scoping-Summary-Report_Sept.2017.pdf*

Key policy issues that the plan will address:

- Recreational Access
- Marinas and Boating
- Environmental Effects of Access
- Recreational Facilities
- Low Lake Levels
- Streamlining the Approval Process
- Public and Private Access to the Lake

TWSA is providing comment in this process. Comments were submitted on water quality concerns. A request was submitted in 2016/17/18 for expansion of the zone of protection (requiring notification to water providers) around intakes from the current 600 ft. buffer to 1,320 ft. This larger zone of protection is now incorporated (partly by ordinance, partly by review process) in new regulatory language, pending approval.

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
Incline Village, Nevada 89451
775-832-1212

TWSA Members:
Cave Rock Water System
Edgewood Water Company
Glenbrook Water Cooperative
Incline Village GID
Kingsbury GID
Lakeside Park Association
North Tahoe PUD
Round Hill GID
Skyland Water Company
South Tahoe PUD
Tahoe City PUD
Zephyr Water Utility

July 2, 2018

Ms. Rebecca Cremeen
Shoreline Plan EIS Comments
Tahoe Regional Planning Agency (TRPA)
PO Box 5310
Stateline, NV 89449

Thank you for taking the time to meet with Tahoe Water Suppliers Association (TWSA) staff on 6/26/18 to discuss the water provider concerns regarding the proposed Shoreline Plan. As was discussed, the TWSA Board supports the formal codification of a '¼ mile requirement of notification' in the Shoreline Plan for *all shoreline structures*, for protection of drinking water infrastructure. Our organization's #1 priority is the protection of the public drinking water sources located here at Lake Tahoe.

On behalf of the Tahoe Water Suppliers Association Board (TWSA), we would like to submit two specific comments, and two general comments, regarding the proposed Shoreline Plan Code of Ordinance language.

The TWSA Board is in support of Alternative 1, *pending adoption of the following language revisions*:

Section 84.4.3:

1) We request that the word "pier" be replaced by "shoreline structure", to read as follows:

Development Standards: "For an additional ~~pier~~ "shoreline structure" located within ¼ mile of a public drinking water intake, TRPA shall notify and consult with the appropriate water provider(s) as part of the application process."

This suggested language revision would clarify Section 84.4.3 to match the definition in Section 50.11. (Section 50.11 - Allocation of Shorezone Structures:
"Structures in the shorezone and lakezone shall be allocated pursuant to applicable provisions in Chapter 84, Development Standards in the Shorezone and Lakezone. The following subsections address allocation of shorezone structures: 84.3 Mooring Structures / 84.4.Piers")

2) Add the suggested language below to Section 84.3.2.E.7 (page 84-4)
(84.3 Mooring Structures, 2. General Standards, E. Allocation, and Permitting:
Add: 7.) "For additional structures located within 1/4 mile of a public drinking water intake, TRPA shall notify and consult with the appropriate water purveyor(s) as part of the application process."

The comments below outline the reasoning behind the requested language changes.

- All structures have potential impact to drinking water supply infrastructure. There have been multiple instances where buoy blocks and anchor lines have been moved by littoral drift, and/or deliberate human alteration. This has placed boats very close to municipal water intakes. Some intakes here at Lake Tahoe have suffered damage from these actions. Boats have sunk close to, and on top of, active intake lines. Having a greater ability to consult with TRPA, and TRPA enhanced enforcement regarding mooring placements, would provide greater protection to the water supply.

- The EIS summarizes the intent for consultation within ¼ mile for "any proposed shoreline structure", and the potential for impacts to water supply, in the EIS Summary section 15.3, excerpt below.

Table ES-1 Summary of Impacts and Mitigation Measures

Impacts	Significance without Mitigation	Mitigation Measures	Significance with Mitigation
B = Beneficial NI = No impact LTS = Less than significant PS = Potentially significant S = Significant SU = Significant and unavoidable			
not result in adverse effects. Specific projects implemented in accordance to the adopted Shoreline Plan would be subject to permit processes and conditions pursuant to TRPA regulations and, depending upon location and whether or not there is federal discretion, CEQA and NEPA statutes and implementing regulations. Such review could include site-specific impact analysis and adoption of feasible mitigation measures that must be implemented to assure that standards of the region are met.			
With the addition of access points to the lake and the increase in navigational hazards in the form of longer piers and additional structures in the water, the Shoreline Plan alternatives could result in a long-term increase in the risk of accidental discharge of fuel and other hazardous materials into the lake. Alternative 1 would require that TRPA consult with water purveyors when evaluating applications and development of permit conditions for any proposed shoreline structure within one quarter mile of a drinking water intake, while Alternatives 2, 3 and 4 would require consultation within 600 feet. Furthermore, as described in Chapter 6, "Hydrology and Water Quality," Impact 6-4, given the rapid rate of biodegradation of hydrocarbon compounds, the non-toxic levels monitored on the lake, and current TRPA regulations pertaining to control of discharges of contaminants from boating facilities using best management practices (BMPs).			

Background: On March 22, 2017, RPIC endorsed a set of policies (see page 131 of the Governing Board packet available at: http://www.trpa.org/wp-content/uploads/March-22-2017-Governing-Board-Packet.pdf) that included the following language: "Public drinking water intakes: within ¼ mile of water intakes, water purveyors will be notified and consulted on project conditions." *(source: Brandy McMahon, bmcmahon@trpa.org, correspondence)*

TWSA Comment summary:

Tahoe Water Suppliers Association	Concerned with zone of protection for water supply intakes. Suggests using Marina Best Management Practices to control debris, oil and AIS fragments, such as trash skimmer and/or water 'air gates'.	Water Quality

Tahoe Water Suppliers Association	Concerned with potential contamination from nearshore development, impacts from boating (especially buoy fields which are encroaching on intake infrastructure and fuel spills), AIS management issues in Tahoe and the Keys, and human water contact recreational bacterial/viral potential contamination.	Public Health and Safety, Recreation, Water Quality
North Tahoe Public Utility District	Concerned about boats sinking near water intakes due to weather. Suggests setting and enforcing a deadline for boats to be removed from the water, especially on buoys around water intakes.	Recreation, Water Quality

To view a map of Lake Tahoe's shoreline including an inventory of shoreline structures (such as marinas and boat ramps), natural features, and environmental constraints go to: *http://gis.trpa.org/ShorelineMap*

Process: Reaching consensus on standards for shoreline structures such as piers, buoys and boat ramps has been difficult in the past with the complex mix of public and private land, the lake's renowned water clarity and natural beauty, a complex regulatory environment with two states, four counties, a city and numerous state and federal agencies.

A team of diverse stakeholders has come together to create a holistic, robust and inclusive planning process for the lake's shoreline. The process, known as the Shoreline Plan, is working to develop a set of policies over the next two years based on engaging a wide range of stakeholders, rigorous scientific data, and creating an open, inclusive process.

TRPA and its partners selected an internationally recognized mediation entity, the Consensus Building Institute (CBI), to design and implement a strategic, organized process that engages stakeholders on all issues. Click here for a detailed outline of the process and timeline.

Shoreline Studies – Resources: A number of studies and reports completed in the past have focused on the impacts of shoreline activities and boating. These studies are helping inform TRPA's ongoing shoreline planning initiative and are being made available on the website as a resource for the public. *www.shorelineplan.org*

Topics: Air Quality/Boating and Watercraft Use/Carrying Capacity/Dredging/Economics Fisheries/Low Lake Level Adaptation/Miscellaneous/Noise/Scenic/Water Quality

Findings – Findings summary available here:
http://shorelineplan.org/wp-content/uploads/2016/06/CBI-Shoreline-Assessment-Findings-for-Public-Review.pdf

Boating
2018 marked the 10th Anniversary of the Tahoe Boat Inspection program. This program has inspected almost 7,000 boats annually, and conducted decontamination processes on about 45% of the boats inspected.

The proposed Shoreline Plan has strong boater (and marina) education, policies, restrictions BMP and enforcement components. *http://shorelineplan.org*

- TRPA boating regulations and information about the mandatory boat inspection program is included in the next chapter of this report.

Recreational boating presents a potential source of pollution. Accidental boat submersion, release of fuel, release of sewage, and the potential introduction of aquatic invasive species (AIS) are all areas of concern. TRPA and other agencies have worked to educate boaters on clean boating practices. TRPA established a blue boating program under the 2008 Shorezone Ordinance; however, the Blue Boater Program (which included water quality monitoring and additional boat inspection requirements on engine tuning) is not in operation.

TRPA's current ordinance does require:
- All boats are prohibited from sewage release except at designated pump-out stations.
- All motorized boats are required to undergo a vigorous AIS inspection before launch.
- All boat launch ramps are locked if there is no inspector on site.
- Any spill incidents are reported to the US Coast Guard and state regulatory agencies who then notify water providers of any potential problems near their intakes.
- All watercraft engines must be 4 stroke to reduce hydrocarbon emissions.
- All non-motorized watercraft are requested to undergo voluntary inspection.
- TRPA boating regulations and information about the mandatory boat inspection program is included in the next chapter of this report.

Shorezone Development and Projects
TWSA staff regularly attends monthly Interagency Shorezone Coordination Group meetings, in order to keep TWSA purveyors informed of development with possible impacts to the drinking water intakes, A ¼ mile (1320 ft.) buffer is (now pending Shoreline Plan adoption) the trigger for prompting water provider input on potential permanent projects. 600 ft. is the buffer for other notifications.

Since 2008, TWSA staff has been receiving copies of re-issued and newly permitted boat buoy permits from Nevada State Lands. Many of these structures are located outside the ¼ mile intake buffer, and as a result, the water providers do not provide comment. Any project of significance to the water providers is forwarded to the applicable agency for comment submittal to Nevada State Lands.

Several large development projects were under review for potential impacts: the Glenbrook Buoy Field Expansion, the Beach Club on Lake Tahoe and the Edgewood Lodge and Golf Course Improvement Project.

Edgewood Lodge and Golf Course Improvement Project
http://www.tahoedailytribune.com/news/local/edgewood-celebrates-completion-of-100m-lodge

They broke ground on the new Edgewood Lodge at the south shore of Lake Tahoe in October of 2015, but plans and environmental improvements began years before that in preparation for the new 169,000 square-foot hotel and spa with dining, shopping and adventures options along with 154 rooms.

Some of the environmental improvements completed to date include: moving the stormwater off the casino corridor and pulling through the ponds on the golf course, a dam system at Friday's Station that supplies water to the course and Edgewood Creek improvements, a cooling system using lake water, dredging the current ponds around the course and bring back to their natural state and the daylighting of Edgewood Creek.

Nearly 25 years in the making, Edgewood Tahoe's $100-million lodge is finally completed.

"What you see here today is the culmination of a vision that was formed 25 years ago when [the late] Brooks Park and [general manager] Bobby King thought it would be a good idea for golfers to have a place to stay after they completed their round of golf," said John McLaughlin, president and CEO for Edgewood Companies.

Park, a major property owner and cattle rancher in Northern Nevada, built Edgewood Tahoe Golf Course in 1968. He passed away in 2001.

Nevada Gov. Brian Sandoval was among the speakers who praised the project for its economic and environmental benefits for Lake Tahoe's South Shore.

"It's going to employ 240 local residents and give them incredible and meaningful jobs," said Sandoval. "The other part that's important to me is pairing redevelopment with conservation. There's some conservation as a result of this project that wouldn't have happened otherwise. It's going to help preserve and protect the lake."

Tahoe Regional Planning Agency's Executive Director Joanne Marchetta pointed to specific environmental restoration projects on the 4,200-acre Edgewood Creek watershed, which feeds directly into the lake — and includes the golf course itself. "It's the environmental benefits that really outshine here. We have enhanced wetlands, new fish and wildlife habitat, and improved stormwater systems," said Marchetta. "The restoration of the golf course is actually improving more than 53,000 square feet of stream environment zone. These are the kinds of new wetlands that filter polluted stormwater runoff before it enters the lake." These environmental improvements were required by the TRPA for the lodge to be built.

South Lake Tahoe Mayor Austin Sass noted that the new lodge is a boon for the entire South Shore, both in Nevada and California. "The South Shore of Lake Tahoe is enjoying a rebirth. Coupled with

what has happened within the city and Douglas County, we have seen over three-quarters of a billion dollars in capital investment over the last five years with the completion of this lodge," said Sass.

The Tahoe Regional Planning Agency Governing Board approved the Edgewood Tahoe Lodge and Golf Course realignment project on August 23, 2012 in a unanimous vote. The Board voted to certify the project's Final Environmental Impact Statement, approved a code amendment for the height amendment and approved the 154-room hotel project that includes environmental improvements to water quality as well as sensitive land restoration.

TWSA staff and member agencies were involved in public comment regarding potential impacts to Edgewood Water Company's drinking water quality from an expanded beach access area near the intakes.

The Edgewood Tahoe Lodge Project will include significant and water quality improvements for the Edgewood Creek watershed. The plan includes the transfer of development rights from blighted sites within city limits to the Lodge Project.

During the summer of 2012, the project proponent (Edgewood Companies) contract engineer (R.O. Anderson) and Project Manager (Brandon Hill) held several meetings and conference calls to address NDEP Bureau of Safe Drinking Water and TWSA Member concerns.

These concerns centered on:

1) Potential increased microbial contamination from the new beach access area (area will have limited access capped at 250 people/day).
2) Requesting use of the TWSA Risk Assessment Model (which was then conducted) and additional support material to verify the contactor submission that project would have no impact to water quality.

Below is a summary of final correspondence from NDEP:

ndep
NEVADA DIVISION OF ENVIRONMENTAL PROTECTION
protecting the future for generations

STATE OF NEVADA
Department of Conservation & Natural Resources
DIVISION OF ENVIRONMENTAL PROTECTION

Brian Sandoval, Governor
Leo M. Drozdoff, P.E., Director
Colleen Cripps, Ph.D., Administrator

August 3, 2012

Ms. Theresa Avance, AICP
Senior Planner
Tahoe Regional Planning Agency
PO Box 5310
Stateline, NV 89449

RE: Edgewood Lodge and Golf Course Improvement Project Final EIS
NDEP project review number (DO-4286-12)

Dear Ms. Avance,

The Nevada Division of Environmental Protection (NDEP), Bureau of Safe Drinking Water (BSDW) has reviewed the Tahoe Regional Planning Agency's (TRPA) responses to the Bureau's comments contained in the Edgewood Lodge and Golf Course Improvement Project Final Environmental Impact Statement (EIS) prepared by Ascent Environmental. We appreciate the work that has been done with appropriate parties to help assure long term protection of public health.

The NDEP-BSDW appreciates the amendments made to the Final EIS in response to expressed concerns with the Draft document. Additional references to the Nevada drinking water program, Nevada Administrative Code and TRPA Code, NDEP regulations governing watershed control and monitoring, the project's creation of a new potential microbial contamination source, and project construction timeline management, all improve the document with respect to increased awareness of interactions between the project's amendments to land use and the drinking water supply for the area. New discussion with respect to the Kingsbury General Improvement District intake also adds clarity on the relative locations of the projects.

As amended in Section 5.6 of the Final EIS, the NDEP-BSDW looks forward to future discussions with the TRPA to address measures linked to the watershed control program. NDEP will remain engaged with the Edgewood Water Company and Edgewood Lodge project proponents to identify any cooperative Best Management Practices for the new beach and pier access that would prove beneficial for the long term health of the watershed.

Should you have any questions or concerns, please do not hesitate to contact me at (775) 687-9515 or jcarr@ndep.nv.gov.

Sincerely,

Jennifer L. Carr, PE, CEM
Chief, Bureau of Safe Drinking Water

cc's on Page 2:

901 S. Stewart Street, Suite 4001 • Carson City, Nevada 89701 • p: 775.687.4670 • f: 775.687.5856 • ndep.nv.gov

Re: Edgewood Lodge and Golf Course Improvement Project Final EIS – NDEP Project review #DO-4286-12

ec: Andrea Seifert, P.E., PWS Compliance Branch Supervisor, NDEP, BSDW
Jim Balderson, P.E., Engineering Supervisor, NDEP, BSDW
Reggie Lang, P.E., Facility Manager, NDEP, BSDW
Dave Emme, NDEP Deputy Administrator
Dave Gaskin, NDEP Deputy Administrator
cc: Cameron McKay, Kingsbury GID, P.O. Box 2220 Stateline, NV 89449
Scott Shunter, Edgewood Water Company, P.O. Box 5400, Stateline, NV 89449
Brandon S. Hill, Edgewood Companies, 1300 Buckeye Road Suite A, Minden, NV, 89423
Madonna Dunbar, Tahoe Water Suppliers Association, 1220 Sweetwater Road, Incline Village, NV 89451
PWS Files: Edgewood Water Company (NV0000235) & Kingsbury GID (NV0000004)

Below is final correspondence from R.O. Anderson Engineering on behalf of Edgewood Companies providing information on the Risk Assessment run conducted July 2012 and other studies reinforcing their position.

R O Anderson

July 19, 2012

Via E-mail and U.S. Mail

Theresa Avance, AICP
Senior Planner
TAHOE REGIONAL PLANNING AGENCY
P.O. Box 5310
Stateline, NV 89449

Edgewood Water Company: Edgewood Lodge and Golf Course Improvement Project, Draft Environmental Impact Statement (TRPA File ENVP2008 – 0002) Response to Comments from Tahoe Water Suppliers Association and State of Nevada, Division of Environmental Protection – Bureau of Safe Drinking Water

Dear Ms. Avance:

As an introduction, R.O. Anderson Engineering, Inc. is under contract with Edgewood Water Company (Water Company) to assist them with a variety of engineering and land surveying related assignments including the design of the modifications to its existing water treatment plant to upgrade the facilities to meet the requirements of U.S. EPA Long-term 2 Enhanced Surface Water Treatment Rule (LT-2). As you likely know, the Water Company is a Member of the Tahoe Water Suppliers Association (TWSA). In 2007 TWSA, in cooperation with U.S. Army Corps of Engineers, commissioned Black & Veatch to prepare a water quality risk assessment of the public water supplies derived from Lake Tahoe. The Final Report for that risk assessment is entitled *Lake Tahoe Source Water Protection Risk Assessment* and is dated October 2008 (Risk Assessment). At the time the Risk Assessment was prepared only the existing beaches and marinas, as sources of body-contact recreation, were evaluated. For the south shore area of Lake Tahoe, those beaches included Nevada Beach, Lakeside Beach, Pinewild and Round Hill.

The Risk Assessment also included a vulnerability assessment of each of the included intakes (Burnt Cedar, McKinney/Quail and Kingsbury General Improvement District) to sewage and fuel spills and other potential contaminating events in the Lake Tahoe Basin. Such a vulnerability assessment is highly complex and dependent on numerous variables such as in-lake travel times, relative concentrations of contaminants, the direction and velocity of advective transport and dispersion rates to name a few. To assist water purveyors understand and prepare response plans to potential impacts from catastrophic contaminant spills, the authors of the Risk Assessment provided a spreadsheet-based simplified pollutant-transport model (*Lake Tahoe Transport Model*). The Lake Tahoe Transport Model was developed as a tool for utilities during a spill event to provide insight as to contaminant risk at their intakes and could be used to estimate[1]:

[1] See Lake Tahoe Source Water Protection Risk Assessment, 2008, pp. ES-4 and 84.

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www.ROAnderson.com

a. The likelihood that pollutants from a given contaminant spill would reach the intake to a public water supply,
b. The amount of time required to reach each effected intake, and
c. The amount of dispersion that would occur during transport.

It does not, however, calculate or predict probabilities or risks of infections resultant from additional body contact recreation activities near public water supply intakes.

During the fall of 2011, while considering the potential impacts to the Water Company from the pending Edgewood Lodge and Golf Course Improvement Project (Lodge Project), the Board of Directors of the Water Company requested our company's assistance to evaluate the potential risks to the Water Company from that proposed project. The Water Company's Board of Directors wanted to better understand the risks to water quality as evaluated in detail within the Risk Assessment and the likelihood to successfully address those risks by enhancing their water treatment facilities to include either filtration or ultraviolet treatment methods compliant with the requirements of LT-2 (2-log removal/inactivation). To address the Board's expressed concerns we reviewed in detail the Risk Assessment and then prepared a comparative evaluation of the Water Company's intake and treatment means to the three water systems evaluated in the Risk Assessment, again, Burnt Cedar, McKinney/Quail and Kingsbury General Improvement District. The results of our comparative review of the Risk Assessment were summarized in our letter to Mr. Bobby King, General Manager of Edgewood Water Company, dated November 4, 2011; a copy of that letter is attached for your review and information. For your convenience, our specific findings included the following observations:

1. The science used to predict the risks associated with body-contact recreation and vulnerability to contamination from spills, even in lake environments, is complex and dependent on numerous variables. As a result, such assessments of risk result in approximations and probabilities of occurrences. That is, these risks cannot be quantified definitively but must be defined by probabilities of occurrence.
2. The current configuration of the Water Company's intake, being 2,500 feet long and 34 feet deep, is significantly further removed from those persons participating in body-contact recreation at existing beaches or other potential activity centers than the intakes to the water systems that were specifically evaluated in the Risk Assessment. As a result, it is reasonable to assume that the risk to the Water Company's intake is less than the calculated and reported risks to either KGID or the Burnt Cedar water systems. The Risk Assessment found that if the treatment upgrades required by the LT-2 Enhanced Surface Water Treatment Rule (2-log removal) are implemented at Burnt Cedar and KGID, the risk of exceeding EPA's target risk level of 1 per 10,000 visitors/year from body-contact recreation were 0.1% and 0.03%, respectively. Accordingly, once the Water Company implements the LT-2 treatment modifications and improvements, whether UV or micro-filtration, we expect the risk of exceeding EPA's target risk level is less than 0.1% for body-contact recreation activities.

3. The Water Company's intake, similar to all other water purveyors within the Basin, is vulnerable to contamination by pollutant spills. In the event that the contaminant spill involves higher concentration of particulate matter, such as a sewage spill, UV inactivation treatment will probably be much less effective for pathogen removal due to the higher concentration of particulate matter than body-contact recreation might generate. The presence of high concentration of particulate matter will tend to lower the UV inactivation rate rendering it potentially less effective than micro filtration for removal of such contaminants.

Although not listed specifically in our letter to Mr. King, in this context it is noteworthy that a specific conclusion reached in the Risk Assessment was that improving water treatment to achieve 2-log removal/inactivation is expected to substantively improve microbial water quality in the finished water.

For your information, the Water Company's Board has since determined to proceed with the design and permitting of upgrades to its treatment methods to achieve 2-log removal/inactivation by using ultraviolet methods to supplement its current disinfection processes (ozone). The Water Company anticipates submitting those designs for review by each agency during the fall 2012 and, subject to receiving requisite approvals, further intends to commence construction in spring or summer 2013.

We have been provided a copy of the comments to the draft Environmental Impact Statement (EIS) for the Lodge Project as provided by TWSA, dated June 27, 2012, as well as those received from Nevada Division of Environmental Protection – Bureau of Safe Drinking Water, which were dated June 28, 2012. To address the comments from each of these agencies seeking additional data to substantiate the findings of the draft EIS, we were requested to use the Lake Tahoe Transport Model to quantify the potential impacts to affected public water supply intakes from a pollution spill in proximity to the proposed beach and pier. To complete this request, we have reviewed the methods and assumptions within the Risk Assessment used for the vulnerability assessment of KGID's intake. Specifically, the authors of the Risk Assessment assumed and then simulated a 50,000 gallon raw sewage spill "… for each of the 42 centermost shoreline segments on each of the …Kingsbury Grade model grids."[2] The findings for those simulations included[3]:

1. "The vulnerability assessment for Kingsbury Grade intake yielded substantially lower peak and event-averaged concentrations when compared with other intakes." The report's author credited this finding to the considerably deeper placement of KGID's intake to the other intakes evaluated.
2. Average concentration: 0.27 oocysts/100 L
3. Travel Time: 5.09 days.

[2] See Lake Tahoe Source Water Protection Risk Assessment, 2008, pp. 73.
[3] Ibid, pp. 80

4. The intake is most vulnerable to spills or other releases 300-500 m to the north, near Nevada Beach and that "...spills to the south of the intake yielded very low predicted concentrations."

As you are aware, the Lodge project is located southerly of KGID's intake. In addition, KGID's intake is approximately 750 feet long and at a depth of 60 feet. As a comparison, the Water Company's intake is approximately 2,500 feet long and at a depth of 34 feet.

We used the Lake Tahoe Transport Model to simulate the probable outcomes from a contaminating event occurring at or very near the beach in proximity to the proposed Lodge project. To understand and attempt to quantify the range of potential results, we used the model to simulate events occurring at two separate locations along the beach: the first, directly east of the Water Company's intake, and the second at a location about 500 feet north of the Water Company's intake. This latter location is closer to, but still about 0.8 miles southerly of KGID's intake and about 1.7 miles from Round Hill's intake. We also varied the initial concentration of contamination from 100 to 500 to test model sensitivity to such input values. From these model runs we have made the following observations:

1. From the assumed spill location that is directly east of Edgewood's intake, the probability that the current is in the direction of Edgewood's intake was found to be 0.5%, but 0% to either KGID's intake or Round Hill's intake.
2. From the assumed spill location that is about 500 feet north of Edgewood's intake, the probability that the current is in the direction of Edgewood's intake was found to be 4.8% and, again, 0% for both KGID's intake as well as Round Hill's intake.
3. In each run, the Median Transit Time to the Edgewood intake for a contaminating event at either of the two tested locations was 5 hours. The Median Transit Time to the intake at KGID ranged from 9 – 10 hours and to the Round Hill intake ranged from 19 – 20 hours.
4. During transport dispersion will dilute contaminants concentrations from the initial values by 99.4 – 99.6% prior to arrival at the Water Company's intake. The effect of dispersion is estimated to fully dilute contaminant concentrations prior to arrival at either the KGID and Round Hill intakes.

For your convenience, I have attaching two summary tables that together list the results from each of these model runs.

Based on the analysis of this data, once the Water Company completes its planned upgrades to its water treatment plant to meet the requirements of LT-2, we expect that the risk of exceeding EPA's target risk level of 1 per 10,000 visitors/year from body-contact recreation, inclusive of the anticipated increased activity from the proposed Lodge project, will be less than 0.1%. The necessary standard of treatment (2-log removal/inactivation) to minimize these potential risks can be safely and prudently achieved utilizing ultraviolet plus ozone water treatment processes. Irrespective of the status of the Lodge project, these upgrades to the Water Company's treatment plant must be made by 2014 to comply with the requirements of LT-2. The Water Company's intake, similar to every other public water

R O Anderson

supply intake within Lake Tahoe, is vulnerable to being effected by a catastrophic event resulting in a contaminant spill. The Water Company has previously taken appropriate measures to minimize this vulnerability by locating its intake nearly ½-mile away from the beach and at a depth greater than 30 feet. Accordingly, we conclude that the proposed Lodge project will have limited if any impact on the ability of the Water Company to continue to meet federal and state drinking water standards including the provisions of Nevada Administrative Code (NAC) 445A.525.

During your review of this summary, should you have any questions or require any clarifications, I trust you will not hesitate to contact me directly.

Yours faithfully,

R.O. ANDERSON ENGINEERING, INC.

Robert O. Anderson, P.E., W.R.S., CFM
Principal Engineer

Attachments

cc: Jennifer Carr, P.E.
Madonna Dunbar
Brandon Hill
Bobby King
Patrick Rhamey
Andrea Seifert, P.E.
Chuck Sharer
Jim Summers
John Summers

Below is TWSA Correspondence initiated because of concerns to drinking water quality which were addressed at the planning stage by project proponent:

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
Incline Village, Nevada, 89451
775-832-1212

TWSA Members:
Cave Rock Water System
Edgewood Water Company
Glenbrook Water Company
Incline Village GID
Kingsbury GID
Lakeside Park Association
North Tahoe PUD
Round Hill GID
Skyland Water Company
South Tahoe PUD
Tahoe City PUD
Zephyr Water Utility

1

June 27, 2012

To: Ms. Theresa Avance, Tahoe Regional Planning Agency

RE: Comment regarding the Edgewood Lodge and Golf Course Improvement Project (TRPA File # ENVP2008-0002)

On June 27, 2012, Mr. Brandon Hill, Project Manager for the above referenced project, contacted Madonna Dunbar (E.D. TWSA) via telephone, in order to provide additional information to draft comments originally developed by the Tahoe Water Suppliers Association (TWSA). From that conversation, some of the draft comment/concerns of the water providers were addressed:

- Mr. Hill agreed that a specific run of the Risk Assessment Model (referenced below) would reinforce the project's position that there should be no microbial contaminant increase from the new beach area. He agreed that the Edgewood Water Company engineer should be able to work with TWSA staff to run the model specific to the project, and that that information could being included in the final EIS and shared with the water providers. *(Item #1 below)*

- TWSA originally had concerns that the KGID intake will be affected by the project. This had been alleviated by specific information that the construction site of the new lodge in 3,200 feet from the KGID intake. *This original comment was removed from reference below.*

- Mr. Hill is researching the availability of the pier spill response plan *(Item #3 below)* to be shared with the TWSA.

Below are modified comments we still wish to be incorporated in the record of the review process. These comments are specific to potential impacts to municipal drinking water quality.

Impact 5.6.1-8 Degradation of Source Water Quality from Boating Activity and Increased Beach Recreation.

Item # 1:
Alternative 1 would include the relocation and extension of the existing pier and would provide new public beach access. The proposed public beach access is not intended to accommodate a large number of people, and Edgewood Companies proposes to adaptively manage public access by potentially setting a limit to the number of people that may use the beach during peak periods.

TWSA Comments:

1) Microbial contamination from human water contact is a main concern for drinking water quality. The Edgewood Water Company maintains a public water system which is in the process of upgrading to meet US EPA Long Term 2 (LT2) compliance for filtration exempt systems. Filtration exemption compliance of this type requires: submission of an annual watershed control program report, a history of regulatory compliance on turbidity and microbial contaminants, a history of the absence of water borne diseases, and other factors.

2) The US Army Corp of Engineers commissioned a Risk Analysis Study and Simplified Pollutant Transport Modeling Tool in 2008 for the TWSA members. This tool can be used to analyze potential risk from human-water contact. We request that the project proponent use this tool to provide a scientific estimate of the increased contamination potential linked to the new beach area next to the intake. TWSA staff can provide the tool and contact information for using the model. This information should be included in the EIS.

3) What mechanisms will be used to limit the beach access? The daily beach access limit (number of persons) is not defined. Delineation of the access control methods needs to be specified. Increased human water recreation on the beach, and from nearby boating activity has the potential for increasing microbial contamination near the intake.

Item # 2:

Furthermore, the Edgewood Water Company primary water supply intake line extends over 2,000 feet from the beach, and its backup line is located over 700 feet from the beach. These distances from the shoreline, combined with the depths of the intakes is sufficient to protect source water quality.

TWSA comments:

1) This statement should be validated by a run of the Risk Assessment Model Tool.

Item # 3:

Projects within 600 feet of a drinking water source identified by TRPA require special consideration as described in Section 60.3 of the TRPA Code and are afforded protection under the Lake Tahoe Source Water Protection Program. There are three protected drinking water sources within 600 feet of the project area: the Edgewood Water Company (EWC) intake line (00703003I11) that extends into Lake Tahoe from a location north of the existing lakefront residences; and two active wells (02903603W11 and 02905101W11) south of the project area boundary near golf hole 9 in California (TRPA 2000). Prior to issuance of a TRPA permit, the project applicant would be required to comply with the source water protection provisions contained in Section 60.3.3.D of the TRPA Code.

60.3. D. Review of Proposed Possible Contaminating Activities Located in Source Water Protection Zones: *Proposed uses determined by TRPA to be projects that are identified as a Possible Contaminating Activity, with a project area located in a source water protection zone, shall not be approved unless TRPA finds that:* ***1.*** *The project complies with the requirements to install BMPs as set forth in subsection 60.4.3;* ***2.*** *TRPA has solicited comments from the operator/owner of the source water, and the department of environmental health with jurisdiction over the source water, and all such comments received*

*were considered by TRPA prior to action being taken on the proposed project; **3.** A spill control plan is submitted to TRPA for review and approval. The plan shall contain the following elements: **a.** Disclosure element describing the types, quantities, and storage locations of contaminants commonly handled as part of the proposed project; **b.** Contaminant handling and spill prevention element; **c.** Spill reporting element, including a list of affected agencies to be contacted in the event of a spill; **d.** Spill recovery element; and **e.** Spill clean-up element. Submittal of a spill control plan may be waived provided a state or local agency with jurisdiction over the subject source water provides a written statement to TRPA that a plan containing the above elements remains on file with that agency, or TRPA staff determines, at its discretion, that requiring a spill control plan would not result in significant additional protection of the source water.*

TWSA comments:

1) The requirements for a spill response plan for the pier have not been detailed as required in TRPA Code of Ordinances (60.3. Source Water Protection -Section D.3).
   Mr. Hill is in the process of gathering this information.

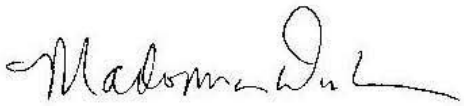
2) Public comment from the affected water providers (Edgewood) was not solicited separately by TRPA (as required in 60.3. Source Water Protection -Section D.2); but is hereby delivered.

Impact 5.6.1-7
Degradation of Water Quality During Pier Relocation and Extension.
Alternative 1 includes removal of the existing pier, and relocation and construction of a new pier. A total of 14 pilings are proposed for pier construction with parallel pilings on fixed pier sections (four per section) and a single piling for each floating section. Pier installation would result in minor disturbance of the lake bottom and minimal resuspension of sediments, nutrients, and other pollutants. The minimal disturbance to the lake bottom associated with Alternative 1 would not adversely affect Lake Tahoe water quality or cause established water quality standards to be exceeded. Therefore, this impact is considered less than significant.

TWSA comments:

1) If the intake is offline during this entire construction process, no mitigation is requested. However, if the intake is in service during lakebed construction with the potential of increased turbidity, a communication plan with the Edgewood Water Company and additional turbidity monitoring between the site and the intake is requested.

Respectfully submitted on behalf of the Tahoe Water Suppliers Association Board,



Madonna Dunbar
Executive Director, Tahoe Water Suppliers Association

Beach Club on Lake Tahoe Development - KGID Treatment Plant Relocation
http://southtahoenow.com/story/07/28/2016/old-kgid-treatment-plant-and-trailers-removed-new-luxury-project

What was once home to 155 mobile homes and the KGID water treatment plant took one big step towards being a luxury condominium project when developers tore down the plant. Going up on the 20-acre site will be the Tahoe Beach Club Lakefront, a 143 two-five-bedroom luxury condominium residences. The first phase, expected to be completed in Fall 2017, will include 48 residences.

Bob Mecay, CEO of Beach Club Development, removed the last vestiges of the retired water treatment plant. In its place will be The Beach Club athletic facility. "It's a momentous occasion for us because it signifies the start of our project as well as milestone for environmental improvements," said Mecay. "The Tahoe Regional Planning Agency Board of Governors unanimously approved the project due to its environmental benefits."

The buildings will be LEED-certified to improve and restore its natural surroundings. Streams spanning over two acres will be restored and native vegetation will be utilized throughout the property. Once finalized the project will reduce the number of sediment run-off from approximately 11,000 to 600 pounds a year. Greenhouse gas emissions anticipate to be reduced by more than 60 percent.

The project also complements the Nevada Tahoe Conservancy District's efforts to restore ecological function of Rabe Meadow within the Burke Creek channel, reduce pollutants into the lake and improve safety in case of a flood.

The Kingsbury General Improvement District's (KGID) new $19 million water treatment plant was relocated to the back of the property in 2015. The state of the art facility utilizes ultraviolet treatment to the ozone disinfection, which meets Environmental Protection Agency requirements. "This is a great example of the partnership between private industry and the public sector coming together to make both projects happen" said Cameron McKay, general manager of KGID.

Those living in the mobile home park were originally told in 2003 that they would have to move so the project could be built. It took 14 years of planning to get to this point.

Editor Notes: On February 29, 2008 NDEP submitted comments that the DEIS did not fully address potential impacts to the Kingsbury GID water system. The DEIS noted that water lines would need to be re-routed, and that buildings will be adjacent to the existing surface water treatment plant. The proposed pier was adjacent to the drinking water intake.

As of 2014, several problems had been resolved, allowing for the project to progress.

Glenbrook Buoy Field Expansion
(DO-2814-07)
http://www.trpa.org/documents/agendas/hearings%20officer/summaries/2007/may_8_2007_Summaries.pdf

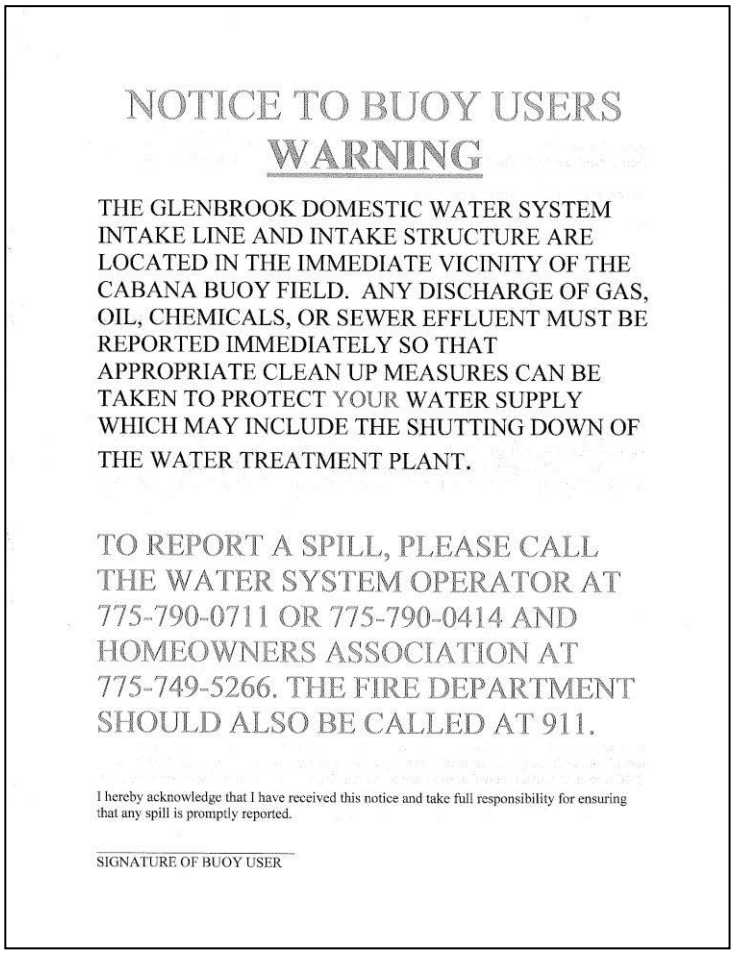
Expansion to the buoy field adjacent to the Glenbrook Water Company intake was determined by NDEP to be a potential source of contamination due to potential source water contamination events from increased boating activity. Mitigation measures agreed upon by NDEP staff include the yearly signing of a notice of awareness for proper boating practices by the buoy users.

A copy of this notice was required to be included in TWSA annual reports starting in 2009, along with information on any incidents and follow up procedures taken. TWSA has a digital copy of the annual letters on file.

In 2008, the Glenbrook Homeowners Association began the required annual notices and reported no incidents since the mitigation process began.

Buoy assignments are given out annually by lottery. Buoy occupants are required to sign a letter stating that they are aware of the proximity of the Glenbrook water intake to the buoy field, and that any accidents or spill incidents need to be reported immediately.

This documentation is maintained by the Glenbrook Homeowners Association and provided to TWSA for review and archiving.



NOTICE TO BUOY USERS

WARNING

THE GLENBROOK DOMESTIC WATER SYSTEM INTAKE LINE AND INTAKE STRUCTURE ARE LOCATED IN THE IMMEDIATE VICINITY OF THE CABANA BUOY FIELD. ANY DISCHARGE OF GAS, OIL, CHEMICALS, OR SEWER EFFLUENT MUST BE REPORTED IMMEDIATELY SO THAT APPROPRIATE CLEAN UP MEASURES CAN BE TAKEN TO PROTECT YOUR WATER SUPPLY WHICH MAY INCLUDE THE SHUTTING DOWN OF THE WATER TREATMENT PLANT.

TO REPORT A SPILL, PLEASE CALL THE WATER SYSTEM OPERATOR AT 775-790-0711 OR 775-790-0414 AND HOMEOWNERS ASSOCIATION AT 775-749-5266. THE FIRE DEPARTMENT SHOULD ALSO BE CALLED AT 911.

I hereby acknowledge that I have received this notice and take full responsibility for ensuring that any spill is promptly reported.

SIGNATURE OF BUOY USER

A sample of the letter used in the Glenbrook Buoy Field mitigation requirements. Copies of the signed letters are received and archived by TWSA annually.

The Nevada Bureau of Safe Drinking Water has stated in association with this project that if increased microbial contamination occurs, the agency will re-evaluate the purveyor's filtration avoidance status.

Chemical and Pesticide Usage
Editor Note: This has been the topic of greatest concern for the TWSA membership for the past several years. Extensive information on the topic and TWSA involvement is included in this next section. The final decision on approval of an herbicide exemption lies with the Lahontan RWQCB Board.

TWSA members have expressed great concern over the potential impacts to drinking water quality by proposed aquatic herbicide issue, for the past 9 years. TWSA staff and members attend monthly meetings with the TKPOA working group, which includes the League to Save Lake Tahoe, Tahoe Sierra Club, Lahontan staff, TRPA staff and other stakeholders. TWSA has provided ongoing public comment on the plan at the TRPA Governing Board, CA State and Lahontan Water Board meetings.

Potential Use of Herbicides
Between 2015-2018 significant effort has been put forth by the TKPOA consultants towards an herbicide application review for a Lahontan and TRPA exemption permit for a "one-time pilot". This pilot test proposed approximately 10-12 acres of 3 different herbicides to be applied, with certain mitigations for water containment.

In summer 2018, the 'pilot application' was replaced by a long-term multi-year, multi-method application, seeking permission to begin in 2020. The review process will be ongoing in 2019.

How to Request a Prohibition Exemption to use Aquatic Pesticides
(October 2016)

Purpose	Key Process Steps			Time to Approval
Vector Control	Submit required Vector-Pesticide information to Water Board for review	Water Board will review submitted information for completeness	If complete, aquatic pesticide use may commence immediately	Typically a few days to a week
Fisheries Management using Rotenone	Submit required Fisheries-Pesticide information to Water Board for review	Water Board will review submitted information for completeness	If complete, Water Board will inform you if proposal is either scheduled for next available public hearing or for Executive Officer action	One month to review for completeness plus at least 3-4 months for Board hearing
EMERGENCY	**IMMEDIATELY** contact the Water Board to notify about the situation	Submit required Emergency-Pesticide information to Water Board for review	If complete, aquatic pesticide use may commence immediately	Can be the same day as notification
Time Sensitive Project	Contact the Water Board to notify about the time sensitive situation	Submit required Time Sensitive-Pesticide information for Water Board to review and respond within ten days	If complete, the Water Board will inform you if proposal is either scheduled for next available public hearing or for Executive Officer action	From ten days to a few months. Additional time may be needed to develop environmental documentation
Not Time Sensitive	Submit required Normal-Pesticide information to Water Board for review	Water Board will review submitted information for completeness	If complete, Water Board will inform you if proposal is either scheduled for next available public hearing or for Executive Officer action	One month to review for completeness plus at least 3-4 months for Board hearing. Additional time may be needed for CEQA documents

Source: LRWQCB

Background: Basin Plan Amendment
Regulatory changes, initiated in 2011, by the Lahontan Regional Water Quality Control Board (LRWQCB) to the "Lahontan Basin Plan Amendment", removed a former prohibition on aquatic herbicides/pesticides and replaced it with a project review process.
EPA approval was given Sept. 10, 2015 on the changes, see letter below.

EPA Approval given for Lahontan Basin Plan Amendment Changes, Sept. 10, 2015.
The U.S. Environmental Protection Agency (EPA) has reviewed the California State Water Resources Control Board (SWRCB) Resolution Number 2012-0018; Amendment to the Water Quality Control Plan for the Lahontan Region (Basin Plan): *To Replace a Pesticide Water Quality Objective with a Waste Discharge Prohibition on Pesticides with Exemption Criteria* (the Amendment).

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

SEP 10 2015

Ms. Patty Z. Kouyoumdjian
Executive Officer
Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Boulevard
South Lake Tahoe, California 96150

Dear Ms. Kouyoumdjian:

The U.S. Environmental Protection Agency (EPA) has reviewed the California State Water Resources Control Board (SWRCB) Resolution Number 2012-0018; Amendment to the Water Quality Control Plan for the Lahontan Region (Basin Plan): *To Replace a Pesticide Water Quality Objective with a Waste Discharge Prohibition on Pesticides with Exemption Criteria* (the Amendment). By this letter, I am pleased to inform you that I am approving the water quality standards portions of this amendment.

The Lahontan Regional Water Quality Control Board adopted the Amendment on December 7, 2011 under Resolution No. R6T-2011-0102, and adopted by the SWRCB on May 15, 2012 under Resolution No. 2012-0018. The Amendment was certified by the California Office of Administrative Law (OAL) on September 6, 2012, in accordance with 40 CFR 131.6(e) that the standards were duly adopted pursuant to California law. EPA received the main submission for review on July 24, 2012 and received notice of the OAL certification on September 10, 2012.

Section 303(c) of the Clean Water Act (CWA) requires EPA to approve or disapprove new or revised state-adopted water quality standards. The State regulatory provisions which are subject to EPA's approval authority under Section 303(c) are those addressing antidegradation, beneficial uses, water quality criteria, and certain provisions addressing implementation of water quality standards for surface waters.

The Amendment makes various revisions to the Basin Plan in Chapters 3 (Water Quality Objectives), 4 (Implementation), and 5 (Water Quality Control Measures for the Lake Tahoe Basin). Revisions in Chapter 3 and Chapter 5 include the removal of the existing water quality objective for pesticides. Other revisions in Chapter 3 include changes to the water quality objectives for use of the fish toxicant rotenone. In addition, the revisions in Chapter 5, pp. 5.1-10 include the removal of water quality objectives for use of rotenone that are duplicative of the revised rotenone water quality objectives in Chapter 3. We have determined that the above revisions are subject to EPA's 303(c) approval authority and are consistent with the requirements of the CWA and its implementing regulations at 40 CFR Part 131.5 and 131.6.[1]

[1] The regulations governing water quality standards were revised in a Final Rule signed August 5, 2015. See 80 FR 51019 ("Final Rule"). This revised rule is effective October 20, 2015, and includes a transition period. For that reason, the State's revisions are evaluated using the regulations as they existed before the Final Rule. See 80 FR 51022.

Printed on Recycled Paper

Revisions in Chapter 4 and additional revisions to Chapter 5 include a new waste discharge prohibition for pesticide application to water with specific exemption criteria and also include changes to certain requirements regarding rotenone use in fisheries management. EPA is not acting on the revisions in Chapter 4 nor the additional revisions to Chapter 5 as they are not new or revised water quality standards under Section 303(c) of the Clean Water Act, but rather implementation provisions that are not within the scope of this approval action.

In order to provide further clarity, we have provided an attachment to this transmittal letter that includes the complete text of the provisions that we are approving in today's action.

Public Participation

Public involvement is an integral component of a successful water quality program. Based upon our review of the administrative record for the subject amendment, the public review procedures followed by the State in the development of State Board Resolution No. 2012-0018 and the Regional Board Resolution R6T-2011-0102 are consistent with the procedural requirements set forth in 40 CFR 131.20(b).

Endangered Species Act

Section 7(a) of the Endangered Species Act (ESA) states that each federal agency shall ensure that any action authorized, funded, or carried out by such agency will not likely jeopardize the continued existence of any threatened or endangered (listed) species or result in the destruction or adverse modification of critical habitat. On August 24, 2015, EPA initiated informal consultation with the U.S. Fish and Wildlife Service (Service) on our action concerning the revised pesticide and rotenone water quality objectives. EPA concluded consultation with the Service on August 31, 2015 with the Service's concurrence with EPA's finding of "may affect, not likely to adversely affect" for the proposed criteria.

EPA looks forward to working with you and your staff toward our mutual goal of protecting and enhancing the quality of California's waters. If EPA can be of further assistance in meeting these goals, please call me at (415) 972-3438 or have your staff contact Matthew Mitchell at (415) 972-3508.

Sincerely,

Michael Montgomery
Acting Director, Water Division

Enclosure

cc: Mary Fiore-Wagner, Lahontan Regional Water Quality Control Board
Dan Sussman, Lahontan Regional Water Quality Control Board
Rik Rasmussen, State Water Resources Control Board
Corey Buffo, U.S. EPA, Office of Water

Aquatic Invasive Species Overview

The focus on control of aquatic invasive species (AIS) has become a leading topic of concern in Tahoe over the past several years. Greater understanding of the extent of the subject has become more relevant in agency management programs. The following excerpts summarize current issues and status of management options.

Photos: League to Save Lake Tahoe (left), peterspain.com (right)

AUGUST 2017

A brief history of aquatic invasive species at Lake Tahoe

In 2008, with some of the most destructive aquatic invasive species (AIS) known, quagga and zebra mussels, approaching Lake Tahoe's doorstep, Lake Tahoe Basin partners jumped into action to launch the nation's most comprehensive boat inspection program. Now nine years later and with no invasions, the Lake Tahoe AIS Program is widely considered a national model for how to effectively keep new AIS from entering a water body.

However, prior to shutting the door on new AIS in 2008, nearly 30 non-native species had already made their way into the lake. Documentation of these species and their locations around the lake began in the mid-1990s even though many were introduced (both intentionally and accidentally) many decades prior. Since their introduction, they have established into infestations and are spreading rapidly, altering the environment in ways that could change Tahoe forever.

Aquatic invasive plants, warm water fish and invertebrates have the adaptive ability to make their surroundings more hospitable for themselves and other invasives, while simultaneously threatening the well-being of Tahoe's native species. These AIS are thriving in the lake right now. By cycling nutrients, altering food webs, preying on native species and covering pristine beaches with clam shells and mats of weeds, they threaten a $5 billion economy while destroying the unique clarity that makes Lake Tahoe an annual destination for over 24 million visitors. The good news is that Tahoe agencies have a plan in place to systematically control these species and take back the lake.

Plan for the control of aquatic invasive species at Lake Tahoe

In 2015, researchers at the University of Nevada, Reno, completed a comprehensive plan to control AIS already established in the waters of Lake Tahoe. This ecologically-based approach to prioritizing species and infestation sites identified two aquatic plants, Eurasian watermilfoil and curlyleaf pondweed, and warm water fish, as the primary targets for control work in the immediate future. Emphasis also remains on early detection and rapid response to any new satellite infestations of aquatic invasive plants and Asian clams.

Coupled with other factors such as feasibility, permitting and project cost, a five year action list was developed to aid in the search for funding needed to complete the job.

A Eurasian watermilfoil infestation in one of three Crystal Shores marinas.
Photo on left taken July 2015 prior to the placement of bottom barriers
Photo on right taken 2016 after control treatment was complete.
Photos: Tahoe Resource Conservation District

Tahoe Taking Action - 2017

Control of AIS is a multi-year endeavor that seeks to reduce the impacts from aquatic invaders to a point of insignificance. An integrated approach using numerous techniques is essential to success. Work taking place in 2017 is fueled by public/ private partnerships and funding sources including California Tahoe Conservancy (SB630 and Prop 1), League to Save Lake Tahoe, Nevada Division of State Lands, Proposition 84, Tahoe Fund, Tahoe Regional Planning Agency, Truckee River Fund, and numerous private contributions. Below are some projects underway in Lake Tahoe today.

Tahoe Using New Innovative Technology

Lead: Tahoe Resource Conservation District

Tahoe RCD and Inventive Resources, Inc. are embarking on a project using ultraviolet light to treat aquatic invasive plants in Lake Tahoe. Ultraviolet-C light works by damaging the DNA and cellular structure of invasive plant life that currently threatens the health of the lake. While this technology needs further field testing to determine its full potential, ultraviolet light could augment Tahoe RCD's methods, especially in low-water years, in tight spaces within marinas, or in river systems.

Success at Crystal Shores

Lead: Tahoe Resource Conservation District

Crystal Shores marinas are now weed-free. After three years of treatment using bottom barriers and diver-assisted suction removal, surveys show no new plants sprouting this season. Moving forward, this site will receive annual surveys to maintain the success and catch any new potential infestations early. Early detection of the infestation and the rapid response by public and private partners to begin treatment was critical for the success of this project.

Asian Clams at Sand Harbor State Park

Lead: Tahoe Regional Planning Agency/Nevada Division of State Lands

A control project began in mid-June at Lake Tahoe Nevada State Park, Sand Harbor, to treat a small, isolated population of Asian clams before it spread to an unmanageable level. The project consists of covering approximately 4 acres of the lake bottom near the boat ramp with thin rubber barriers which is intented to suffocate the clams. While boating in the area, please do not anchor within the project to avoid ripping or tearing the barriers.

Tahoe Keys Passes Special Assessment to Combat Weeds

Lead: Tahoe Keys Property Owners Association

The Tahoe Keys Property Owners Association (TKPOA) is proud to announce a nearly 2/3 "FOR" vote was achieved in April 2017authorizing up to $2.4 million over 4 years to test various ways to control the invasive weeds in the Tahoe Keys lagoons, including bottom barriers, plant fragment control methods, laminar flow aeration and other innovative approaches. The "FOR" vote also authorizes the TKPOA to propose a small-scale, pilot test to assess the effectiveness of aquatic herbicides on the invasive plants, if permitted.

Eyes on the Lake Volunteers Take Action

Lead: League to Save Lake Tahoe

Tahoe's citizen science monitoring program, Eyes on the Lake, is comprised of volunteers reporting presence and absence of aquatic invasive plants. In 2016, volunteers identified two new invasive weed infestations and reported them to resource managers. Both locations are receiving control work this season because of these dedicated volunteers.

INVASIVE SPECIES PROGRAM
LAKE TAHOE EIP

August 2015

A Brief History of Aquatic Invasive Species at Lake Tahoe: The Tipping Point?

In 2008, with the threat of invasion from some of the most destructive aquatic invasive species (AIS) known (quagga and zebra mussels) approaching Lake Tahoe's doorstep, Basin partners jumped into action to launch the nation's most comprehensive boat inspection program. Now seven years later and with not one new invasion, the Lake Tahoe AIS Program is widely considered a national model for how to effectively keep new AIS from entering a water body. This $1.5 million per year program (funded by user fees and public dollars) has inspected 43,000 boats and decontaminated 21,000 boats while finding hundreds of potential invaders threatening Lake Tahoe, including mussels on twelve boats in 2014.

However, prior to shutting the door on new AIS in 2008, nearly 30 non-native species had already made their way into the Lake. Documentation of these species and their locations around the Lake began in earnest in the mid-1990s even though many were introduced (both intentionally and accidentally) many decades prior. Since their introduction, they have established into prolific infestations and are spreading rapidly, altering the environment in ways that could change the Lake Tahoe we know forever.

Key Invasive Species of Concern (year introduced)[2]

Signal Crayfish (invertebrate)	late 1800s
Mysid Shrimp (invertebrate)	1960s
Eurasian Watermilfoil (plant)	1970s
Bass, Bluegill, Goldfish (warm water fish)	1970s
Asian Clams (invertebrate)	2002
Curlyleaf Pondweed (plant)	2003
American Bullfrog (amphibian)	2004

Aquatic invasive plants, warm water fish and invertebrates have the adaptive ability to make their surroundings more hospitable for themselves and other invasives, while simultaneously threatening the wellbeing of Tahoe's native species. These AIS are thriving in the Lake right now. By cycling nutrients, altering food webs, preying on native species and covering pristine beaches with clam shells and mats of weeds, they threaten a $5 billion economy while destroying the unique clarity that makes Lake Tahoe an annual destination for over three million visitors. The good news is that Tahoe now has a plan in place to systematically control these species and take back the Lake.[1]

Photos (clockwise from top left):
Tahoe Resource Conservation District (TRCD), peterspain.com, TRCD

Implementation Plan for the Control of AIS within Lake Tahoe

Researchers at the University of Nevada, Reno developed the Implementation Plan in collaboration with the Lake Tahoe AIS Coordination Committee and with review by an AIS expert panel of individuals from academic, management and regulatory backgrounds. They designed the Implementation Plan to serve as an ecologically-based approach to prioritizing species, locations and strategies for removal and control of AIS at Lake Tahoe for the next three to five years. Seven of the most damaging species were categorized into **three categories** of management recommendations.

Category 1 Species | Feasible Control Action

- **Eurasian Watermilfoil (plant)**
- **Curlyleaf Pondweed (plant)**
- **Warm Water Fish**

Resources should be focused on these species first because there are existing control methods that have been used successfully at Lake Tahoe and removal of these species may lead to the reduction of other AIS in the Lake.

Eurasian watermilfoil and curlyleaf pondweed grow rapidly and spread easily, forming dense mats of vegetation. These infestations inhibit recreation, cycle nutrients into the water column leading to increases in algal growth, decrease water clarity and provide habitat for invasive warm water fish. Warm water fish in turn alter the food web through predation, decreasing the biodiversity of native fish species.

Originating on the south shore of Lake Tahoe, Eurasian watermilfoil was identified at 13 sites around the Lake in 1995, increasing to 18 sites in 2012. Curlyleaf pondweed was identified at two sites in 2003 and now occupies eight sites as of 2012.

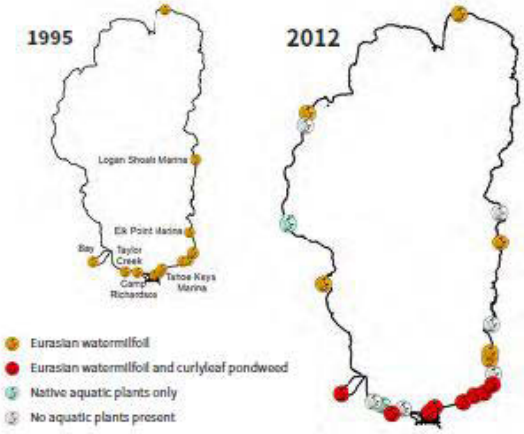
Both aquatic invasive plants spread through fragments transported by currents and boats as well as by root structures, seed and in the case of curlyleaf pondweed, by clone structures called turions. In 2006, invasive warm water fish species were found in 12 of 19 sites surveyed, but current distribution is unclear.

Recommended Action: Control

Efforts to remove a nearly 6 acre infestation of Eurasian watermilfoil in iconic Emerald Bay proved successful through a multi-year comprehensive strategy using bottom barriers to block out sunlight, followed by SCUBA diver-assisted suction and hand removal of plants. As of 2015 there are no longer aquatic invasive plants at this site. This methodology has been used effectively at other infestations in Lake Tahoe including lakeside of the Tahoe City Dam where a quarter acre infestation was removed in 2014. Mechanical removal of warm water fish using electro-shocking has decreased these fish populations in the short term. Multi-year treatments are recommended to occur in concert with aquatic invasive plant removal efforts. All control efforts need to include post-project monitoring to assess effectiveness.

Photos: Phil Caterino (left), California State Parks (right)

Spread of Invasive Aquatic Plants in Tahoe



Category 2 Species | Potential Control Action

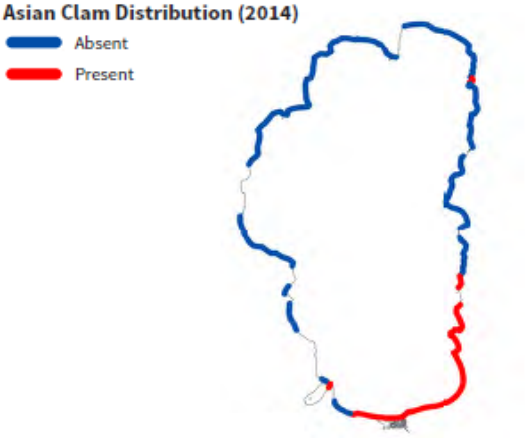
- **American Bullfrog (amphibian)**
- **Signal Crayfish (invertebrate)**

There are existing control methods that have proven to reduce populations of these species but the long-term feasibility of these methods for use at Lake Tahoe is still unknown.

American bullfrogs have been observed along the south shore since 2004, including several breeding populations. Signal crayfish populations dominate the nearshore zone around the entire Lake with the highest densities along the west and north shores. Both species are voracious predators that significantly alter the food web, while crayfish can also provide a food source for invasive warm water fish species.

Recommended Action: Increased Monitoring
Crayfish are currently being commercially harvested but it is unknown if this action is significantly reducing populations. It is unclear at this time if American bullfrog populations are increasing in Tahoe and what unwanted effects may be occurring. Increased monitoring of both species will assist in guiding future control actions. In areas where bullfrogs persist, proposed future projects should include monitoring and potential control actions. [2]

Asian Clam Distribution (2014)



Category 3 Species | No Feasible Control

- **Mysid Shrimp (invertebrate)**
- **Asian Clams (invertebrate)**

At this time, no control method that is allowed at Lake Tahoe has been proven to be successful in effectively reducing populations.

Mysid shrimp were intentionally introduced into Lake Tahoe in the 1960s as a food source for game fish (kokanee salmon and lake trout). They now persist in high densities (300 individuals per square meter) throughout the lake. They dramatically alter the native food web and have been proven responsible for fisheries collapse in other regions. There are no known control methods for mysid shrimp.

In 2002, researchers found low densities (two to 20 individuals per square meter) of Asian clams in a small section of the southeastern portion of the Lake, but by 2014, populations had spread along approximately 13 miles of shoreline from Cave Rock to Baldwin Beach (including a six acre satellite population at the mouth of Emerald Bay), with densities reaching 5,000 individuals per square meter in some areas. Once established, Asian clams dominate the lake bed and have been associated with algal blooms. Their shells also wash up on beaches in large numbers, affecting aesthetics and usability.

Recommended Action: Research Control Methods
Small scale control actions in areas where Asian clams are causing negative impacts to water quality should still be implemented while continuing to research a combination of control methods for future use. [2]

Site Prioritization for Control Actions | Category 1 Species

A decision support tool was developed, with factors including fish/plant interactions, infestation size, human visitation and satellite populations. **The goal is to reduce overall expansion of these species in Lake Tahoe**

1. Tahoe Keys Main Lagoon | 2. Tahoe Keys Marina | 3. Meeks Bay | 4. Ski Run Marina & Channel
5. Tahoe City Dam | 6. Lakeside Marina | 7. Regan Beach | 8. Taylor Creek | 9-11. Crystal Bay Marinas 1,2,3

These ecologically-driven priorities will be further refined in an action list based on factors such as cost and feasibility.



Tahoe Keys

The Tahoe Keys is a large private homeowners development and commercial marina completed in the 1960s within the Upper Truckee meadow. It consists of 1,529 homes covering 372 acres of land and 172 acres of interconnected waterways, with three outlets to Lake Tahoe. Several AIS were introduced beginning in the 1970s and 80s that have now become established populations and a potential source for spread to the rest of Lake Tahoe.

Two of these invasive aquatic plant species, Eurasian watermilfoil and curlyleaf pondweed, along with a nuisance native aquatic plant, coontail, now occupy nearly 100 percent of the waterways. The environment created within the Tahoe Keys provides the perfect habitat for invasive warm water fish and the potential introduction of other AIS. Any efforts for long-term control of these species in Lake Tahoe are contingent upon control within the Tahoe Keys.
The Tahoe Keys Property Owners Association (TKPOA) invests $400,000 per year to "harvest" these plants in order to maintain use of the channels. A better solution is needed and the TKPOA has recently completed an Integrated Weed Management Plan (IWMP) to address this problem.

Recommended Action
The IWMP recommends a suite of control actions including the placement of bottom barriers, shifts in landscape practices to reduce nutrient inputs and targeted herbicide application (among others). The implementation of this plan still requires regulatory agency approvals and extensive environmental review with a target date for action no sooner than 2017. [3]

We Must Continue the Fight

The Lake Tahoe AIS Program, a partnership composed of 40 agencies and organizations, has successfully prevented new introductions of AIS into Lake Tahoe since 2008 and provides the framework for successful implementation of AIS control actions moving forward.

The recent development of two science-based control plans for Lake Tahoe and the Tahoe Keys offers the guidance needed to systematically and comprehensively stop the assault of AIS on Lake Tahoe. Additionally, the recent passing of California Senate Bill 630 (SB630) provides funding from private pier and buoy leases, a portion of which is directed to AIS control efforts at Lake Tahoe. With the combination of best available science, extensive public education, agency collaboration and private sector participation solving the AIS Challenge is within reach.

We must continue to make progress. The next step is to secure the additional funding needed to expand and improve the control efforts to protect the Lake.

Information in this overview is drawn from the following management plans.

1. TRPA (Tahoe Regional Planning Agency). 2014. Lake Tahoe Region Aquatic Invasive Species Management Plan, California - Nevada. 35 pp. + Appendices.

2. Wittmann, M.E. and Chandra, S. 2015. Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe. Lake Tahoe AIS Coordination Committee, July 31, 2015. Reno, NV. 52 pp.

3. August 2015. Draft Integrated Weed Management Plan for the Tahoe Keys Lagoons. Prepared by Sierra Ecosystem Associates for the Tahoe Keys Property Owners Association.

You can make a difference.
Contact one of these organizations or agencies to get involved.

KEEP TAHOE BLUE
League to Save Lake Tahoe

TAHOE REGIONAL PLANNING AGENCY

TAHOE FUND

TAHOE LAKEFRONT OWNERS' ASSOCIATION

Photos (clockwise from top left): League to Save Lake Tahoe, League to Save Lake Tahoe, Map data ©2015 Google, Tahoe Resource Conservation District

Tahoe Keys Property Owners Association (TKPOA)
http://www.keysweedsmanagement.org

Multiple documents are available on the website, listed below.

The revised application (2018) was not posted on the TKPOA website as of 10/24/18.

All materials submitted for the current proposed application should be posted on a public information page on the Lahontan website in November 2018. *https://www.waterboards.ca.gov/lahontan*
(pers. Comm. D. Smith / R. Norman, Lahontan)

Tahoe Keys Water Quality Board Update
From Board Chair, Andy Kopania / September 25, 2018 / Printed in Keys Breeze, October Edition

Update on Plans to Combat Weeds in the TKPOA Lagoons:
As aquatic invasive plants have increasingly become an urgent, Lake Tahoe-wide threat to water quality, the environment and the economy, the Tahoe Keys Property Owners Association has been hard at work on implementing strategies to control the plants both today and well into the future. As the Chair of the Water Quality Committee I wanted to give an update to the members as to where we are at in the process.

What we are doing today:
Harvesting + Fragment Collection:
In 2017, TKPOA staff removed 9,996 cubic yards (that's more than 900 dump trucks) of aquatic invasive plants from its lagoons, an undertaking that totaled more than 6,000 man-hours of work. We have also installed a bubble curtain across the west channel entrance. The bubble curtain, together with the boat back-up station, is designed to significantly reduce the number of weed fragments that leave the Tahoe Keys lagoons and enter Lake Tahoe.

Bottom Barriers:
Bottom barriers were once again installed this spring in the lagoons at locations requested by homeowners who volunteered for this program.

Non-Point Source (NPS) Plan:
As part of the Waste Discharge Requirements (WDRs) issued to TKPOA by the Lahontan Regional Water Quality Control Board (Lahontan), we have prohibited the use of phosphorus-containing fertilizers, encourage the reduction of lawn irrigation, and have conducted "lunch and learn" seminars for contractors to educate them on ways to reduce the release of nutrients and other contaminants (e.g. from construction work or from draining spas) into our lagoons.

Laminar Flow Aeration:
We are also in the process of applying for permits from various regulatory agencies to test a technology called Laminar Flow Aeration (LFA). LFA involves bubbling air through several small diffusers on the bottom of the lagoons. The air bubbles cause the water to circulate, increasing the amount of oxygen at the bottom of the lagoons, which in turn changes the form of some of the nutrients in the sediment and "muck". This change is intended to make the nutrients less available for

the weeds, which should reduce the rate and amount of weed growth in the area of the LFA test. The test will be conducted in the lagoons adjacent to Christie Drive, north of Venice Drive. TKPOA has received financial support for this project from The League to Save Lake Tahoe.

Before we can start this test, we need to receive permits and regulatory approvals from the Tahoe Regional Planning Agency (TRPA), the California Department of Fish and Wildlife, the U.S. Army Corps of Engineers, and Lahontan. The number of regulatory approvals needed for this simple test illustrates some of the challenges that TKPOA faces in finding and implementing solutions to the aquatic invasive weed infestation. A similar test was recently approved and installed at Ski Run Marina so we are hopeful that we will also receive approval soon.

Plans for the Future:
While we are committed to non-chemical methods for long-term control of invasive plants; the reality is that the current approved methods are not enough to reduce the infestation to the point where those methods can keep up with the growth across the 170 or so acres that make up our lagoons.

To get the plant growth to a level where non-chemical methods can be effective and the need for harvesting will be substantially reduced, we are proposing a short-term, highly managed spot use of herbicide in specific areas of the lagoons, away from the main channel and far from the entrance to Lake Tahoe. In short, our expert panel and consultants have indicated that short-term herbicide use will provide the most promising option at this point to truly curtail and treat the aquatic invasive plants in the Tahoe Keys and minimize the potential for spread throughout the lake and beyond the control of resource managers.

In order to move forward with controlled herbicide use, a joint Environmental Impact Statement (EIS)/Environmental Impact Report (EIR) must be prepared by TRPA and Lahontan. In step with this process, we have applied for a permit from both agencies to allow use of safe, EPA-approved herbicides to combat the weeds. The herbicides that our experts have recommended target the specific invasive weed species but do not affect native aquatic plants, fish, wildlife, or recreation. The proposed rate of application would be well below the EPA-approved concentrations and are expected to quickly degrade. The herbicides would only be used in a series of controlled and careful applications to reduce the volume of plants to a manageable level, and then replaced with non-herbicide methods for long-term weed management.

Despite the documented safety of using the proposed herbicides to combat the invasive weeds, we understand that herbicide use can be a divisive and contentious topic. To ensure transparency and constructive dialogue, key stakeholders have agreed to engage in a collaborative process over the next 12 months. Several stakeholders, including TKPOA, worked with TRPA to hire Zephyr Collaboration to conduct the facilitation and mediation work during the EIS/EIR process to ensure there is input from all stakeholders. Our hope is that by engaging in a robust collaborative process to design the most effective path forward, we will get to a solution faster.

We will keep the TKPOA membership updated as we move forward through the process.

If you would like to know more about the EIR/EIS process, herbicides or the invasive weed management plan in the Tahoe Keys, please visit www.keyweedsmanangement.com or attend one of our monthly Water Quality committee meetings.

- Reference:
  {OLD} Application for Exemption to the Basin Plan Prohibition on the Use of Pesticides for the Tahoe Keys West Lagoon Integrated Control Method Test (Amended Supplemental July 20, 2017) Appendices

Tahoe Keys West Lagoon Integrated Control Methods Test Application - Supporting Materials:

- Boat Backup Station Report
- Water Quality Report
- Water Quality Report Volume 2
- Appendices
- Biological Control
- Floating Treatment
- Wetlands Mechanical Controls
- Sediment Report
- Skimmer Boat Evaluation
- Treatment Options and Engineering Controls for Aquatic Invasive Plant Mitigation
- Benthic Macroinvertebrate Sampling Report (2016)
- End of Season Harvesting and AIS Report (2016)
- 2016 Mesocosm Study
- Rhodamine WT Dye Study Report
- Nonpoint Source Water Quality Management Plan
- Water Quality Certification Letter
- Bottom Barrier Monitoring Report
- Macrophyte Survey Report
- Integrated Management Plan Update

(Editor Note 1: The Tahoe Water Suppliers Association Board of Directors' position on non-emergency AIS management is as follows: Lake Tahoe's' ONRW Tier 3 status warrants that permitted herbicide use should be considered only after the full testing and failure of all non-chemical control methods. In the case of the introduction of zebra or quagga mussels {which would be considered an emergency} chemical methods could be warranted.)

(Editor Note 2: In addition to weed problems, some of Tahoe Keys Lagoons were subject to intensive blue green algae growth and associated cyanobacteria blooms for several weeks in summer 2017. The situation was monitored and public health notices posted, but no control actions were taken. http://www.tahoedailytribune.com/news/toxic-algae-detected-in-some-tahoe-keys-waterways)

Aquatic invasive plants affect all the marinas around Lake Tahoe and continue to spread, constituting the immediate threat to Lake Tahoe, according to the University of Nevada, Reno's 2015 Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe.

The comparatively warm and shallow waters of the Tahoe Keys lagoons (located in South Lake Tahoe) make for the perfect habitat for the aquatic invasive plants (Eurasian watermilfoil and curly leaf pondweed). Ongoing harvesting programs pulled roughly 100 cubic yards of weeds in 1984 - around 10,000 cubic weeds were removed in 2016. They have now taken over more than 90 percent of the 172-acre lagoons.

The Tahoe Keys Property Owners Association (TKPOA) has been leading the efforts to address the growing concerns over aquatic invasive weeds in their lagoons. In 2015, the TKPOA commissioned Sierra Ecosystem Associates (SEA) to prepare an Integrated Weeds Management Plan (IWMP).

The IWMP in its May 2016 revision focused on non-chemical control methods. However, a one – time pilot test of herbicides was initially proposed for 2018, separate from the IWMP activities.

The main goal of the Tahoe Keys Integrated Management Plan is to gain control over aquatic invasive weeds and nuisance weeds in the Tahoe Keys lagoons, which are a major part of the greater Tahoe Keys development. The plan aims to reduce the biomass (overall volume) of these weeds – curly leaf pondweed, coontail and Eurasion watermilfoil – by about 90% (revised 70-80% 2018) from 2015 levels by the year 2020.

The goals of the Nonpoint Source Water Quality Management Plan are to reduce runoff and the sediment, nutrients and other pollutants that runoff can carry into the keys lagoons and into Lake Tahoe.

TWSA Executive Summary of Tahoe Keys Lagoons Restoration Project submitted to regulatory agencies on July 25, 2018 (Summary by S. Vidra)

The Tahoe Keys Homeowners Association (TKPOA) submitted a revised project plan to the TRPA and Lahontan RWQCB (LRWQCB) on July 25, 2018, "Tahoe Keys Lagoons Restoration Project, Application for Approval to Reduce Aquatic Invasive and Nuisance Plant Species" referred to in this document as 'The Project'.

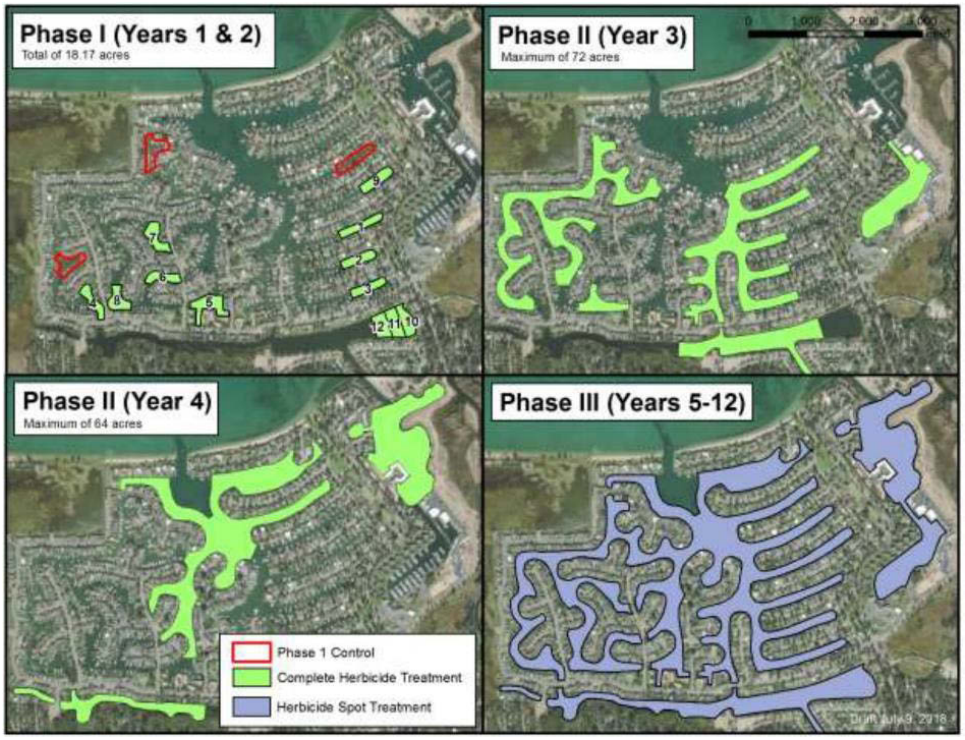
The previous pilot project application submitted to the TRPA and the LRQWCB submitted in July 2017 underwent the regulatory review process of both organizations. The conclusion of this process what that the TKPOA would need to do a full CEQA Environmental Impact Report (EIR) and TRPA Compact Environmental Impact Statement (EIS). The TKPOA then revoked the July 2017 Pilot application, and resubmitted The Project plan to provide a comprehensive restoration project for the EIR/EIS process.

The Project has been deemed incomplete by both LRWQCB and TRPA without the EIR/EIS analysis and resulting revisions from findings, as of August 27, 2018.

On September 13, 2018, LRWQCB Staff provided additional information to the TWSA Board on the current review of The Project, and its escalation to legal counsel of the CA State Water Resources Control Board (CA Water Board) and EPA, for antidegradation determination to a Tier III Outstanding National Resource Waterbody (ONRW Tier III). The LRWQCB will have legal counsel results by November 2018, and LRWQCB staff believes that the cumulative effects of The Project will result in long-term degradation, and require a resubmission of The Project.

The following is a summary of 'The Project' for review/reference of the TWSA Board.

The TKPOA is proposing a 12-year, three-phase full-scale herbicide implementation project; this is not a pilot as proposed in 2017. The Project includes the use of two CalEPA approved herbicides, and one EPA approved herbicide.



By the completion of the 4th year of The Project, the entirety of the TKPOA lagoons will be treated with herbicide, with exception of the Main Lagoon.

Project Phases

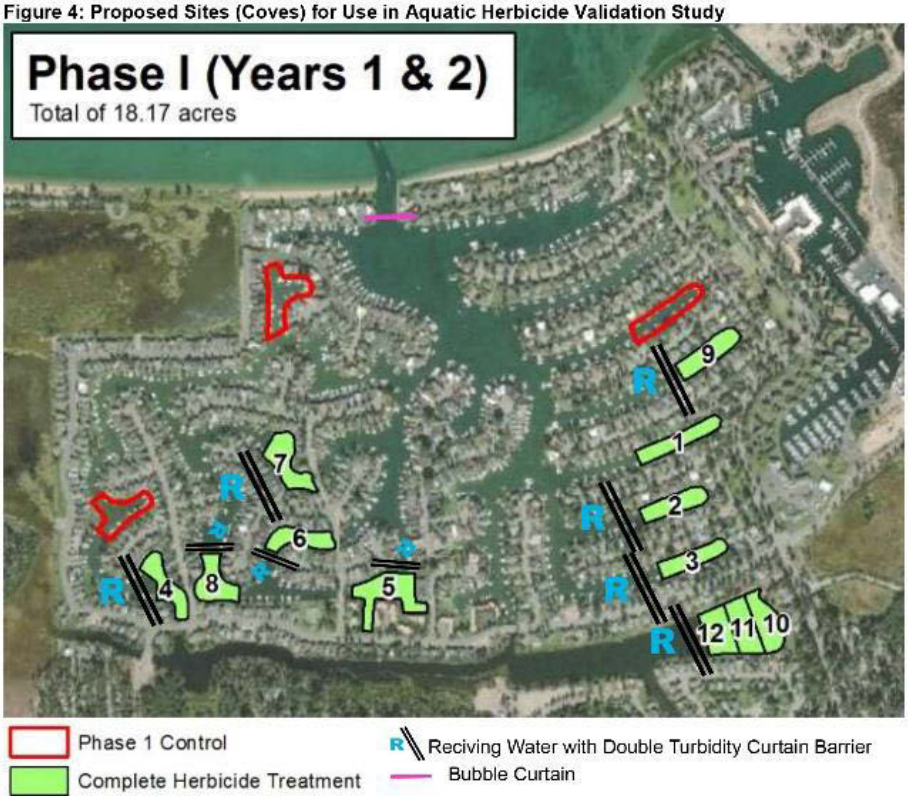
- Phase I:
  - Year 1 = 18 acres of herbicide treatment
  - Year 2 monitoring and non-chemical.
- Phase II:
  - Year 3 = 72 acres of herbicide
  - Year 4 = 64 acres of herbicide
  - Implementation non-herbicides controls after treatments.
- Phase III:
  - Years 5-12, ≤ 35 acres of herbicide ('spot' treatment of larger re-infestation areas) per year.

Herbicide Application Approach

- If there is more than 75% of Eurasian watermilfoil then the site will be treated with ProcellaCOR™ (or triclopyr if ProcellaCOR™ is not approved by CalEPA).
- If there is more than 75% of curlyleaf pondweed, then endothall will be used.
- If there appears to be an even mix of Eurasian watermilfoil, curlyleaf pondweed, and coontail, then endothall will be used.

Phase I: Years 1 & 2, Herbicide Validation Study (HVS)

Figure 4: Proposed Sites (Coves) for Use in Aquatic Herbicide Validation Study

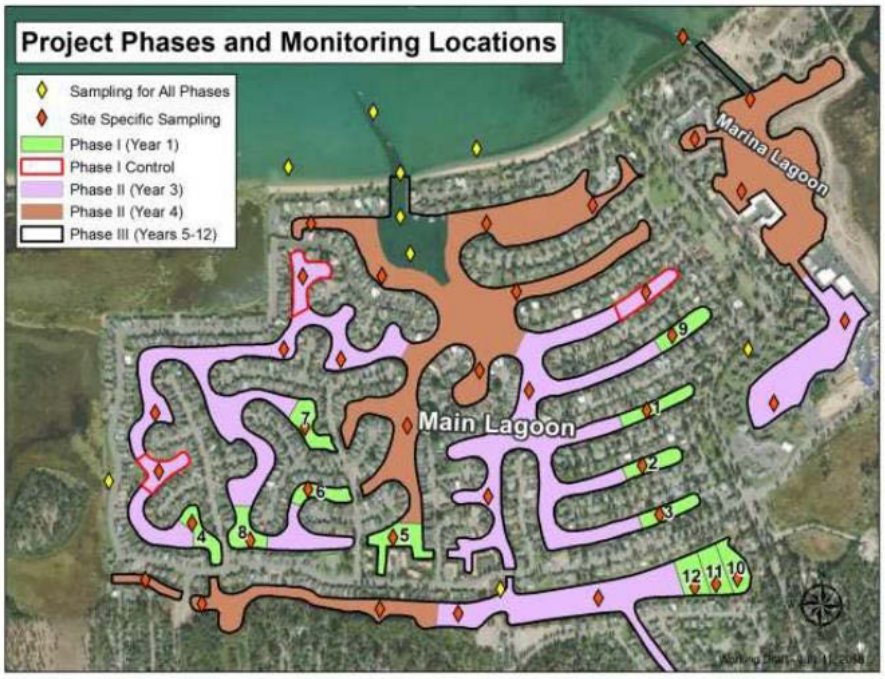


- Number of Sites: 12, sites 1-9 dead end coves, sites 10-12 Lake Tallac
- Total Acres: 18
- Control sites: 3, TBD areas
- Herbicides to be validated: Triclopyr, Endothal, Penoxsulam, Florpurauxifen-Benzyl
- Containment: Double turbidity curtain at treatment site, bubble curtain at West Channel
- Monitoring Plan: target and non-target plant populations, herbicide active ingredient concentration and movement, Active Ingredient degradants, in situ parameters*
- Number of monitoring locations: 20 locations in the main lagoons, 4 locations lake Tahoe (Figure 9)
- Number of herbicide monitoring sites: 1 site for each herbicide, 3 stations with in each site, 3 outside site (Figure 9). Duplicate samples unanalyzed will be frozen for contingency analysis.
- Degradant monitoring: 1 site for each herbicide, 3 stations with in each site, 3 outside site (Figure 9)
- Monitoring schedule: Pre- Treatment/herbicide application 24-hours prior, post Treatment/herbicide application 6-hours, 24-hours, 72-hours, 14-Days, continued if detected at previous in 30-day increments until ND.
- Sample Depth (Pre- and Post- Treatment): Surface 12-25cm below, mid-depth, bottom 25-30cm from bottom. 72-hours post-treatment mid-depth only.
- Cost per acer of Herbicide Treatment: $250-$500

- Allowable water quality objective violations: Complete Herbicide Treatment area only, no violations allowed in receiving water adjacent to double turbidity curtain (Figure 4).

* In situ measurements with be conducted using a calibrated, logging device for the following parameters: dissolved oxygen, redox, pH, temperature, turbidity and conductivity.

Figure 9. Proposed Project Phases and Monitoring Stations



Phase II: Years 3 & 4, Full Scale Implementation

- Total Acres: treatment area 1- 72 acres, treatment area 2-64 acres
- Control sites: 0
- Herbicides: Triclopyr, Endothal, Penoxsulam, Florpurauxifen-Benzyl
- Containment: Double turbidity curtain at treatment site, bubble curtain at West Channel
- Monitoring Plan: target and non-target plant populations, herbicide active ingredient concentration and movement, in situ parameters*
- Number of herbicide monitoring sites: 1 station (minimum) inside treatment area, 1 station (minimum) outside treatment area.
- Monitoring schedule: Pre- Treatment/herbicide application 24 hours prior, post Treatment/herbicide application 24-hour increments, then weekly until ND
- Sample Depth (Pre- and Post- Treatment): Surface 12-25cm bellow, mid-depth, bottom 25-30cm from bottom. 72-hours post-treatment mid-depth only.
- Required additional documentation: Aquatic Pesticide Application Plan with detailed monitoring plan.

Phase II Treatment Area 2 includes the Marina Lagoon. Treatment of the Marina Lagoon will only take place if all property owners enter into Memorandum of Agreements with TKPOA or if other regulatory permissions/orders are issued to treat in this area.

Phase III: Years 5-12, Maintenance

- Total Acres: ≤ 35 acres of herbicide per year
- Control sites: 0
- Herbicides: Triclopyr, Endothal, Penoxsulam, Florpurauxifen-Benzyl
- Containment: Double turbidity curtain at treatment site, bubble curtain at West Channel
- Monitoring Plan: See Phase II
- Required additional documentation: Aquatic Pesticide Application Plan with detailed

Contingency Monitoring Locations

Phase I only: If herbicides are detected within the west channel then additional contingency sampling will be conducted at sites 0.25 mile to 0.5 mile intervals extending from the channel in three directions:

Figure 12. Additional Contingency Monitoring Stations for Phase I

*Samples for Herbicide will only be taken at these sites if herbicide residues are detected within the West Channel

Permits and Approvals (Anticipated)

- LRWQCB Basin Plan Prohibition Exemption
- LRWQCB Individual NPDES Permit
- LRWQCB Antidegradation Analysis
- LRWQCB Water Quality Certification
- TRPA Environmental Improvement Program Permit
- CA Fish and Wildlife Lake and Streambed Alteration Agreement
- USACE Nationwide Permit
- Combined CEQA, TRPA Environmental Document and public review process

Contingency Measures:

Well Water Treatment

- If monitoring detects herbicide residues at the Tahoe Keys Water Treatment facility, then TKPOA operators will be instructed to only use Well No. 2 for water supply, which is equipped with charcoal filters.
- Additional water demand will be met under the Mutual Aid Agreement with South Tahoe Public Utility District using the existing water system connection.

On Site Treatment:

A mobile filtration system will be rented on site and available to treat:

- Localized areas if herbicide residues exceed allowable label use.
- To treat groundwater supplies if needed to support Well 2's treatment system.

Herbicide Alternatives Considered
A table of non-chemical methods considered and primary reasons for dismissal is available in section 3.0, Table 5, pages 55-58.

Decisions Criteria for herbicide treatment
- A flow chart has been provided for Phase I in section 1, figure 7, page 28.
- A flow chart has been provided for Phase II and Phase II in section 1, figure 8, page 29.

Media Coverage of the TKPOA IWMP
Beginning in summer 2015, the topic was picked up by several news sources. TWSA is one of the more vocal groups in the Tahoe region critical of the plan's heavy reliance on chemical control methods.

News articles published with TWSA/IVGID coverage on the IWMP topic include:

- Tahoe Quarterly http://tahoequarterly.com/environment/solutions-differ-on-weeds-choking-tahoe-keys
- Lake Tahoe News http://www.laketahoenews.net/2017/04/purity-lake-tahoe-water-source-pride/
- High Country News: *https://www.hcn.org/articles/can-herbicides-keep-tahoe-blue*
- Sierra Sun: *http://www.sierrasun.com/news/18445143-113/feds-ok-herbicide-use-near-lake-tahoes-south*
- Moonshine Ink: *http://www.moonshineink.com/sites/default/files/Moonshine_Ink_Vintage_13_Nip_12_v2.pdf*

General articles on same topic:
- *http://www.sierrasun.com/news/18302838-113/trpa-column-meeting-the-aquatic-invasive-species-challenge*
- *http://www.sierrasun.com/news/opinion/17985648-113/opinion-the-trpa-unr-are-misleading-you*

Below is the story that was featured in High County News web edition:

"Can Herbicides Keep Tahoe Blue?"
https://www.hcn.org/articles/can-herbicides-keep-tahoe-blue
A new chemical weed management plan has the lake's water suppliers nervous.
Ben Goldfarb Sept. 28, 2015 Web Exclusive

On a hazy July afternoon a few miles west of the California-Nevada border, Lars Anderson paces the docks that frame Lake Tahoe's southern shore, twirling a rake in his right hand, preparing to pull some weeds. With a flick of his wrist, the plant physiologist flings the rake, tethered to an orange rope, 20 feet out into the lake's opaque waters. Anderson hauls hard and the rope twangs taut, as though he's hooked a gigantic fish. At last his catch emerges: a dripping mat of blackish vegetation,

longer than Anderson is tall, its tendrils dense and clotted as hair plucked from the drain. Anderson lays it on the dock, where it shimmers like a dead deep-sea squid.

The plant, Anderson pronounces, is Eurasian milfoil, an invasive species. He picks through the snarl, finally plucking a green needle from the slimy haystack. “Native elodea,” he says, holding up a pitiful sprig. “This is probably 5,000-to-1, non-native to native.” Speedboats line the docks of the marina; cookie-cutter houses squat along the shore. “If we didn’t do anything, this whole thing would be covered in plants,” Anderson says. “You couldn’t even get a boat out.”

Welcome to the Tahoe Keys.

Lake Tahoe is famous for many things: world-class skiing, slightly less world-class casinos, Frank Sinatra’s rowdy Rat Pack. Above all, however, it’s famous for being blue. Writing in 1863, the physicist John LeConte was astounded by its lucidity and spectral diversity; he observed “cyan-blue (greenish-blue), Prussian blue, Cobalt-blue, genuine ultramarine-blue,” and even “Marie-Louise blue,” a tribute to the color of Napoleon’s army’s uniforms.

In the Tahoe Keys, however, the water takes on a murkier cast, as though a few dollops of brown paint have mixed with the indigo. The Tahoe Keys is a manmade 750-acre housing complex that was dredged from the wetlands along Tahoe’s southern shore in the 1960s; these days, it’s described by the *Tahoe Daily Tribune* as an “amalgam of islands and peninsulas with no particular symmetry at all.” Invasive species readily colonized the Keys’ warm, shallow artificial channels, particularly Eurasian milfoil, which arrived in the 1980s. The weedy mats entangle propellers, crowd out native vegetation and spawn algal blooms by pumping nutrients into the water column.

“When I first moved out here, you’d see a hundred kids swimming in the Tahoe Keys canal — now, you wouldn’t let your dog swim in there,” says Steve Urie, a resident of nearby Truckee who’s lived in the area for over 40 years. “If we didn’t have the Tahoe Keys, there wouldn’t be an invasive species issue.”

Milfoil also shelters other invaders, like bluegill, largemouth bass and even gargantuan goldfish. Not only has the Keys been itself overrun, it’s become a locus of invasion for the entire lake: Scientists think that boaters accidentally introduced milfoil to nearby Emerald Bay State Park, among other sites. In recent years, California’s drought has encouraged the plant’s growth by reducing lake levels and exposing more habitat. Another hardy invader, curlyleaf pondweed, is spreading, too.

“Weeds have a tendency to get up a head of steam, and their expansion can be exponential,” says Joel Trumbo, senior environmental scientist at the California Department of Fish and Wildlife. “Sooner or later, they’ll move out of the Keys and find suitable habitat in other places around the lake and cause ecological havoc.”

Now lake managers are considering more aggressive tactics to control the invasion. The Tahoe Keys Property Owners Association, a residential community comprising 1,500 homes, already spends $400,000 annually on harvesters — floating mowers — that remove the plants. But the harvesters haven’t succeeded; in fact, they may actually promote milfoil’s spread, by creating plant fragments that settle and establish elsewhere. Call it the Sisyphean approach to weed control.

That's why Anderson and others want to try a technique alien to Lake Tahoe: herbicides. The Tahoe Keys Integrated Weed Management Plan — released in August by the Property Owners Association — mentions the usual mechanical strategies, including better harvesting, scuba divers pulling up plants, and bottom barriers, mats that block sunlight and smother weeds. But it also relies heavily on chemical control. "The problem is big enough that we need to consider all available methods, and that includes herbicides," says Anderson, a former Department of Agriculture aquatic weed specialist who co-authored the plan as a consultant to the Association.

Though the Keys has yet to decide on a chemical, the draft management plan mentions five polysyllabic options, such as imazamox and penoxsulam. Trumbo, one of five independent experts who reviewed the plan, attests to its safety. "Herbicides are directed at plant physiological processes," he says. "The potential herbicides they'd be using on this project run from slightly toxic to fish down to practically non-toxic — the two lowest categories. When it comes to mammals, it's largely the same thing."

Trumbo adds that herbicide concentrations will be low enough, and dilution rapid enough, to keep the odds of dangerous human exposure vanishingly small. And if monitoring suggests that herbicides may escape the Keys' canals and enter the rest of the lake, giant curtains can be lowered to contain the chemicals' flow.

Next month, the Keys plans to submit the Weed Management Plan to the Lahontan Regional Water Quality Control Board, the regulatory body that governs Lake Tahoe. Though Lahontan had long prohibited the application of pesticides in Lake Tahoe, in 2011 it created an exemption, motivated by the arrival of invasive quagga mussels in nearby Lake Mead.

Still, the exemption is no rubber stamp: "Herbicides have never been used before, and people are going to want to make sure it's being done carefully, and to the minimum extent necessary," says Lauri Kemper, assistant executive officer at Lahontan. If the board OKs the Keys' weed plan, the herbicides could start flowing in 2017 and continue through 2020.

Predictably, not everyone is delighted at the prospect of dousing Lake Tahoe with chemicals. Down by the docks, 50 feet from where Anderson harvests his weedy bounty, Madonna Dunbar, a pink-faced woman in a broad sunhat, discourses on why the herbicides represent a potential catastrophe. Dunbar serves as executive director of the Tahoe Water Suppliers Association, a group that represents 11 Lake Tahoe municipal water providers. Dunbar's constituents purvey some of the country's finest water: Beyond the Keys, the lake's water is so clean that six water suppliers have a rare filtration exemption from the EPA.

Dunbar believes it would be madness to jeopardize that purity, either in reality or in reputation. After all, Rachel Carson and Theo Colborn, the scientist who helped alert society to the perils of endocrine disruptors, have taught us that categorically guaranteeing the safety of chemicals is a dangerous game. Penoxsulam, for instance, is classified as "Suggestive Evidence of Carcinogenic Potential," which means that it may cause tumors in rodents, though there's "not enough information to extrapolate the risk to humans." According to one analysis, water droplets from the Keys can reach nearby drinking water intakes in less than 24 hours.

"We have a long history of spending billions of dollars to prevent things from entering Lake Tahoe," Dunbar says. "This would be a total shift in philosophy about what's allowed here."

Dunbar agrees that milfoil poses a serious problem — she just believes that chemicals should remain a last resort. "That's what it means to be an *integrated* plan, and not just an aggressive herbicide plan," she says. Among other techniques, she advocates retrofitting harvesters into rototillers that would churn up the bottom and dislodge plants by their roots, a method that the Okanagan Basin Water Board has used in British Columbia to control milfoil. (In response, Anderson points out that Okanagan used the rototillers in a swimming area, rather than in a sensitive ecosystem.)

It's true that mechanical removal worked in Emerald Bay, the state park that was invaded by milfoil along its western shore. There, teams of divers hand-pulled a million stems over four years; in 2015, Dan Shaw, an environmental scientist at California State Parks, has not seen any milfoil in Emerald Bay. "It really has exceeded our expectations," says Shaw, though the battle is far from won. "We have a thousand boats a day coming into Emerald Bay, and they could all be carrying (aquatic invasive species) — especially if they're coming from other infested areas."

Emerald Bay's experience, however, may not apply to the Tahoe Keys. Hand-pulling weeds is a laborious process; meanwhile, according to the weed plan, it would cost a whopping $65,000 to $100,000 per acre to install bottom barriers in the Tahoe Keys. By comparison, says Sudeep Chandra, a biologist at the University of Nevada-Reno who's studied the lake for over a decade, herbicides are "more effective and much cheaper."

Chandra didn't form that opinion idly — for years he'd refused to even consider herbicides in Lake Tahoe. "But seeing the amount of invasive species movement around the lake, and how it affects near-shore water quality, has made me change my position," he says. "The problem has gotten bad enough that we need to have multiple tools in the toolbox."

For decades, Lake Tahoe's advocates have been united in their approach to water quality. They've fought the buildup of impervious pavement that leads to polluted stormwater runoff; they've promoted forest health; they've battled the influx of sediment from rampant development. (In addition to the weed plan, the Keys is also working on a nutrient management strategy to curtail pollutants that stimulate weed growth.) In many ways, those efforts have paid off: According to UC Davis' 2014 State of the Lake report, last year Tahoe was the clearest it had been in over a decade.

"We're gaining a better understanding of how Lake Tahoe functions, and our efforts to keep it blue and clear are starting to work," says Geoffrey Schladow, director of the University of California, Davis Tahoe Environmental Research Center.

At least where the Tahoe Keys is concerned, however, consensus has broken down. A strain of "us versus them" permeates the rhetoric pitting Keys residents against other lake users: the anti-herbicide Facebook group with nearly 1,500 members, the op-eds asserting that "poisoning our lake for the convenience of homeowners … is not the answer." Herbicides seem to have widened existing divisions in a watershed where multimillion-dollar mansions and working-class communities crouch in tense juxtaposition, where year-round residents and Bay Area vacationers rub uneasy elbows.

Water quality in Lake Tahoe is virtually a religion, and "Keep Tahoe Blue" its mantra, proclaimed on bumper stickers across the West. Everyone — blue-collar or white-, full-time or time-share — is passionate about water. Yet different factions prioritize different qualities: Some want their lake clear and weedless; others are most concerned that it remains chemical-free, now and forever.

A development as harmful as the Tahoe Keys would never survive the permitting process today, but it's too late to reverse course now. Indeed, that's the nature of conservation throughout the modern West, where preservation has ceded to the management of fragmented landscapes and compromised waters.

"There's some deeply entrenched people who would like to return the Tahoe Keys to a wetland," acknowledges John Larson, president of the Property Owners Association's board of directors. That's not going to happen. Still, says Larson, "In the last few years, we've been working hard to accept responsibility for what we are, who we are, where we are. Dealing with weeds is part of that. It's something we have to do."

Summary of TWSA Issues and Concerns over Aquatic Herbicides

Lake Tahoe source water is some of the cleanest and purest drinking water in the world. TWSA water provider's water treatments systems are designed for deactivation / removal of biological contaminants. Their efficacy at potential organic chemical compound removal is unknown. If contaminants begin to be detected in municipal raw water sources, from any pollutant source, then ratepayers may face potential water outages and costly infrastructure upgrades. Circulation pattern models for Lake Tahoe, conducted by Dr. Geoff Schladow, indicate consistent, rapid, water movement from the Tahoe Keys area to the eastern portion of Lake Tahoe, which is the location of multiple drinking water intakes. (Report downloadable from: *www.yourtahoeplace.com/public-works/water/source-water-protection/documents-links*

The chemicals proposed for use have been tested and used primarily in lower quality waters. We believe Tahoe's special status as an ONRW Tier 3 waterbody warrants a strong focus on all non-chemical methods being used, before chemical application is considered. Chemical methods for the weeds control are supposed to be an option used after all other non-chemical methods have been vetted. The Tahoe Keys IWMP vetted non-chemical control methods and most were rejected because of the high cost of implementation. Some non-chemical methods have been proven technically feasible at Lake Tahoe, such as the successful Emerald Bay eradication of Eurasian Milfoil and Asian Clams, using bottom barriers and diver assisted suction.

Should chemicals be used for weed eradication it will be important that effective monitoring methods and best practices be used to assure that public health and safety are not impacted. This may include isolation of treated areas, enhanced monitoring and laboratory testing and potential neutralization of chemicals using portable water treatment systems.

The following is the official TWSA Factsheet on AIS Concerns:

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
Incline Village, Nevada, 89451
775-832-1212
www.TahoeH2O.org

TWSA Members:
Cave Rock Water System
Edgewood Water Company
Glenbrook Water Cooperative
Incline Village GID
Kingsbury GID
Lakeside Park Association
North Tahoe PUD
Round Hill GID
Skyland Water Company
South Tahoe PUD
Tahoe City PUD
Zephyr Water Utility

Tahoe Water Suppliers Association is Greatly Concerned by Potential Herbicide Use at Tahoe Keys to Control Aquatic Weeds

Who We Are
The Tahoe Water Suppliers Association (TWSA) is an organization whose members are the 11 principal Tahoe Basin municipal drinking water providers with intakes that draw water from Lake Tahoe, plus one groundwater utility. These providers serve the majority of water consumers in the Lake Tahoe Basin. TWSA's mission is *"to develop, implement and maintain an effective watershed control program in order to satisfy recommendations in watershed sanitary surveys, advocate for the protection of Lake Tahoe as a viable source of drinking water, and to satisfy additional state and federal requirements."*

Consistent with this mission, TWSA has been actively engaged in the public process with state and federal regulatory agencies working to address the proliferation of aquatic invasive weeds at Lake Tahoe and the impact potential control strategies may have on the quality of Lake Tahoe's drinking water and the infrastructure used to procure and deliver that water.

The Problem
Nuisance non-native and native aquatic plants have been observed in marinas and other recreational areas in Lake Tahoe and the Lake Tahoe Basin. Dense coverage of aquatic plants can degrade the water quality and aquatic habitat by making the ecosystem less favorable for native organisms that are adapted to the pristine water of Lake Tahoe. The excessive growth of these nuisance plants interferes with boating and recreational access to Lake Tahoe when they become entangled in propellers and keels. Plants can also ensnare swimmers and divers and compromise their safety. Various agencies, experts and observers agree that the greatest single concentration of aquatic plant and weed problems are in the Tahoe Keys development on the Lake's southwest shore. The Keys is a residential subdivision that includes inland waterways and coves and is home to the Tahoe Keys Marina, Tahoe's largest marina facility. The Keys totals 172 acres of water surface accessible to and from Lake Tahoe through two boating channels.

Tahoe Keys Property Owners Association (TKPOA) Integrated Weed Management Plan
By order of the California Lahontan Regional Water Quality Control Board, the TKPOA has funded preparation of an *Integrated Weed Management Plan for the Tahoe Keys Lagoons*. The stated purpose of the Plan is to "present a strategy to control and manage invasive and nuisance aquatic plants." **One of the control strategies identified in the Plan is the use of aquatic herbicides.**

Aquatic Plants and Weeds of Greatest Concern
The multi-agency Lake Tahoe Aquatic Invasive Species (AIS) Coordination Committee continues to inventory and track the presence and growth of aquatic nuisance and invasive plants and weeds and guide their management and control at Lake Tahoe. Specific to the Tahoe Keys, the *Tahoe Keys 2014 Aquatic Plant Survey* is another document prepared by the TKPOA. Three species are considered to be the most significant threat.

- **Curlyleaf Pondweed -** This plant is extremely adaptable and its spread beyond marinas to sections of Tahoe's nearshore is very visible. It is considered the main threat to Lake Tahoe's aquatic habitat. Pondweed "turions" spread as seed packets and can survive harsh conditions.
- **Eurasian Water Milfoil** - Colonization in Lake Tahoe itself is more limited, so this plant is more a threat to marinas and other areas where water is more shallow, sheltered and warmer. The plant spreads via fragments.
- **Coontail -** This species is native to Lake Tahoe. It thrives in deeper water. It becomes a safety and nuisance factor for boating, swimming, and diving due to its floating and matting nature.

TWSA Perspectives and Concerns

Our members provide water service to all manner of users, rate payers, tax payers and visitors to Lake Tahoe. We are dedicated to the protection of Lake Tahoe's pristine water quality and healthy ecosystem. We also appreciate recreational boating and water-based sports in the world-renown destination resort region. We recognize that the growth of invasive plants and weeds is a serious problem. Prompted by the exponential growth of invasive weeds, federal and state water quality regulators have lifted a previous prohibition against the use of aquatic herbicides in the waters of Lake Tahoe as one of the control strategies for invasive weeds. The chemicals proposed for use have been tested and used primarily in lower quality waters. TWSA believes Lake Tahoe's special status as a Tier 3 Outstanding National Resource Water (ONRW) warrants a priority focus on non-chemical methods before the use of chemical herbicides is considered. TWSA also urges the IWMP to include a more detailed analysis of the potential impacts of herbicides on drinking water supply.

TWSA members share concerns about the potential impact of herbicides on our water intake systems and quality of the water we provide to our customers. Tahoe's municipal water treatments systems are not specifically designed to remove chemical contaminants. Six TWSA members hold "filtration exemption" status from the U.S. Environmental Protection Agency (US EPA). This is a rare status, usually granted only to a "non-contact" watershed. It has been granted based on the fact that Tahoe "tap water" is some of the cleanest and purest drinking water in the world. The treatment process of ultra-violet and ozone disinfection used by members with "filtration exemption" status is designed for the deactivation of potential biological contaminants, not chemicals. Their effectiveness and efficiency at removing chemical compounds is unknown. In addition to TWSA members, a number of water systems owned by private companies and individuals also draw water from Lake Tahoe. If chemical contaminants begin to be detected near Lake Tahoe water intakes, our ratepayers and the owners of small private water systems may face costly infrastructure upgrades.

The purpose of this TWSA background and fact sheet is to help educate the public about the challenges of aquatic invasive weed management and control and our concern about the potential impact of aquatic herbicides on Lake Tahoe's pristine drinking water and our drinking water delivery systems. In 2016, the *TKPOA Integrated Weed Management Plan (IWMP)* was submitted to the Lahontan Water Board. In January 2017, the *Application for Exemption to the Basin Plan Prohibition on the Use of Pesticides for the Tahoe Keys West Lagoon Integrated Control Methods Test*, was submitted to Lahontan staff. The proposal is to test 3 different herbicides (Triclophyr, Endothall, Penoxsulam) in 9 locations within the Keys, a total of 13.7 acres, about 8% of the Keys water area, during one season, with followup in years 2/3 by diver handpulling, bottom barriers and harvesting. Mitigations are proposed to physically separate the treatment area from Lake Tahoe. Water quality sampling mitigation is also proposed. The proposal is currently under TRPA and Lahontan staff review, with anticipated public comment in early winter 2018, after CEQA environmental documents are prepared.

Learn More, Get Involved: To review the proposals, visit http://www.keysweedsmanagement.org./#methods. Comments are requested for the review process. Final documents will post at: http://www.waterboards.ca.gov/lahontan/public_notices/bp_prohibition_exemptions.shtml

SUBMIT COMMENTS AT ANY TIME TO:

Lahontan Regional Water Quality Control Board (LRWQCB)		***Tahoe Regional Planning Agency (TRPA)***	
Bruce Warden	*bruce.warden@waterboards.ca.gov*	*Dennis Zabaglo*	*dzabaglo@trpa.org*
Russell Norman	*russell.norman@waterboards.ca.gov*	*Paul Nielsen*	*pnielsen@trpa.org*

For More Information: Madonna Dunbar, TWSA, mod@ivgid.org 775-832-1212

TWSA Executive Summary - TKPOA Aquatic Pesticide Application Plan (APAP)
June 2016, S. Vidra (This information is provided for historical context. The APAP was withdrawn and resubmitted in 2018)

The TKPOA has prepared an Aquatic Pesticide Application Plan (APAP) in accordance with the Statewide General National Pollutant Discharge Elimination System (NPDES) permit, for residual aquatic pesticide discharges to water of the United States from algae and aquatic weed control, to the State Water Resource Control Board (WRCB).

The APAP includes the use of three aquatic herbicides, with 9 planned injection locations. Herbicides injections are justified in the application in order to obtain scientifically valid data on the herbicide efficiency and non-targeted effects of treatments. The herbicides and their target objectives are found in Table 4, page 23 of the document - an image of the table is provided below.

Table 4. Proposed Herbicide Products *(No Adjuvants will be used)*

Herbicide Active Ingredient (Product name)	EPA Reg. No. (All on Calif. General NPDES Permit)	Maximum allowable (ppm)	Proposed use (ppm)	Application Method (s)	Target Plants Controlled product labeling
Endothall (Cascade) Contact type	EPA Reg. No. 70506-176	5.0	2.0	Drop hoses	Eurasian watermilfoil Coontail Curlyleaf pondweed
Triclopyr (Renovate liquid or OTF) Systemic type	EPA Reg. No. 67690-42	2.5	1.0	Drop hoses or granular spreader for OTF formulation	Eurasian watermilfoil
Penoxsulam (Galleon SC) Systemic type	EPA Reg.No. 67690-47	0.1	0.02	Drop hoses	Eurasian watermilfoil Curlyleaf pondweed

*Products are approved for use under the General NPDES permit in California

The TKPOA is proposing the use of herbcides in the waters of the Tahoe Keys Lagoons because the current erradication methods are not sufficent in containing the growth of AIS, and other non-chemical method have not proven to be effective when used in a fashion that allows for recreational boating as listed on page 13. (There are boating constraints on useage on alternative large or small scale physical removal methods). The APAP calls for the treatment of 8% of the 172 infested acres of the TKPOA jurisdiction totaling 13.7 acres.

The TKPOA has listed 9 containment and contingency actions to protect Lake Tahoe including the following: Pre-herbicide use containment curtains, contingency containment curtains, "Fail Safe" closure of the west channel, Rhodamine (dye) WT monitoring, herbicide residue monitoring, water circulation (via existing pump system), well water treatment (activated charcoal), flooding the Tahoe Keys with Lake Tallac Lagoon water (via dam breach) and mobile filtration system. Triggers and location references are available on page 29.

The APAP includes a section with description of the monitoring program (section 8) pages 33-38, which includes section 8.1.2 Herbicides. Water samples will be taken pre-(background) and post herbicide application at fixed sampling stations, at mid-depth and 20 cm from the bottom. All samples will be analyzed using US EPA methods and all pre-application samples with be taken within 24

hours of application. Sample sites will include four locations within the treatment site (two mid-side, and one on each side of the site). At least five sampling locations will be established outside the treated site at approximtely 100 ft. linear intervals. Samples will be taken immediately adjacent of the west channel, at the mouth of the west channel and and 0.25 mile to 0.5 mile intervals extending from the channels in three directions (E,W,N) into Lake Tahoe, itself. Water samples will be taken pre and at the following post application intervals: 1 hr., 4 hr., 8 hr., 24,hr., and at 48 hr. intervals thereafter for 14 days. Sensitive site monitoring will be done at the well water intake in the Tahoe Keys, mouth of Memorial Bay, and three stations within 100 ft. from raw water intakes of TWSA Purveyors Lakeside and Round Hill at 30 ft. in depth. These sites will be sampled pre and post appliation at 24 hr. (pre and post) and 48 hr. intervials for 14 days for a total of 8 sampling events. The APAP includes a secton on examination of possible alternatives, all of wich have been exclided as as beening ineffective and costly.

Map of proposed sites for use in the (2018) aquatic herbcide demonstration is provided below:

It is unclear at this time if the information provided in the APAP will provide the Lahontan Regional WRCB with the criteria and procedures needed to apply for an exemption to the Basin Plan Prohibition of introducing aquatic pesticides into Lake Tahoe waters.

Proposed Activities and Timeline
(source: TKPOA)

TKPOA AIS Program Activities

	2016	2017*
Activities Required by Waste Discharge Reqs	• IMP Update (October) • NPS Water Quality Management Plan Implementation • Harvesting and Fragment Control • Annual Macrophyte Survey • Water Quality Certification Reporting • Prepare Annual Reports/IMP & NPS Update	• NPS Water Quality Management Plan Implementation • Harvesting and Fragment Control • Annual Macrophyte Survey • Water Quality Certification Reporting • Grant Research and Applications • Prepare Annual Reports/IMP & NPS Update
Proposed Elective Field Activities	• Baseline WQ and Sediment Sampling • Skimmer Boat Trials • Bottom Barrier Program • Modified Skimmers • Seasonal Weed Conveyor • RWT Dye Test Near Channels • Mesocosm Study • UV Light Trial • Boat Back-up Station with Monitoring	• Baseline WQ and Sediment Sampling (reduced scale) • New Doppler and WQ instruments • Bottom Barrier Program (larger scale) • Seasonal Weed Conveyor (one new) • Two Boat Back-up Stations with Monitoring • Combination Control Methods Test (Aquamog/Bottom Barrier/Control) • UV Light Trial • New Omni Cat and new TigerCat (skimmer boats)
Proposed Elective Research Activities	• Sterile Grass Carp • Other Biological Controls Evaluation • Water Circulation System Assessment Phase I • Floating Treatment Wetlands Evaluation • Dredging/ Dewatering Evaluation (Phase I) • Weed Rollers/ Rotovating	• Water Circulation/Treatment System Assessment Phase II (?) • Dredging/ Dewatering Evaluation Phase II (?) • Containment Barriers Phase II • Active Mounted Fragment Skimmers • Passive Mounted Fragment Skimmers • Weedrollers/ Rotovating Trials

*2017 activities will depend on funding availability and on 2016 findings.

Revised Draft September 22, 2016

Tahoe Keys Property Owners Association
AIS Program Additional Field Activities Status Update
September 22, 2016

Project	Status Update
Bottom Barrier	Installation of bottom barriers occurred in early June. Monitoring has occurred since installation by homeowners and SEA/ TKPOA staff. Bottom barriers are required to be removed by no later than October 15 and homeowner evaluations are due by November 1st. A final report will be prepared and submitted to the LRWQCB with the annual WDR package in January.
Water Quality, Sediment, and BMI Sampling	Water quality sampling began on May 9, and was conducted again on May 23, June 6, June 20, July 6, July 18, August 1, August 15, August 29, and September 12. Next sampling date is set for the week of October 10. Sediment sampling took place on May 25 and the next sampling is tentatively scheduled for October 11 and 12. BMI sampling took place on July 13, 14, and 21. Samples have been shipped to the lab where they will be analyzed and a preliminary report prepared.
New Skimmer Boat Trials and TKPOA Skimmer Boat Retrofit	Two manufacturers of skimmer boats conducted field tests. ELASTEC, manufacturer of the Omni Cat, and Weedoo, manufacturer of the TigerCat. There are continuing discussions with the manufacturers on possible boat modifications. An attachment for the existing skimming boats was constructed and is awaiting additional material before testing.
RWT Dye Study	West Lagoon dye injection took place on June 1 with monitoring June 1 thru June 3. An additional lagoon dye study began June 20th and was observed by several stakeholders. Tests of the barrier containment system took place in two locations; Alpine and Venice, and Emerald and Venice. The final report was prepared by Dr. Lars Anderson and submitted to the LRWQCB for review.
Mesocosm Study	Initial application of treatments took place on August 5. Weekly monitoring and recording has taken place since the start of the study. Harvesting of remaining plant biomass and disposal of test materials occurred on September 21. Plant material will be analyzed by Dr. Lars Anderson and a preliminary report will be prepared
UV Light Study	Study has been placed on hold until next summer due to inventor's complications with equipment.
Boat Back-Up Station and Monitoring	The boat back-up station will stay in place until the end of the season. Plans are being made for installation next season in both the West and East lagoons with possible assistance from the League to Save Lake Tahoe.

SEA Revised Draft September 22, 2016

TWSA Public Comment on the TKPOA IWMP Drafts
The following letters were submitted as part of the public comment and technical panel review process:

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
Incline Village, Nevada 89451
775-832-1212

August 22, 2017

NPDES Wastewater Unit
Attn: Gil Vazquez
State Water Resources Control Board
1001 I Street, 15th Floor
Sacramento, CA, 95814

RE: Comments on Tahoe Keys West Lagoon Integrated Control Methods Test; Notice of Intent for the General NPDES Permit for Residual Aquatic Pesticide Discharges from Algae and Aquatic Weed Control Applications for the Tahoe Keys Property Owners Association. WATER QUALITY ORDER NO. 2013-0002-DWQ GENERAL PERMIT NO. CAG990005.

To the California State Water Resources Control Board:

The Tahoe Water Suppliers Association (TWSA) Board of Directors wishes to comment on the *Notice of Intent (NOI) for the General NPDES Permit for Residual Aquatic Pesticide Discharges from Algae and Aquatic Weed Control Applications for the Tahoe Keys Property Owners Association*, recently submitted to the State Board. A bi-state organization, the TWSA represents both California and Nevada public water suppliers at Lake Tahoe.

The NOI has been filed to the State Board with the understanding that the final decision is to be determined after the Lahontan Regional Water Quality Control Board's review of the *Application for Exemption to the Basin Plan Prohibition on the Use of Pesticides for the Tahoe Keys West Lagoon Integrated Control Methods Test.*

We do not support approval of this General Permit Application for the following reasons:

TWSA believes Lake Tahoe's special status as a Tier 3 Outstanding National Resource Water (ONRW) warrants a priority focus on non-chemical methods being thoroughly field tested before an exemption can be considered for herbicide application. The TKPOA application provided an academic evaluation of non-chemical methods, and dismissed them all as not applicable, except when used in combination with herbicides. *("While some alternative methods can be effective in small, relatively isolated areas, their deployment as a sole means of*

1

management in the extensively and heavily vegetated Tahoe Keys lagoons is neither feasible or effective in meeting the IMP goals and has unacceptable associated risks to the environment, non-target species and to Lake Tahoe." – Pg 7. APAP). Dismissal of the non-chemical methods is based primarily on the lower cost of herbicide use, plant selectivity and the speed of action of herbicides versus other non-chemical methods such as diver assisted suction. TWSA views the introduction and use of aquatic herbicides as an unacceptable risk to Lake Tahoe.

Lake Tahoe's Outstanding National Resource Water Tier 3 status is a key factor in the consideration and analysis of the application request. State Water Resources Control Board Resolution 68-16, guides CA Anti-Degradation Policy. The Federal Antidegradation Policy establishes three tiers or types of waterbodies to guide antidegradation analysis.

- Tier 1 maintains and protects existing uses and water quality conditions to support such uses. Tier 1 requirements apply to all surface waters (USEPA 2012).
- Tier 2 is comprised of High Quality Waters. Tier 2 waterbodies have higher water quality than those required to support designated uses (USEPA 1987).
- Tier 3 is comprised of Outstanding National Resource Waters. In CA, these include Lake Tahoe and Mono Lake as the sole, interior water bodies considered Tier 3. Significant coastal areas fall under Tier 3 status as well. Tier 3 status was interpreted in 2012 by the Santa Ana Regional Water Quality Control Board, as allowing NO DEGREDATION IN A TIER 3 WATERBODY. *(Evaluation of San Joaquin River Flow and Southern Delta Water Quality Objectives and Implementation, December 2012, ICF 00427.11).*

CEQA documents are currently being prepared for the pending Lahontan Water Quality Control Board's review of the *TKPOA' s Amended Supplemental Application for Exemption to the Basin Plan Prohibition on the Use of Pesticides for the Tahoe Keys West Lagoon Integrated Control Methods Test (July 20, 2017).* These documents will be critical in the analysis of any approval. Determinations should not be made, at the state or regional level, until all relevant documentation is available.

SWRCB Resolution 68-16 establishes a two-step process to determine whether a discharge complies with the state's Antidegradation Policy.

Step One: Whenever the existing quality of water is better than the quality established in policies, such existing high quality will be maintained until it has been demonstrated to the State that any change:

will be consistent with maximum benefit to the people of the State;
will not unreasonably affect present and anticipated beneficial use of such water, and;
will not result in water quality less than that prescribed in the policies.

Step Two: Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that:

- a pollution or nuisance will not occur, and;
- the highest water quality consistent with maximum benefit to people of the State will be maintained.

Discharges may only be allowed if the proposed application of aquatic pesticides is consistent with state antidegradation requirements. The decision making process for the State Water Board in consideration of this permit request requires:

Step 1: .... will be consistent with maximum benefit to the peoples of the State; will not unreasonably affect present and anticipated beneficial use of such water, and; will not result in water quality less than that prescribed in the policies.

The State must make the decision based on maximum benefit to the peoples of the State.
Does this project provide benefit for primarily the Tahoe Keys property owners, or is it truly designed for the maximum benefit for the peoples of the State? There are non-chemical methods that have the potential for success, but would take longer to achieve control and cost more. Non-chemical methods do provide the alternatives to maximally benefit the peoples of the State, creating no new introduction of chemicals or discharges.

In the *GENERAL NPDES PERMIT FOR RESIDUAL AQUATIC PESTICIDE DISCHARGES FROM ALGAE AND AQUATIC WEED CONTROL APPLICATIONS* it is stated on page 12: "To reduce the potential impacts to water quality, Dischargers shall implement the feasible alternatives to algaecide and aquatic herbicide use that are identified in the APAP.

"Local ordinances concerning water quality or nuisance and the use of the water as a water supply may also be factors in determining maximum benefit to the people." (Q's and A's Resolution No.68-16, February 16, 1995)

"With reference to economic costs, both costs to the discharger and costs to the public must be considered. Cost savings to the discharger, standing alone, absent a demonstration of how these savings are necessary to accommodate 'important social and economic development' are not adequate justification for allowing degradation." (Q's and A's Resolution No. 68-16, February 16, 1995).

Project must be justified for social or economic reasons.
There is no argument that something must be done to control weeds in the Tahoe Keys, to reduce the risk of spreading invasive aquatic plants to other areas of Lake Tahoe, or downstream through the Truckee-Pyramid Lake watershed; and associated economic impacts to recreation. However, the use of herbicides continues to be the main method promoted, with cursory reference to the use of non-chemical methods as limited alternatives. The use of herbicides will affect present and anticipated beneficial use of such water.

The introduction of chemical controls has potential economic impact to the water providers, in two specific ways:

a) TWSA members share great concern about the potential impact of herbicides on our water intake systems and quality of the water we provide to our customers. Tahoe's municipal water treatment systems are not specifically designed to remove chemical contaminants. Six TWSA members hold "filtration exemption" status from the U.S. Environmental Protection Agency (US EPA). This is a rare status, usually granted only to a "non-contact" watershed. There are only 60 filtration exempt systems in the US; 10% of them are here at Lake Tahoe. Filtration exemption was granted based on the fact that Tahoe "tap water" is some of the cleanest and purest drinking water in the world. The treatment process of ultra-violet and ozone disinfection used by members with "filtration exemption" status is designed for the deactivation of potential biological contaminants, not chemicals. Their effectiveness and efficiency at removing chemical compounds is unknown. TWSA's remaining filtration plants are not designed to remove chemical contaminants. In addition to TWSA members, there are many water systems owned by private companies and individuals that also draw water from Lake Tahoe. If chemical contaminants begin to be detected near Lake Tahoe water intakes, our ratepayers and the owners of small private water systems may need to take their intakes off line to protect public health and safety and face costly infrastructure upgrades. In most of these cases, the lake intakes are their only source of potable drinking water. TWSA supports a more detailed analysis of the potential impacts of herbicides on drinking water supply.

b) In 2010, the TWSA drinking water providers established brand recognition for the quality of Tahoe tap water, in an outreach campaign called DRINK TAHOE TAP ®. This campaign has become regionally recognized as the TWSA 'brand', and was federally trademarked in 2015. An herbicide project, and potential ongoing applications of herbicides, has a probable effect to create negative economic and social impact of water provider consumer confidence and thereby negatively affect the trademarked, DRINK TAHOE TAP® brand. The customer confidence we have built in "Tahoe Tap" may be impacted and cannot be repaired if consumer confidence is eroded by the use of herbicides introduced into the Tahoe Keys, which adjoins Lake Tahoe. Non-chemical projects currently mitigate standard issues (such as turbidity) occurring at Tahoe, but do not impact established water quality standards. Nationally, there is tremendous consumer concern over chemical contaminants in drinking water, so the high confidence in the quality of water we provide to ratepayers and the general public, including national and international visitors, is extremely rare and valuable within our industry.

Project must be shown to have temporary impacts if water quality decline is permitted.

Herbicide introduction - is it temporary, or long term? This NOI/APAP indicates the pilot will be an evaluation tool towards repeated use of herbicides. *("The completion of the proposed aquatic herbicide demonstration study will provide important and relevant information on which the LRWQCB can, in part, base its review of subsequent proposed uses of aquatic herbicide in the Tahoe Keys lagoons." – page 21, APAP).* The desire to evaluate, then subsequently propose additional applications, points to a long term strategy to repeat treatment using herbicides. This can create potential long term impacts. The primary beneficial use of Lahontan

waterbodies is drinking water, any perceived adverse effect to beneficial use as drinking water can have a negative impact on our business of providing high-quality drinking water to the public.

Step 2: A pollution or nuisance will not occur, and the highest water quality consistent with maximum benefit to peoples of the State will be maintained.

Herbicide application and residuals should be considered discharges and pollution in Tier 3 waterbodies. "To comply with Resolution 68-18, a discharge may not cause pollution." "The term pollution is defined in the CWC to mean an alteration of the waters of the state by a waste to a degree which unreasonably affects either the waters for beneficial use or the facilities which serve these beneficial uses (CWC Section 13050(l))." (Q's and A's Resolution No. 68-16, February 16, 1995)

In the *CA-GENERAL NPDES PERMIT FOR RESIDUAL ORDER NO. 2013-0002-DWQ AQUATIC PESTICIDE DISCHARGES FROM NPDES NO. CAG990005 ALGAE AND AQUATIC WEED CONTROL APPLICATIONS, in Attachment D – Fact Sheet states on page D-27 – D-28:* Penoxsulam degrades by two different transformation mechanisms, producing 13 different identified transformation products, 11 of which meet the criteria to be classified as major degradation byproducts, six of which reached peak concentrations at study termination, indicating a greater degree of persistence than Penoxsulam and a potential to reach concentrations even greater than those reported at study termination. The results of the screening-level risk assessment suggest that Penoxsulam will not pose a threat to aquatic or terrestrial animals, however, this conclusion must be tempered by the fact that testing has not been conducted on several major degradation byproducts. The U.S. EPA defines major degradation byproducts to be BSA, 2-amino-TP, TPSA, BSTCA methyl, BSTCA, 2-amino-TCA,5-OH-penoxsulam, SFA, sulfonamide, 5,8-di-OH and 5-OH, 2 aminoTP.

In the CA-General NPDES definition of Receiving Water Limitations:

B. Dissolved Oxygen. There is no discussion on how herbicide application will be handled to maintain the Lahontan Water Quality Standard for Dissolved Oxygen (DO). "The discharger shall not result in any of the following: Dissolved oxygen to be below the Regional Water Board Basin Plans' dissolved oxygen objectives for the receiving water. In the LRWQCB Water Quality Objectives – Chapter 3 (pg. 3-10) it is stated that DO levels cannot be less than 7.0 mg/L "The dissolved oxygen concentration shall not be depressed by more than 10 percent, below 80 percent saturation, or below 7.0 mg/L at any time, whichever is more restrictive."

- F. Taste and Odors. Taste- or odor-producing substances to be present in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses or domestic or municipal water supplies.

Tahoe's long standing control of discharges, including sewage, stormwater and sediment, represents billions of dollars in public and private sector investment. It should be noted that the storm drains discharging into the Tahoe Keys (operated by the City of South Lake Tahoe) have yet to be mitigated to reduce sediment and nutrient loading.

There is other important information missing from this APAP:

- There is no discussion on chemical adaptation/herbicide resistance;
- No cost for herbicide project with mitigation and monitoring costs;
- No discussion on algae bloom potential/cyanobacteria.

Final Comment:

On page 37, section10.2 e) The TWSA has not agreed to be the official communication channel for TKPOA to distribute information on the herbicide pilot test to all area water users. It is the responsibility of the Tahoe Keys POA as the project proponent to notify all water providers as detailed in the Lahontan Basin Plan.

In closing, The TWSA requests the State Water Resources Control Board table any decision on this permit application until non-chemical methods are more thoroughly field tested, more information on the potential impacts to drinking water supply (especially byproducts) is provided and CEQA documents are released for public review.

If you have questions, please contact us directly. Thank you for the opportunity to comment.

Madonna Dunbar, TWSA Executive Director & Suzi Gibbons, TWSA Board Chairperson

Cc:
Lahontan Regional Water Quality Control Board:
Patty Z. Kouyoumdjian; Paul Nielsen; Dennis Zabaglo
TRPA:
Joanne Marchetta; Russell Norman; Bruce Warden
TKPOA/SEA:
Kirk Wooldridge; Rick Lind
NDEP:
Jennifer Carr

Background Statement:

The Tahoe Water Suppliers Association (TWSA) is an organization whose members are the 11 principal Tahoe Basin municipal drinking water providers with intakes that draw water from Lake Tahoe, plus one groundwater utility. These providers serve the majority of water consumers in the Lake Tahoe Basin.

TWSA's mission is *"to develop, implement and maintain an effective watershed control program in order to satisfy recommendations in watershed sanitary surveys, advocate for the protection of Lake Tahoe as a viable source of drinking water, and to satisfy additional state and federal requirements."*

Consistent with this mission, TWSA has been actively engaged in the public process with state and federal regulatory agencies working to address the proliferation of aquatic invasive weeds at Lake Tahoe and the impact potential control strategies may have on the quality of Lake Tahoe's drinking water and the infrastructure used to procure and deliver that water.

Our members provide water service to all manner of users, rate payers, tax payers and visitors to Lake Tahoe. We are dedicated to the protection of Lake Tahoe's pristine water quality and healthy ecosystem. We also appreciate recreational boating and water-based sports in the world-renown destination resort region. We recognize that the growth of invasive plants and weeds is a serious problem.

Prompted by the exponential growth of invasive weeds, federal and state water quality regulators have lifted a previous prohibition against the use of aquatic herbicides in the waters of Lake Tahoe as one of the control strategies for invasive weeds. The chemicals proposed for use have been tested and used primarily in lower quality waters. Lake Tahoe is a Tier III Outstanding National Resource Water (ONRW). As such, it should be held to a higher set of standards than a Tier I or II water body. If Lake Tahoe does not warrant additional protections against the introduction of chemical herbicides; there is serious question about what is meant with Lake Tahoe's listing as a Tier III ONRW.

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
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10/11/16

Mr. Kirk Wooldridge
General Manager, TKPOA
356 Ala Wai Blvd.
South Lake Tahoe, CA, 96150

On September 23, 2016, the Tahoe Keys Property Owners Association (TKPOA) distributed a six-page outline of the Aquatic Herbicide Demonstration Project in the Tahoe Keys Lagoon. The TKPOA requested comment on the demonstration project no later than 30 days after receipt of the letter.

The Tahoe Water Suppliers Association (TWSA), which represents Cave Rock Water System, Edgewood Water Company, Glenbrook Water Cooperative, Incline Village GID, Kingsbury GID, Lakeside Park Association, North Tahoe PUD, Round Hill GID, Skyland Water Company, South Tahoe PUD, Tahoe City PUD and Zephyr Water Utility, is unable to provide comment at this time on the project, but reserves the right to comment in the future.

We are not able to provide significant comment for several reasons:

a) 30 days to respond does not allow the TWSA Board and its member agencies enough time to place this item on an agenda for discussion and possible action by their respective Boards. This past year, comments have been requested from the stakeholder group, with as little as 3 to 7 days turnaround time. We wish to suggest that 90 days is a more functional response time for future requests; based on the need to place items of this nature onto our meeting agendas. For reference, meetings are held monthly for member agencies, and quarterly for TWSA.

b) At the 3/10/16 TWSA Board meeting, the following motion passed: "The TWSA AIS subcommittee shall execute the TWSA mission, in review, discussion and communication on the Tahoe Keys Property Owners Association's IWMP. The use of chemicals can only be evaluated in proposals in totality or entirety. The official response of the TWSA will be communicated through the lead regulatory agency, in this case, the Lahontan Regional Water Quality Control Board."

1

c) The correspondence letter does not provide information on the proposed project in its entirety. The letter outlines in the narrative a project description, but no reference documents specific to the herbicide application were provided. In order to make informed comments, the stakeholders need full information such as the final draft of the California general APAP; or a fully prepared draft APAP for Lahontan Board submittal.

To provide comment, the TWSA requests that TKPOA provide the following information on the Aquatic Herbicide Demonstration Project:

- Quantifiable project objectives
- Specific methodologies for the study, including:
  - Proposed herbicide concentrations and usage rates, and justification for those concentrations and usage rates
  - Justification for the size of treatment area (proposed treatment area is 13.7 acres)
  - Justification for the selection of the nine treatment sites (currently states "backwater coves and small bays of the Main (West) Lagoon and Lake Tallac Lagoon", but provides no specific locations or justification for number of sites)
  - Detailed description of how data will be collected and results analyzed
  - Detailed description of non-treatment controls, and how the results would be compared between treatment sites and non-treatment controls
- Detailed description of the herbicide monitoring, spill contingency program, and other safety measures, including:
  - Expected distribution, dissipation, and movement of herbicides post-treatment
  - Methods for and frequency of herbicide monitoring
  - Description of flow monitoring (if implemented) to ensure inflow into lagoon during time of treatment
  - Description of impermeable barriers
  - Specific placement of impermeable barriers
  - Duration of time the impermeable barriers will be in place
  - Fail-safes for impermeable barriers
  - Pre- and post-treatment sampling scheme of water, sediment, and biota (if implemented)

On page 5 of the letter, TKPOA states, "TKPOA would... employ and evaluate non-herbicide methods within the demonstration sites as a potential long-term, integrated approach for the control of the invasive plants within the lagoons". The TWSA is also aware that TKPOA has been

investigating other, non-chemical methods for controlling aquatic invasive species, including but not limited to:

- Improved harvesting
- Improved plant fragment collection
- Benthic barriers
- Dredging
- Dewatering
- UV light treatment
- Biological controls
- Community programs, such as reduction of nutrient inputs into lagoon and a boat back-up station
- Recommissioning of water treatment plant and circulation system

The TWSA requests that TKPOA provide the following information on the investigation of those non-chemical methods, including:

- Quantifiable objectives for each study
- Specific methodologies for each study
- Results for each study thus far
- Description of which non-chemical methods are expected to be employed within the demonstration site following herbicide treatment in the Aquatic Herbicide Demonstration Project
- Description of how the non-chemical methods will be evaluated within the demonstration site following herbicide treatment in the Aquatic Herbicide Demonstration Project

To aide in the comment process, we request the following documents related to the Aquatic Herbicide Demonstration Project, including:

- 2011 Final Report Tahoe Keys Aquatic Management Research Project
- 2012 Final Report Tahoe Keys Aquatic Management Research Project
- 2013 Final Report Tahoe Keys Aquatic Management Research Project
- Aquatic Plant Recolonization Study Report by Dr. Lars Anderson, which may have contributed to the 2013 Final Report Tahoe Keys Aquatic Management Research Project
- Any other documents reporting the methods and results of chemical and non-chemical methods studied
    - Project goals and methods of evaluating success
    - Documentation of the failure of alternatives

- Full description of proposed herbicides for use and associated toxicological information
- Comprehensive mitigation plan
- Comprehensive monitoring plan
- Information on how this would be a 'one-time' test
- Cost analysis of the pilot

On page 2, the TWSA does not support the statement that Curlyleaf Pondweed presents a "significant threat to public water systems". We acknowledge the potential threat to the Tahoe ecosystem from the plants, but the presence of the plant itself does not create a concern in water supply or quality to the 'significant threat' level of a potential zebra or quagga mussel colonization.

If you have questions, please contact us directly.

Madonna Dunbar, TWSA Executive Director & Greg Reed, TWSA Board Chairman

Sent by mail and email on 10/11/16

CC via email to: Rick Lind, SEA; Bruce Warden, LRWQCB; Harold Singer, Sierra Club; Jesse Patterson, LTSLT; TWSA Board members

Tahoe Water Suppliers Association
Protect the Source

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Edgewood Water Company
Glenbrook Water Cooperative
Incline Village GID
Kingsbury GID
Lakeside Park Association
North Tahoe PUD
Round Hill GID
Skyland Water Company
South Tahoe PUD
Tahoe City PUD
Zephyr Water Utility

8/12/16

Via email to:
Sierra Ecosystem Associates
Attn: Rick Lind

As requested, below are stakeholder comments regarding the revised comments from TKPOA/SEA on the Aquatic Pesticide Application Plan (APAP) (version 7, dated 7/26/16) being prepared for submittal to the CA State Water Resources Board. The following are our comments. Disclosure: these comments have not been vetted or adopted by the full TWSA Board due to the quick turnaround time requested.

1. Attachment A – page 4:
"This herbicide test is not intended to result in the long-term elimination of the invasive plants at the test sites from the single test application, but rather the test is intended for several other reasons. If included in a future IMP, herbicide applications would likely occur over broader but well-constrained and strategically located areas, and only once or twice, to bring the major infestations of aquatic weeds under control so that other methods can successfully manage future infestations."
This statement is one of the first formal, written references to the use of herbicides "only once or twice" as a management tool. This statement sets up a belief that herbicides will be effective to the point they will only be used "once or twice". However, more information on how other methods will be implemented (type, scale, scope) after an approved herbicide application, should be included. Much of the national scientific literature states that herbicide treatment controls are short lived and that ongoing use of herbicides, often incorporating different chemicals, is commonly required for ongoing control. If the non-chemical methods prove to be too costly, will there be a reversal of "once or twice"?

2. Attachment A – page 5:
"TKPOA agrees that a comprehensive evaluation of alternatives will be necessary during the joint Lahontan RWQCB Basin Plan exemption and TRPA EIP permit application review processes. However, alternatives that are demonstrated to be infeasible for technical, environmental, or economic reasons will not require full analyses so long as the basis for infeasibility is clearly explained and substantiated. TKPOA agrees that unsubstantiated conclusions of a control method being not applicable or not effective are insufficient to dismiss alternatives. However, TKPOA disagrees that other control methods need to be

tested on the same scale in the lagoons as herbicides, and also disagrees that the methods cannot be dismissed until field tested. As explained in the paragraph above, methods that are found to be technically, environmentally, economically or otherwise infeasible, whether field tested or not, is a valid basis under environmental and permitting regulations to dismiss alternatives, so long as the infeasibility of the alternative is clearly explained and substantiated."

This argument sets up the precedent to exclude most methods other than herbicides on purely an economic consideration. However, these are the same methods that will need to be implemented for ongoing control. Feasibility of the use of manual controls is crucial to a long term management plan stated to not be reliant on long-term use of chemical controls.

In the Lahontan Basin Plan Amendment (December 2011 Proposed Basin Plan Amendment - attached), it is stated as a requirement to provide "A description of the failure of non-chemical measures to effectively address the target organisms. The description will include either (1) evidence that non-chemical efforts failed to address target organisms or (2) justification, accepted by Regional Board, of why non-chemical measures were not employed or are not feasible (CEQA Guideline 15364) to achieve the treatment goals.

TWSA does not agree with the TKPOA interpretation that enough evidence exists to support "2 – justification" to reject non-chemicals methods. These are the same methods repeatedly stated to be the options to be used "after one or two chemical applications". If they are all rejected as first options by 'justification" - how are they to be used after chemical application?

It has also been stated at multiple public forums, by multiple agency personnel, that all non-chemical methods will be fully vetted before chemicals are considered. Most recently this was restated by Denniz Z. of TRPA, in response to public comment at the 2016 AIS Public Forum held in May 2016 at the Tahoe Environmental Research Center.

3. Attachment A – page 5:

"Given the time-sensitive need to bring the invasive weeds under control, especially curlyleaf pondweed because of its threat to Lake Tahoe, the feasibility of herbicides need to be evaluated concurrently with other control methods, which is consistent with the adaptive management process established through the IMP and WDRs permit issued to TKPOA by the Lahontan RWQCB."

The proposal to test herbicides is being put forth for field testing. However, the stakeholders have not seen a proposal to test on any significant scale: bottom barriers, diver assisted removal, dredging or recently identified, practical, innovate methods such as UV for field testing. These are the same methods that will need to be implemented for ongoing control. Gathering information on the effectiveness and associated costs, is valuable information for the overall management decision making process.

Under the section "Time Sensitive Projects in the Lahontan Basin Plan Amendment (December 2011 Proposed Basin Plan Amendment – attached) – the following language reinforces the need for

DEMONSTRATION, not just academic evaluation, of non-chemical methods before rejection. "Demonstration that non-chemical measures were evaluated and found inappropriate/ineffective to achieve the project goals. (Alternatives to pesticide use must be thoroughly evaluated and implemented when feasible (as defined in CEQA Guideline 15364: "Feasible" means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors.))."

4. Attachment A – page 6:
"A portable water treatment system with filtration will be tested prior to and during the herbicide test to help ensure functionality if it is needed as an emergency response measure during the test."
The water providers probably would support the inclusion of this option as a safety mitigation measure. More information on the type of water filtration system under consideration is requested.

5. Attachment A – page 7:
"TKPOA agrees that real time flow monitoring in the West Channel, along with the proposed RWT Dye monitoring, is appropriate and will help verify no herbicide movement out of the Tahoe Keys lagoons during the test."
The water providers probably would agree with the inclusion of this option as a safety mitigation measure.

6. Attachment A – page 7:
"TKPOA will sample water at Lakeside, Edgewood, and Kingsbury GID supply intakes and will consult with the three water suppliers regarding access and timing of sampling, as well as ensuring that the proper QA/QC procedures and reporting are in place."
The water providers probably would agree with the selection of these intakes for monitoring as a safety mitigation measure.

7. Attachment A – page 7:
"Contingency response procedures are followed by licensed herbicide applicators. Further information on the licensed applicator procedures and also on the scope and protocol for the mitigation and contingency decision matrix will be submitted as part of a combined application to the Lahontan RWQCB for a Basin Plan exemption permit and to TRPA for an EIP permit."
The responsibility for implementation of contingency plan actions must remain the responsibility of TKPOA or regulatory agencies. Deferral to a 3rd party on mitigation and contingency response is not acceptable to TWSA.

If you have questions, please contact us directly. Thank you for the opportunity to comment.

Madonna Dunbar, TWSA Executive Director & Greg Reed, TWSA Board Chairman

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Kingsbury GID
Lakeside Park Association
North Tahoe PUD
Round Hill GID
Skyland Water Company
South Tahoe PUD
Tahoe City PUD
Zephyr Water Utility

7/1/16

Via email to:
Sierra Ecosystem Associates
Attn: Rick Lind

We reiterate our recognition of the significant efforts to address the aquatic weeds problem in the Tahoe Keys area. The financial investment, time and work of the Tahoe Keys Property Owners Association, Sierra Ecosystem Associates and the Technical Advisory group should be acknowledged and have been significant in the past several years.

At this time, we have been asked to provide comments on the Aquatic Pesticide Application Plan (APAP) being prepared for submittal to the CA State Water Resources Board. The following are our comments. Disclosure: these comments have not been vetted or adopted by the full TWSA Board due to the quick turnaround time requested.

1. The field testing of non-chemical methodology to this point, as applicable in the Tahoe Keys, has primarily been an academic exercise. We strongly feel that as a Tier 3 Outstanding National Resource Water (ONRW), field tests should be required on multiple, non-chemical methodologies before they are dismissed as non-applicable or not effective. The harvester modifications, new skimmer boat and diver hand removal options have NOT been field tested. The use of bottom barriers has not been conducted in a formal, planned and comprehensive matter. UV Light has potential, but is still untested.

2. The vetting of ALL non-chemical methods is a requirement of the Lahontan Basin Plan, before an exemption can be considered for herbicide application. The continued focus on potential herbicide application, without through field testing of the array of non-chemical methodologies available, is disconcerting. Harvesting has been the only long term non-chemical method utilized, and it has itself contributed to the spread of the weeds by creation of fragments.

3. The scale of the proposed herbicide testing remains too large as a 'pilot' test. The scientific reason for validation of data should not be the main factor to drive the scope of the potential herbicide project.

4. The 9 mitigation methods and contingency procedures proposed, seem overall to be technically sound and thorough. However, there are concerns of the abuse of containment curtains by boaters, the functionality of the water circulation system and the concept of "flooding" as a mitigation (since it would drive water into the main lake area).

5. The proposed monitoring plan seems very thoroughly planned. In Record of Monitoring (page 36) and Section 8.4 (page 38) – the addition of submittal of calibration logs is requested as a reported item.

6. In section 8.2.3: Sensitive site monitoring – We request the addition of sampling at Kingsbury GID's and Edgewood's intake in addition the Lakeside and Round Hill intakes.

If you have questions, please contact us directly. Thank you for the opportunity to comment.

Madonna Dunbar, TWSA Executive Director & Greg Reed, TWSA Board Chairman

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Kingsbury GID
Lakeside Park Association
North Tahoe PUD
Round Hill GID
Skyland Water Company
South Tahoe PUD
Tahoe City PUD
Zephyr Water Utility

9/16/15

Mail to:
Sierra Ecosystem Associates
Attn: Kris Keine
P.O. Box 2260
Placerville, CA 95667

Cc: Email via: kris@sierraecos.com

The Tahoe Water Suppliers Association Board (TWSA) provides the following comments on the Tahoe Keys Property Owners Association *Integrated Weeds Management Plan* (TKPOA IWMP) public draft released 8/11/15 with comment period ending 9/25/15:

We appreciate the opportunity to participate in, and recognize the efforts of, the Tahoe Keys Property Owners Association, Sierra Ecosystem Associates, the Technical Advisory group and the Expert Panel in developing this draft plan. The TKPOA should be recognized for their leadership in initiating plan development; however it is important to the overall success of proposed control measures to ensure that the other Keys area property stakeholders are brought into agreement on the plan proposal and implementation.

Our comments:

1. The Non-Point Source (NPS) plan required in Lahontan Water Board Order # R6T-2014-0059 (page 22 and Attachment D) should be completed and implemented as part of the IWMP. There are specific deliverables required to detail actions, plans and improvements to limit nutrient loading from TKPOA properties to the receiving waters. The NPS Plan deadline was established as Jan. 31, 2016; the same deadline as the IWMP.

There are runoff issues from TKPOA, private and City of South Lake Tahoe properties providing nutrient loading into the Tahoe Keys' waters. Runoff must be managed to reduce the nutrients feeding the weeds. Implementing chemical control efforts to reduce the weed biomass while allowing nutrient loading to continue, defeats the management efforts. The two plans must be used together to achieve success in reducing the weeds.

The street drains managed by the City of South Lake Tahoe should be placed on an Environmental Improvement Program priority list for storm water treatment system implementation. The 70+ drains leading to Keys' waters should be undergoing sediment and nutrient removal treatment before entering the receiving waters.

2. The IWMP is being promoted as an integrated management plan. However there is great concern that other than the existing harvesting program, the largest areas for treatment are slated for herbicide application in non-contained areas. The scale and timeline proposed for chemical use is rather aggressive.

   In summary – the IWMP proposes in the 5 year timeline:
   385.5 acres of mechanical harvesting; reduced to 27 acres by 2020 – less than herbicide controls for that year;
   Only 7.8 acres of bottom barrier in 5 years;
   Only 9.6 acres of diver assisted suction in 5 years;
   210.7 acres of herbicide application; primarily open water application in Keys coves, primarily without partitioning or physical containment. In 2019, the proposal outlines using herbicides on just under 80 acres; almost half the water acreage of the Keys lagoons and marina areas.

Non-chemical methods such as bottom barriers and diver hand assisted suction are used minimally in the plan. It is the opinion of the TWSA that non-chemical methods must be used on a much larger scale than what is proposed in the IWMP. There should be more extensive information on long term non-chemical management options, as mentioned below:

Diver hand pulling (pages 34-35 *IWMP*): The option of diver assisted hand removal (without suction) is discussed in the IWMP but is not used in the actual plan, been rejected due to potential costs and potential turbidity issues. No actual cost estimate is provided in the IWMP. This method combined with bottom barriers was very effective in the Emerald Bay control program. Diver hand pulling is the primary method used in a very successful and cost effective control program in upstate New York, for multiple lakes including Lake George, Lake Placid and Saranac Lake. We suggest that consultation with Aquatic Invasive Management LLC (AIM LLC) (www.milfoilremoval.com) on their refined hand pulling methods may provide an excellent, cost effective alternative to the scope of the herbicide application. AIM LLC has provided long term treatment with excellent results utilizing their pulling process using only trained scuba divers and small boats, removing the plants from the water in burlap bags. The contact person for AIM is Andrew Lewis, Aquatic Invasive Management, LLC, (240) 818-1070, andrew@milfoilremoval.com. They recently published a report on their methodology at: http://www.lakegeorgeassociation.org/what-we-do/Invasive-Species/documents/FinalReport2ndDraft.pdf.

Advantages of diver hand pulling listed in the IWMP include:

- Removing regenerative plant parts (roots) can greatly reduce regrowth
- In shallower waters, hand pulling can be an effective and comparatively inexpensive method
- In deeper waters, using trained divers can be effective at removing biomass
- If water clarity is good, can be very selective

Harvester design is mentioned for improvement. Details should be provided on these modifications and improvements should be happening immediately. Current harvester operations are being critiqued by residents as ineffective on the TKPOA blog:
(August 10, 2015 https://www.tkpoa.com/distribution/viewtopic.php?f=13&t=48 : "What I heard from one of the crew was that you need to call and schedule a harvester to come to your dock and they don't really have a scheduled route this summer. Another observation regarding the skimmers: on several occasions the skimmer does not seem to follow where there harvester action is/has been, leaving a lot

of weeds free to float around in the channels. Maybe that is their instructions but it seems suboptimal to me and really annoying for the boat traffic if you get the stuff in your prop or cooling."

Rotovating is dismissed in the IWMP. However, there are lakes using this method successfully. This tool has several advantages:

- Rotovating can be utilized in the recreation off season from late fall to early spring
- Rotovating can effectively control milfoil for up to 2 seasons. Deep water rotovatation has resulted in an 80 percent to 97 percent reduction of milfoil with controls lasting for up to two years. (Source pg. 28: *EIS for Permitted Use of Triclophor, May 2004; Washington State Dept. of Ecology publication number 04-10-018 revised*)
- Drawbacks: Fragmentation must be addressed and potential turbidity issues.

3. More consideration must be given to new and alternative non-chemical technologies such as:
   - **MOBITRAC** (www.weedsdigest.com) a multi-use amphibious tool, capable of offering small scale dredging and excavating in water and on shoreline, at a lower cost than traditional large scale machinery.
   - **Integrated use of bottom barriers and aecetic acid or high temperature treatments** "Recent experiments conducted at the bench and mesocosm scale, showed that using a gas impermeable rubber barrier and a 2-week exposure of turions to dilute acetic acid ($C_2H_4O_2$, tapioca starch pearls, which facilitated slow release of the compound) resulted in complete inhibition of sprouting turions at and above acetic acid concentrations of 83.3 mmol (Barr & Ditomaso 2014). Similar results were found with treatments of hot water under bottom barriers (Barr and Ditomaso, *In Press*). These findings demonstrate the potential of acetic acid or hot water combined with impermeable benthic barriers as an effective method for the inhibition of curlyleaf pondweed turion sprouting." (Source: pages 18-20 *Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe* - Marion E. Wittmann, Ph.D. & Sudeep Chandra, Ph.D. July 2015)
   - **Hot water under bottom barriers** "The final study examined hot water exposures under the barriers to kill and inhibit sprouting in turions. Heated water circulated under an insulated benthic bottom barrier may potentially offer a simple non-chemical rapid method to target surface propagules on the sediment, subterranean propagules and young plants." (Source: http://pqdtopen.proquest.com/doc/1449166206.html?FMT=ABS)
   - **Light shading** A new mechanical shading method that just became available is the use of floating balls used in Los Angeles for evaporation control, that may have applicability in the weeds control program. http://awtti.com/armor_balls_cover.php

4. The *2011 Rhodamine Dye Study* conducted by Dr. Anderson in July and October, 2011 is being heavily relied upon as the sole basis for acceptance of open water herbicide application in the Keys coves. The variability of seasonal weather conditions from year to year, warrants a more cautious approach to the potential transport of herbicide through physical containment.

In the discussion on Biological Controls, introduction of Watermilfoil Weevils (*IWMP* page 47-48) – there are several reasons for the rejection of these organisms including one reason which seems to contradict the argument that herbicides will not travel, "Common disturbances in the Tahoe Keys

lagoons such as wave action from high level of boat traffic and from mechanical harvesters could discourage the establishment of a sufficient population of insects , such as the watermilfoil weevil, to offer effective control."

This water movement from wind and boats, is also the reason for the rejection of larger areas of bottom barriers . "Bottom barriers can be readily dislodged by wave action even in areas where the boat speeds are slow." (*IWMP* pages 39-40)

5. The recently published *Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe by Marion E. Wittmann, Ph.D. & Sudeep Chandra, Ph.D. July 2015* highlights the need for an integrated approach approached, with very limited use of chemical suggested.

For example, page 19/20: **"Conclusions based on curlyleaf pondweed control research**
Control of curlyleaf pondweed likely requires multiple strategies to reduce plant biomass, destroy turions, and reduce rhizome growth. The integrated use of diver-assisted suction removal and bottom barriers to reduce both vegetative growth and rhizome spread is recommended. Exploration of dredging activities to remove turions from sediments is also warranted. Further, based on results from studies in systems outside of Lake Tahoe, the integration of either acetic acid (e.g., vinegar) or hot water application with the use of bottom barriers or other mechanical removal means may be effective to inhibit turion production and enhance localized eradication efforts for this species. This integrated approach, applied particularly at the early stages of establishment, may provide significant reduction in turion production, vegetative growth and the spread of this species. In order to understand the efficacy of curlyleaf pondweed removal, a better understanding is needed of both the temporal pattern in rhizome growth in Lake Tahoe, and the efficacy of integrative treatments for reducing rhizome and turion spread."

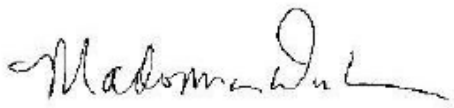
Pages 16-17: **"Conclusions based on Eurasian watermilfoil control research**
Successful control of Eurasian watermilfoil at Lake Tahoe requires integration and consistency of removal strategies, as well as post-treatment efficacy monitoring and rapid response capabilities. This recommendation is largely based on the results of the comprehensive and multi-year removal program (relative to a particular site) with post-treatment monitoring and rapid response capability in Emerald Bay, which has resulted in a significant decrease of Eurasian watermilfoil at this location. Further, where control efforts have been haphazard and without monitoring or rapid response capabilities, Eurasian watermilfoil recolonization has occurred. The use of multiple and integrated methods (e.g., bottom barriers, hand pulling, and suction removal) for plant removal is highly recommended, particularly in localized habitats that have variable characteristics. In systems other than Tahoe, chemical control has been successfully used for both seasonal and long-term reductions of Eurasian milfoil. While highly controversial and a number of years away from regulatory permission, herbicide treatments in Lake Tahoe, particularly in marina or other protected nearshore zones, may provide a cost effective means to reduce local infestation and limit the spread of Eurasian watermilfoil lakewide."

Should chemicals be used for weed eradication, it will be important that effective monitoring methods and best practices be used to assure that public health and safety are not impacted. This may include isolation of treated areas, enhanced monitoring and laboratory testing and potential neutralization of chemicals using portable water treatment systems.

Typical projects of this magnitude include a preliminary, small-scale "phase 1 study" under tightly controlled parameters, including contaminant containment and extensive monitoring. Given the potential adverse significance to the water quality of Lake Tahoe in the event of an herbicide application, this type of project warrants more study be conducted prior to implementation on a larger scale.

The IWMP falls short in detailing how the application of herbicides will be monitored to assure their use does not impact drinking water supplies. Simply referring to the chemical manufacturers recommendations is not adequate. It is the opinion of the TWSA that all documents, permits and plans moving forward must better detail and describe how the drinking water supply will be protected to assure the health and safety of public.

The intensive direction towards chemical use in the IWMP with the dismissal of multiple non-chemical methods does not support an integrated approach to solving the weeds problem. Chemicals do not disappear. The chemicals proposed for use have been tested and used only in lower quality waters. We believe Tahoe's special status as an ONRW Tier 3 waterbody warrants a strong focus on all non-chemical methods being used, before chemical application is considered. The customer confidence we have built in "Tahoe Tap" cannot be replaced once chemicals are introduced into Lake Tahoe. Lake Tahoe's Tier 3, Outstanding National Resource Water designation demands innovation in the handling of invasive weeds be paramount in the Aquatic Invasive Species Management programs at Lake Tahoe.



Madonna Dunbar
Executive Director, Tahoe Water Suppliers Association
Resource Conservationist, Incline Village General Improvement District
Submitted on behalf of the Tahoe Water Suppliers Association
9/16/15

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
Incline Village, Nevada, 89451
775-832-1212

May 19, 2015

Attn: Kris Keine
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Sierra Ecosystems Associates
P.O. Box 2260
Placerville, CA 95667

RE: TWSA comments on the 4/29/15 draft of the "Tahoe Keys Integrated Weeds Management Plan (TKIWMP)"

The Tahoe Water Suppliers Association (TWSA) represents the majority of the municipal water purveyors in the Lake Tahoe Basin whose source of drinking water is Lake Tahoe. The Tahoe Water Suppliers Association formed in 2002 to serve as a unified voice for source water protection in the Tahoe Basin and to fulfill regulatory requirements supporting the TWSA members' USEPA filtration exempt status on drinking water treatment.

We appreciate the opportunity to participate in, and recognize the efforts of, the Tahoe Keys Technical Working Group in the development of this draft plan. We wish to offer the following comments regarding the TKIWMP draft released 4/29/15 and information discussed at the 5/4/15 meeting.

Comments:

TKIWMP offers repeated reference to successful chemical use in other California water bodies. However, none of the case studies mentioned have exceptional source water quality status such as Lake Tahoe's Outstanding National Resource Water (ONRW) Tier III designation. None of the case study water bodies referenced are source water for multiple water providers with the treatment exclusion of filtration exemption status. Lake Tahoe's ONRW Tier III status designation dictates all non-chemical methods be fully vetted before consideration of chemical use. There has been no explanation in this report of analysis of the impacts of chemical applications to ONRW Tier III waters, nor filtration exempt drinking water systems.

The draft report and presentation support the preferred use of chemical methods as an initial AND ongoing control. For example in the presentation (5/4/2015) the only 'next step' referenced regarding the development of the Implementation section of the IWMP is "recommend 3 (+/-) herbicides", with the parameters for selection detailed.

The potential of selected areas of the Tahoe Keys waters experiencing chemical use every year was stated in the 5/4/15 meeting by Dr. Anderson. The establishment of the use of chemical controls as an ongoing management protocol is unacceptable to the water providers. If this is the actual protocol being proposed, this must be clearly stated in the updated version of the plan and the implementation plan.

On page 25, Goal # 5 states "Assist the Tahoe Region in achieving goals for reductions in greenhouse gas emissions, as described in the Sustainable Communities Action Plan, by minimizing the air quality impacts of aquatic weed maintenance actions." This appears to be a highly subjective statement that needs explanation and validation.

Data must be included in the report on the long-term effectiveness of various treatment methods. This report continues to favor the use of chemical methods as a 'cost effective' option. A cost-benefit analysis should be done to consider non-chemical methods compared with longer-term control results. For example, mechanical dredging or roto-tilling to remove the sediment and plant roots may be more expensive initially; however the longer term effect of the treatment may also be more beneficial.

One potentially valuable non-chemical option (used with great success in the Okanangan Basin, British Columbia) known as roto-tilling or "rotovating" is dismissed as an option with no fiscal or scientific data provided, simply the narrative (on pg. 38): "Suitability to Tahoe Keys Lagoons - Due to the severe impact of rotovating on the sediment and benthic organisms and the attending increase in turbidity, this type of device is not suitable for use in the Tahoe Keys." This option deserves further consideration and analysis; not dismissal. At the meeting on 5/4/15, Dr. Anderson responded to my question about this method being dismissed - stating: "it creates turbidity; it disturbs the sediment and benthic community too much." However, this method has tremendous potential for long-term success. The use of turbidity curtains or physical closure of the work area would mitigate sediment disturbance, similar to dredging. The benthic community in the Tahoe Keys is not representative of open lake conditions. The removal of nutrient loaded sediment MUST be integrated into control operations for long-term success of the plant controls.

Application of bottom barriers has been approved for use. Dredging of channels has also been approved for use. Both of these approved methods disturb the benthic substrate. Therefore, using a roto-tiller should also gain approval, regardless of the benthic substrate impacts, otherwise it is contrary to previously approved methods. This method has great potential to REMOVE invasive weeds fully and completely. In addition, roto-tilling is conducted in the late fall and winter months, offering a control method that takes advantage of the low recreation season.

"Clean, Drain, Dry" is the mantra of the Tahoe boat inspection program. Dewatering and mechanical dredging provides the same methodology to the sediment loaded, impacted conditions of the Tahoe Keys waters. In this report there is dismissal without data of the option of large scale dewatering and mechanical dredging to remove sediment and aquatic plants. Dewatering/excavation is briefly mentioned on pg. 44. Similar to the roto-tilling method, dewatering and dredging has the potential to address removal of nutrient loaded sediment and the roots of the plants; creating the potential for greater long-term success. This method should be strongly considered.

The use of silt/turbidity curtains is routinely mentioned as "costly" or "increases the cost" with no data provided (pg. 38). This type of mitigation is standard in almost all lake bed construction and maintenance activity in the Tahoe Basin, therefore details on actual cost are available for general applications and should be provided.

Additional non-chemical methods not addressed or referenced that can be supported by the TWSA include the exploration of bioremediation methods such as floating wetland islands, multiple aeration methods (beyond the Solar Bees mentioned in the report) and microbial bio-dredging. Research has shown these methods, when combined, have the potential to be a permanent solution, with added benefits of improved water quality, aesthetics, and habitat enhancement. The Lake Tahoe community has always been recognized for innovative solutions to/for environmental problems. This is the time to take the solution to the problem to a higher level than simply the immediate need of killing the weeds. The complexity of the water quality and AIS/nuisance weed issues in the Tahoe Keys requires a holistic, multi-dimensional approach, one of healing the ecosystem rather than one of chemical kill.

There is no mention of the use of the Lake Tallac circulation system in this report. One of the main issues in the waters of the Keys is lack of oxygen. The circulation system was designed to promote oxygenation in the far back areas, this is needed for reduction of anoxic conditions, currently contributing to low water quality.

In section 1.3 Seasonal Patterns of Water Movement (pg. 5), there is no mention of the uncertainty of water movement from the mouth of the Keys to the southern corners of Lake Tahoe. The TWSA and NDEP have commissioned a recent study in this area by Dr. Geoff Schladow, which should be utilized in further analysis. There is significant evidence in Dr. Schladow's report indicating water movement from the Tahoe Keys entrances reach the drinking water intakes in the southeastern corner of Lake Tahoe in less than 24 hours. Dr. Schladow's report did not account for dilution during time of travel. However, it does reveal significant, consistent current activity which must be considered.

There is reference to a separate Nutrient & Fertilizer Management Plan on page 46. This plan is integral to the success of the Integrated Weeds Management Plan in the Tahoe Keys. A progress update should be provided on the status of the Nutrient & Fertilizer Management Plan. The two plans need to be linked during development and implementation phases to address the endless cycle of nutrient loading and plant growth.

Also on pages 45/46 there is mention of the storm water management system that is outside the purview of TKPOA and the IWMP. Detailed information on nutrient loading from this storm drain management system is needed for the success of the IWMP.

On pages 46/47 there is mention of an education and outreach program regarding nutrient management to address BMP issues on TKPOA property. As a self governing association, the TKPOA should be actively considering passing new, mandatory CC&R landscaping regulations limiting turf size per parcel, irrigation management, and restrictions on terrestrial herbicide/pesticide/fertilizer use. If the TKPOA is not willing or able to address the nutrient loading issue on private property from a self regulatory mechanism, then a regulatory agency should make this requirement a condition of approval of this plan.

Additionally, page 45 states: "Reducing run-off from fertilized landscapes can be easily achieved through improved irrigation management and other practices such as buffer strips." These recommendations should be made mandatory on both common and privately owned parcels.

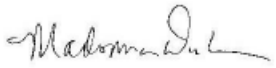
The TWSA supports the defined requirement for an Integrated Weeds Management Plan with specific deadlines and deliverables. This draft is a starting point; however, we feel that there is much more information that must be included. And, as shown by our limited research, there are other viable non-chemical methods that must be given serious consideration and implementation, rather than summary rejection.

We also wish to remind the group that the beneficial use of water is defined under federal law in the federal Clean Water Act, as the following, listed in order of priority:

(i) Water supply.
(ii) Fish and shellfish: salmonid migration, rearing, spawning, and harvesting. Other fish migration, rearing, spawning, and harvesting. Clam, oyster, and mussel rearing, spawning, and harvesting. Crustaceans and other shellfish (crabs, shrimps, crayfish, scallops, etc.) rearing, spawning, and harvesting.
(iii) Wildlife habitat.
(iv) Recreation (primary contact recreation, sport fishing, boating, and aesthetic enjoyment).
(v) Commerce and navigation.
(vi) Aesthetics.

As water purveyors charged with protection of the #1 beneficial use of water, the TWSA board restates our firm opposition to any use of chemical control methods in Lake Tahoe. Please feel free to contact me directly if you have any questions.

Respectfully submitted on behalf of the TWSA Board,



Madonna Dunbar

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Background Information and Previous TWSA Public Comment

Tahoe Keys (TKPOA) Circulation System Operating Permit -Waste Discharge Requirements (WDR) *http://www.waterboards.ca.gov/lahontan/board_info/agenda/2014/july/item_12.pdf*

2014 Reissuance of WDR Permit:
In 1975, the Lahontan Regional Water Board issued a permit to TKPOA which allowed operation of a water treatment facility and a circulation system for the lagoons. These systems were state-of-the-art at that time and their purpose was to keep the waterways clear. By the late 1970s, a few residential homes had been constructed on the private lots, and construction of the homes significantly increased after the building moratorium was lifted in 1985. Most homes at the Keys were built in the late 1980s through the 1990s. Throughout this time, TKPOA operated the circulation and treatment facilities intermittently as needed to reduce turbidity and prevent stagnation and the Water Board updated the permit periodically. Though the treatment and circulation systems were being operated, the lagoons were experiencing exponential growth of aquatic weeds.

The treatment system has not been operated following an incident in August 1998 where TKPOA allegedly discharged alum flocculent from to the waterways. To resolve the alleged violation, the Water Board and TKPOA entered into a settlement agreement whereby TKPOA agreed to spend $198,000 performing water quality improvement projects. These projects included a bioassessment study, installation of filters in storm drain inlets, and increased harvesting removal of aquatic weeds. By 2005, TKPOA completed all terms of the settlement agreement, yet the lagoon aquatic weeds had not been controlled. Since then, TKPOA has been exploring options for controlling the invasive aquatic weeds and has been consulting with Water Board staff on understanding the viable options. The proposed Waste Discharge Requirements (WDR) are a result of intensive collaboration over many months between TKPOA and Water Board staff. The purpose of this new WDR is to require TKPOA to develop and implement management control measures to prevent the discharge of pollutants from non-point source activities.

The WDR allows TKPOA to operate its water circulation system and place bottom barriers in the lagoons to suffocate invasive aquatic weeds. Specific orders in the WDR require TKPOA to develop and implement a Non-Point Source Management Plan for land-based activities, and an Integrated Management Plan for Aquatic Invasive Species for all water-based activities. Under a Municipal NPDES Stormwater Permit, the City of South Lake Tahoe (CSLT) is responsible for all stormwater within its jurisdiction, which includes TKPOA. The CSLT and TKPOA have agreed to coordinate operation and maintenance of shared stormwater facilities. To strengthen TKPOA's involvement in stormwater management and to comply with the Lahontan Basin Plan, the WDR requires TKPOA to either document coordination with the CSLT to demonstrate that shared stormwater treatment facilities treating private property discharges and public right-of-way stormwater are sufficient to meet the CSLT's average annual fine sediment and nutrient load reduction requirements, or meet the surface water numeric effluent limits.

As part of developing the draft WDR, Water Board staff consulted with representatives from the Tahoe Regional Planning Agency, the California Department of Fish and Wildlife, the City of South Lake Tahoe, and the US Army Corps of Engineers. Adoption of the WDR will include rescission of the 2004 NPDES permit, and issuance of a Clean Water Act Section 401 Water Quality Certification and Basin Plan prohibition exemption for the bottom barrier placement. A tentative WDR was circulated for public review which ended July 3, 2014.

TKPOA, USEPA, and the Tahoe Water Suppliers Association (TWSA) each submitted a comment letter by the deadline. The Tahoe Regional Planning Agency and Steve Bridges (a Tahoe Keys resident) submitted comments on July 7, 2014. Enclosure 3 contains a copy of all comments received. In the comments received, TKPOA appreciated that Water Board staff were helpful and maintained an excellent level of communication during the preparation of the tentative documents. TKPOA hopes that, in addition to voluntary actions taken by TKPOA over the last several years, the requirements contained in the WQC and WDR will facilitate an effective aquatic invasive weed control program. US EPA Region 9 strongly supports the proposed WDR focus on the invasive weed problem in the TKPOA lagoons, which previous permits have not addressed directly and encouraged the Water Board to strengthen these measures by enhanced monitoring and reporting.

The TWSA supported the required Non-Point Source Plan's strong emphasis in fertilizer and nutrient management with mandatory public education, water quality monitoring and specific goals and deadlines for a management plan for nutrient reduction. TWSA also supported the provisions of the Integrated Weed Management Plan and the nonchemical control of aquatic weeds.

All five comment letters provided suggested text to correct minor errors and to clarify certain items. The Proposed WDR incorporates appropriate changes in the Proposed WDR to address these comments and strengthens the effectiveness of AIS and NPS nutrient control. One significant change in the Proposed WDR is an added requirement for TKPOA to meet the surface water numeric effluent limits for discharges from shared stormwater facilities if TKPOA fails to document coordination with the CSLT reduction requirements. Enclosure 4 contains the specific responses to the individual comment letters.
In 2014, the following public comment was offered in regards to the renewed LRWQCB Operating permit for the Tahoe Keys Water Circulation System. Some but not all of these comments were incorporated into the approved permit.

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
Incline Village, Nevada, 89451
775-832-1212

6/23/2014

TWSA Comment Regarding Lahontan Region Water Quality Control Board Tentative Water Quality Certification and Waste Discharge Requirements (WDR) for Tahoe Keys Property Owners Association (TKPOA) - comment period ending 7/3/14.

The Tahoe Water Suppliers Association represents the majority of the municipal water purveyors whose source of drinking water is Lake Tahoe. We appreciate the efforts of Lahontan staff to formalize TKPOA prior informal practices and requirements into this Board Order.

We wish to offer the following comments or suggestions regarding WDID6A09008900 (Board Order No. R6T-2014-TENT).

1. The TWSA supports the strong emphasis in fertilizer/nutrient management formalized in this permit with mandatory public education, water quality monitoring and specific goals/deadlines for a management plan for nutrient reduction.
2. The TWSA supports the defined requirement for an Integrated Weeds Management Plan with specific deadlines and deliverables.
3. The TWSA appreciates the clear statements referenced several times in the document that this Board Order does not authorize the use of chemical methods for Aquatic Weeds.

Our revision suggestions:

Page 8, item 14, Table 3: Raw data used to prepare the annual averages should be offered in greater detail in an appendix. There is significant information available for seasonal nutrient loading that is not presented in the annual averages presented in Table 3. This information should be published in conjunction with the WDR.

Page 10 under Non–Chemical Control of Aquatic Invasive Species Paragraph 4; end of paragraph: "Final results for this study are pending, though preliminary results suggest bottom barriers are expensive and demonstrate limited long term effectiveness in reducing aquatic plant growth."

This sentence is in direct contradiction with the statement on page 12, item 17 b: "handpulling, suction dredged-assisted removal, and cutting by marine harvesters is not as effective as bottom barrier placement in areas similar to the Tahoe Keys Lagoons."

These statements should be clarified and made to match. Bottom barriers are an effective method of weed control, evidence supports this through the recent full eradication of invasive weeds in Emerald Bay by use of bottom barriers and hand pulling.

Page 12, Item 17, c: 'Projects allowed by this order must not exceed 5 acres of bottom barriers.' At a 5 acre limit annually, it will take an estimated 34 years to cover all areas of the Tahoe Keys. TKPOA should be required to file for a CEQA permit exploring the potential for a 'mitigated negative declaration'; thereby allowing for much larger areas to be treated with bottom barriers.

Page13; item F: The suggestion of improved harvester design is mentioned. TKPOA should be required to investigate the modification of their equipment. There is an excellent resource available in the document: *Management Plan for Eurasian Milfoil in the Okanagan, British Columbia, Genevieve Dunbar, April 2009.*

The Okanagan Basin Water Board website contains a larger amount of information on roto-tilling versus harvesting and non-chemical methods. They have developed a custom roto-tiller which is used in the winter months to pull the roots of the plants, thereby reducing the use of the harvesters which cut the plants and produce fragments. http://www.obwb.ca/milfoil/methods-of-control/

Page 14, item 3, #2: change '~~Promoting~~' best management practices to 'Requiring' best management practices.

Page 14, item 19: please set a reasonable deadline for 100% TRPA BMP Compliance for both common area and residential properties, to be consistent with page 22, items b-e..

Page 15, item 1, line c: add 'Aggressively' before 'Pursue institutional changes'.

Page 17, item 22, change: The discharges under this permit ~~"will not"~~ to "shall not" adversely affect drinking water quality.

Page 20, item 5, add may be granted in writing by the Executive Director add "plus the written approval of other regulatory agencies including TRPA."

Page 20, Item 6: Remove all reference to exemptions for this requirement. Items #1-5 & #7-11 have no exemptions. The exemption criteria is too broad to adequately address water provider concerns. Remove:
~~An exemption to this prohibition may be granted whenever the Water Board finds all of the following:~~
~~a. The discharge of waste will not, individually or collectively, directly or indirectly, unreasonably affect the water for its beneficial uses, and~~
~~b. There is no reasonable alternative to the waste discharge, and~~
~~c. All applicable and practicable control and mitigation measures have been incorporated to minimize potential adverse impacts to water quality and beneficial uses.~~

Page 23, item 3: add: "and stakeholders"

Page 24, item 2: deadline seems incorrect. 'beginning in January 31, 2016' should this be 'beginning in January 31, 2017'?

Attachment B: we suggest adding a monitoring point close to the mouth of the Marina Channel.

Attachment D: we encourage the construction of the groundwater monitoring wells.

MONITORING REPORT

Page 1: remove reference to 'weekly thereafter'; this phrase is not referenced in the document.

Page 1: Add definition of "monthly" as 30 days.

Page 2, Item 1: Add Marina Channel Monitoring Point

Page 2, Item 5: Elaborate/Define: 'other conditions'.

Page 3: Add TDS, pH, and Turbidity to the monitoring parameters to be consistent with the baseline data presented in Table 3 in the Board Order.

Page 4, item E: 'shall keep a log ~~or~~ permanent record'; revise to "shall keep a log and permanent record"

Page 5, Item G: Add Non Point Source Plan Monitoring: "TKPOA shall conduct monitoring and maintain permanent record for irrigation and fertilizer practices based on Attachment D of the Board Order".

Page 5, item 2: 'Any omission of data ~~should~~ be accompanied by an explanation and plan to obtain the omitted data. Reword: Any omission of data shall be accompanied by an explanation and plan to obtain the omitted data.

Please feel free to contact me directly if you have any questions.

Respectfully submitted on behalf of the TWSA Board,

Madonna Dunbar
Executive Director, Tahoe Water Suppliers Association
Resource Conservationist, Incline Village General Improvement District

Lahontan Regional Water Board Water Quality Control Plan (Basin Plan) Changes to the Water Quality Objective for Pesticide Application to Water
http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/pesticidebpa.shtml

Since 2010, TWSA has been active in drinking water quality advocacy. The potential use of herbicides remains one of chief concern and activity in the previous reporting years for TWSA member agencies. In 2014, Basin Plan Cleanup Amendments were passed by the LRWQCB.

Staff of the Lahontan Water Board proposed amendments to the Basin Plan that:
(1) change reference to Nondegradation Objective from a water quality objective to a policy statement and implementation measure,
(2) add mixing zone provisions,
(3) revise certain existing waste discharge prohibitions and/or exemptions to those prohibitions, delete certain existing waste discharge prohibitions and applicable exemptions, and add certain waste discharge prohibitions and exemptions, (4)
amend Chapter 5 for consistency with the updated Clean Water Act Section 208 Water Quality Management Plan (208 Plan), and
(5) correct grammatical and punctuation errors, and address outdated policy references.

Description of the Revised Amendment
The Lahontan Regional Water Quality Control Board (Water Board/LRWQCB) amended the Water Quality Control Plan for the Lahontan Region (Basin Plan) by replacing the existing region-wide pesticide water quality objective - which essentially prohibits pesticide application to water - with a region-wide waste discharge prohibition on pesticides in water with exemption criteria for application of aquatic pesticides to water. Circumstances eligible for a prohibition exemption involve the use of aquatic pesticides for purposes of protecting public health and safety (e.g., vector control, drinking water protection) and ecological integrity (e.g., fisheries management, aquatic invasive species control).

Previously, addition of pesticides to water for any purpose was in conflict with the water quality objective. The proposed BPA amends the water quality objective to provide the Water Board with the discretion to approve specific aquatic pesticide applications and regulate the project under the National Pollution Discharge Elimination System program.

The project, under the California Environmental Quality Act, is the amending of a water quality objective. The proposed BPA is a region wide amendment. The project area is the Lahontan Region. The Lahontan Region is defined in terms of drainage basins by Section 13200(h) of the Porter-Cologne Act. For planning purposes, the Lahontan Region has historically been divided into North and South Lahontan Basins at the boundary between the Mono Lake and East Walker River watersheds. The entire Lahontan Region is about 570 miles long and has a total area of 33,131 square miles. Specifically, the language in Chapter 4 of the Basin Plan that discusses the proposed waste discharge prohibition and the exemption criteria required modification to allow for the potential use of other lower toxicity slow-release systemic aquatic pesticides in addition to allowing slow release larvicides. For pesticides other than larvicides, the previously proposed language limited the duration of the treatment event to one-week. A one-week time limitation may have precluded the potential use of slow-release pesticides, which may require presence at effective concentrations in the water column beyond a one-week duration to achieve desired project goals. The modified language allows for the potential use of these slow-release compounds, but requires that the treatment event be limited to the shortest possible time and confined to the smallest area necessary for project success.

STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2014-0032

APPROVING AMENDMENTS TO THE
WATER QUALITY CONTROL PLAN FOR THE LAHONTAN REGION CLARIFYING THE ANTIDEGRADATION POLICY, ADDING MIXING ZONE PROVISIONS, REVISING CERTAIN WASTE DISCHARGE PROHIBITIONS, AND AMENDING CHAPTER 5- WATER QUALITY CONTROL MEASURES FOR THE LAKE TAHOE BASIN

WHEREAS:

1. On April 9, 2014, the California Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board) adopted Resolution No. R6T-2014-0027, amendments to the *Water Quality Control Board for the Lahontan Region* (Basin Plan).

2. The Lahontan Water Board found that the analysis containing in the California Environmental Quality Act (CEQA) "Substitute Environmental Documentation" for the proposed Basin Plan amendments, including the CEQA checklist, the final staff report entitled "Staff Report/Substitute Environmental Document for Proposed Amendments to the *Water Quality Control Plan for the Lahontan Region* (Basin Plan) Clarifying the Antidegradation Policy, Adding Mixing Zone Provisions, Revising Certain Waste Discharge Prohibitions, and Amending Chapter 5 – Water Quality Standards and Control Measures for the Lake Tahoe Basin" and the responses to comments comply with the State Water Board's regulations for the implementation of CEQA, as set forth in the California Code of Regulation, Title 23, sections 3775 through 3781. The State Water Board has reviewed the Substitute Environmental Documentation for the Basin Plan amendments and concurs with Lahontan Water Board's findings

3. The Lahontan Water Board also adopted the Basin Plan amendments pursuant to the "Necessity" standard of the Administrative Procedures Act, Government code section 11353, subdivision (b).

4. The Lahontan Water Board found the Basin Plan amendments are consistent with the Statement of Policy with Respect to Maintaining High Quality of Waters in California (State Water Board Resolution No. 68-16) and the federal Antidegradation Policy (40 C.F.R. § 131.12).

5. The State Board finds that the Basin Plan amendments are in conformance with Water Code section 13240, which specifies that regional water quality control board may revise basin plans, and section 13242, which requires a program of implementation for achieving water quality objectives.

6. A Basin Plan amendment does not become effective until approved by the State Water Board and until the regulatory provisions are approved by the Office of Administrative Law (OAL). The Basin Plan amendments must also receive approval from the United States Environmental Protection Agency (U.S. EPA).

THEREFORE BE IT RESOLVED THAT:

The State Water Board:

1. Approves the Basin Plan amendments adopted under Lahontan Water Board Resolution No. R6T-2014-0027.

2. Authorizes and directs the Executive Director or designee to submit the Basin Plan amendments adopted under Lahontan Water Board Resolution No. R6T-2014-0027 to OAL for approval of the regulatory provisions and the U.S. EPA for approval of the Basin Plan amendments.

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board on July 2, 2014.

AYE:	Chair Felicia Marcus Vice Chair Frances Spivy-Weber Board Member Tam M. Doduc Board Member Steven Moore Board Member Dorene D'Adamo
NAY:	None
ABSENT:	None
ABSTAIN:	None

Jeanine Townsend
Clerk to the Board

Below is the LRWQCB memorandum approved 12/7/11:

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

RESOLUTION R6T-2011-0102

APPROVAL OF AMENDMENT TO THE WATER QUALITY CONTROL PLAN FOR THE LAHONTAN REGION TO REPLACE THE REGIONWIDE PESTICIDE WATER QUALITY OBJECTIVE WITH A REGIONWIDE WASTE DISCHARGE PROHIBITION ON PESTICIDES WITH EXEMPTION CRITERIA FOR AQUATIC PESTICIDE APPLICATIONS AND CERTIFICATION OF SUBSTITUTE ENVIRONMENTAL DOCUMENTATION

The California Regional Water Quality Control Board, Lahontan Region, (Lahontan Water Board) finds:

1. The proposed amendment to the Water Quality Control Plan for the Lahontan Region (Basin Plan) was developed in accordance with Water Code section 13240 et seq.

2. Pursuant to Public Resources Code section 21080.5, the Resources Agency has approved the Regional Water Boards' basin planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act (CEQA) (Public Resources Code section 21000et seq.) requirements for preparing environmental documents. (Cal. Code Regs., tit. 14, §15251, subd. (g); Cal Code Regs., tit. 23, § 3777.) The Substitute Environmental Documentation for this project includes the staff report; the language for the proposed amendment; the environmental checklist that identifies potentially significant adverse environmental impacts of the Basin Plan amendment, including any reasonably foreseeable significant adverse environmental impacts associated with the potential methods of compliance with the exemption, and mitigation measures to reduce those potential impacts; an analysis of alternatives; findings consistent with section 15091 of the CEQA Guidelines; a statement of overriding considerations consistent with section 15093 of the CEQA Guidelines; responses prepared by staff to address comments provided during the public review period, and this resolution.

   The project is an amendment to the Water Quality Control Plan for the Lahontan Region that will establish a regionwide prohibition for pesticides in water in Chapter 4 of the Basin Plan. This prohibition will replace the existing regionwide water quality objective for pesticides. The amendment will give the Lahontan Water Board discretion to allow exemptions to the pesticide prohibition for aquatic pesticide treatments proposed for purposes of protecting public health or safety or ecological integrity and only if such projects satisfy specific exemption criteria.

   The amendment also includes minor revisions to discussion of pesticide use throughout Chapters 3, 4, and 5 of the Basin Plan that are affected by the prohibition

language. These revisions include revising the language pertaining to rotenone use, which provides the Lahontan Water Board with discretion to allow the conditional use of rotenone by the United States Fish and Wildlife Service, in addition to uses currently proposed by the Department of Fish and Game. The amendment updates the current rotenone language by (1) refining the existing control measures and monitoring requirements for fisheries management programs, and (2) providing appropriate metrics to evaluate recovery of non-target organisms.

3. In the development and adoption of the amendment, the Lahontan Water Board considered factors in Water Code section 13241, and has concluded the requirements to comply with the amendment are reasonable and necessary in order to allow aquatic pesticide use for projects meeting specific exemption criteria while maintaining protection of water quality and past, present and probable future beneficial uses of water. The waste discharge prohibition coupled with exemption criteria will preserve the ability of the Lahontan Water Board to protect water quality from pesticide discharges while allowing specific aquatic pesticide projects to be carried out under Board oversight. The amendment provides the Lahontan Water Board the discretion to approve eligible aquatic pesticide applications carried out to protect public health, public safety, or ecological integrity. Such an approval includes granting an exemption to the prohibition and subsequently regulating the aquatic pesticide discharge under an applicable permit, such as individual or general Waste Discharge Requirements (WDRs), a National Pollution Discharge Elimination System (NPDES) permit, or a waiver of WDRs issued by the State or Regional Water Board.

4. The substitute environmental documentation concludes that the adoption of the Basin Plan amendment, which will allow the conditional use of aquatic pesticides, may have less-than-significant environmental impacts in many cases where aquatic pesticides are applied. As described in the Statement of Overriding Considerations, the SED also acknowledges and accepts the potential for significant environmental impacts for some uses of aquatic pesticides where long-term benefits to the people and environment of California outweigh those potentially significant environmental impacts.

5. CEQA scoping meetings were conducted on July 29, 2009 in Bishop, July 30, 2009 in Victorville, and July 31, 2009 in South Lake Tahoe. A notice of the CEQA scoping meetings was provided on the Water Board's website, printed in newspapers of record and was sent to interested parties, including public and environmental health departments, mosquito abatement districts, water management officials, federal and state wildlife agencies, resource conservation districts, environmental groups, and other individuals interested in the use of aquatic pesticides.

6. A Notice of Filing, the staff report, substitute environmental documentation, including a CEQA environmental checklist, and the draft basin plan amendment were prepared and distributed to interested individuals and public agencies on March 21, 2011 for review and comment in accordance with state environmental regulations

(California Code of Regulations, title 23, section 3775 et seq.) and federal Clean Water Act regulations (40 Code of Federal Regulations (CFR) Parts 25 and 131.)

7. During the written public comment period, two public hearings were held on April 13, 2011 and May 11, 2011 to solicit public testimony regarding the proposed Basin Plan amendment.

8. Lahontan Water Board staff considered public comments received and realized that some key changes to the proposed basin plan amendment language were necessary. On September 30, 2011, a subsequent Notice of Filing, a revised staff report, a CEQA environmental checklist, and the revised draft basin plan amendment were recirculated to interested individuals and the public. The scope of the recirculation was to solicit public input on modifications to the proposed amendment since it was last sent out for public review on March 21, 2011. This second public comment period was also conducted in accordance with state environmental regulations (California Code of Regulations, title 23, section 3775 et seq.) and federal Clean Water Act regulations (40 CFR Parts 25 and 131.)

9. The Lahontan Water Board heard and considered all written public comments and all testimony presented at duly noticed public hearings held at its regular meetings on April 13, 2011, May 11, 2011, and December 7, 2011.

10. The record as whole, including the staff report and environmental checklist, indicates that this amendment is consistent with the provisions of the State Water Resources Control Board Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California" and the federal anti-degradation policy prescribed in 40 CFR section 131.12. The anticipated changes in water quality associated with discharges of aquatic pesticides that may be allowed under the amendment will not unreasonably affect present and anticipated beneficial uses of such water.

    Lahontan Water Board staff acknowledge that projects may result in a temporary lowering of water quality. California Water Code, section 13241 recognizes that it is possible for the quality of water to be degraded to some degree without unreasonably affecting beneficial uses. While the presence of aquatic pesticides may temporarily lower water quality, control measures that are built into the project (to satisfy exemption criteria and permit requirements) will limit the temporal and spatial extent of any impacts to water quality. As such, water quality is maintained at levels that comply with water quality objectives and at levels capable of supporting beneficial uses.

    The staff report analyzes emergency and vector control projects for consistency with the requirements of the state and federal anti-degradation policies. For all other aquatic pesticide projects, when filing an exemption request, project proponents must supply project-specific information that will allow the Water Board to determine

whether the project is consistent with the provisions of federal and state anti-degradation regulations.

11. Based on the entire record, including the environmental checklist and staff report, and public comments and staff's responses to comments, the Lahontan Water Board has determined that adoption of the proposed amendments to the Basin Plan may have, either individually or cumulatively, potentially significant impacts on the environment, specifically in the areas of biological resources, greenhouse gas emissions, water quality, hazardous materials and indirect effects on human beings. The environmental documentation includes a Statement of Overriding Considerations in which the Lahontan Water Board finds that the anticipated long-term benefits of this Basin Plan amendment outweigh and render acceptable the potentially significant impacts that were unable to be mitigated to levels less than significant. Serious public health, safety, and economic implications could result if the amendment is delayed and uses of aquatic pesticides to protect health, safety, and maintain the integrity of the environment continue to be prohibited. In effect, the amendment will make it possible for the Lahontan Water Board to allow the conditional use of pesticides for projects vital to public health and safety and ecological preservation which benefit the people and the environment of California as a whole.

12. The Lahontan Water Board finds that the analysis contained in the staff report, the proposed amendment, the environmental checklist, the alternatives analysis, the CEQA findings and Statement of Overriding Considerations, and the responses to public comments comply with the requirements of the State Water Board's certified regulatory CEQA process, as set forth in California Code of Regulations, title 23 section 3775 et seq.

13. The proposed amendment meets the necessity standard of the Administrative Procedures Act, Government Code section 11353, subdivision (b).

THEREFORE BE IT RESOLVED THAT:

1. The Lahontan Water Board considered the information and analysis provided in the Substitute Environmental Documentation prepared by Lahontan Water Board staff pursuant to Public Resources Code Section 21080.5, and the Lahontan Water Board certifies that the Substitute Environmental Documentation reflects the independent judgment of the Lahontan Water Board and complies with all applicable requirements.

2. The Lahontan Water Board adopts the amendment to the Water Quality Control Plan for the Lahontan Region to replace the existing regionwide water quality objective for pesticides with a regionwide prohibition for pesticide application to water with exemption criteria for aquatic pesticide use.

3. The Executive Officer is directed to forward copies of the Basin Plan amendment and the administrative record to the State Water Board in accordance with requirements of section 13245 of the Water Code.

4. The Lahontan Water Board requests that the State Water Board approve the Basin Plan amendment in accordance with the requirements of sections 13245 and 13246 of the Water Code and forward them to the California Office of Administrative Law (OAL) and the U.S. Environmental Protection Agency for approval.

5. Following approval of the Basin Plan amendment by the State Water Board and OAL, the Executive Officer shall file a Notice of Decision with the Resources Agency. The record of the final Substitute Environmental Documentation shall be retained at the Lahontan Water Board's office at 2501 Lake Tahoe Boulevard, South Lake Tahoe, California, in the custody of the Lahontan Water Board's administrative staff.

6. If, during its approval process, Lahontan Water Board staff, State Water Board or OAL determines that minor, non-substantive changes to the amendment language or supporting staff report are needed for clarity or consistency, the Executive Officer may make such changes, and shall inform the Lahontan Water Board of any such changes.

I, Harold J. Singer, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, Lahontan Region on December 7, 2011.

Harold J. Singer

HAROLD J. SINGER
EXECUTIVE OFFICER

The Lahontan Regional Water Quality Control Board's (LRWQCB) Basin Plan Amendment was adopted by the Regional Water Board and the CA State Water Board. The CA Office of Administrative Law (OAL) has reviewed and approved the amendment. It became l become effective after final USEPA approval (which took 3 years). Throughout this process, TWSA was heavily involved in public opposition to the LRWQCB revisions of the Basin Plan Amendment. The new regulations allow for LRWQCB review of proposed herbicide/pesticide application projects in Lake Tahoe for aquatic invasive species management. Prior regulations upheld a prohibition on chemical use. TWSA staff and members attended multiple LRWQCB meetings, special planning workshops and CA Water Board meetings, providing both written and public comment. TWSA supported an unsuccessful 5-year moratorium on these projects at Tahoe.

TWSA involvement did yield enhanced public notification measures: any proposed chemical use project now requires notification and solicitation of comments from potentially affected water providers, regardless of the distance of the provider's service area from the proposed projects.

Another result of the public comment process has been TWSA maintaining presence on the Nearshore Aquatic Invasive Weeds Working Group (NAIWWG) and the Tahoe Keys Water Quality Working Group.

Initially, Lahontan staff began rewriting the amendment in early 2010, without input from the water providers, or the Nevada drinking water and water quality regulators (Nevada Department of Environmental Protection {NDEP} and California Department of Public Health {CDPH}). By providing written and public comment, TWSA staff was successful in bringing the issue of the Tahoe drinking water purveyors' filtration exempt status and their concerns to the LRWQCB. LRWQCB staff was then given direction to work with TWSA, NDEP and CDPH on the regulatory language and review process.

In July 2009, the Lahontan Region Water Quality Control Board began the scoping process for revisions to regulatory language in the Lahontan Basin Plan regarding aquatic herbicides, pesticides and other chemical controls. The revised Basin Plan was approved on Dec. 7, 2011, and received CA State Water Board approval on May 15, 2012.

This project was an amendment to the Water Quality Control Plan for the Lahontan Region regulating aquatic pesticide/herbicide use in Chapter 4 of the Basin Plan. The amendment replaced existing region wide water quality objectives for pesticides. The amendment will give the Lahontan Water Board discretion to allow exemptions to the pesticide prohibition for aquatic pesticide treatments proposed for purposes of protecting public health or safety or ecological integrity and only if such projects satisfy specific exemption criteria.

These revisions removed the previous blanket prohibition on direct water applications of herbicides/pesticides at Lake Tahoe.

TWSA staff and members presented public and written comments opposing the revisions throughout 2011, 2012, 2013 and 2014 presenting comments to the Lahontan Regional Water Quality Control Board and the CA State Water Board on multiple occasions.

The TWSA presented argument that Lake Tahoe's Tier 3 Outstanding National Resource Water (ONRW) status warranted a prohibition. TWSA staff attended meetings and voiced the concerns of the water purveyors over chemical use in Lake Tahoe; supporting a preference for maintaining the ban on such use at Lake Tahoe.

Based on public comment; meetings between TWSA staff and member agencies and LRWQCB staff were held in April & May 2011. Both the CA and NV drinking water regulatory agencies submitted mitigation language to LRWQCB in May 2011.

Final approval of the Basin Plan Amendment revisions was given on Sept. 10, 2015 by USEPA.

An herbicide test pilot was proposed for AIS weed management in the Tahoe Keys area in 2018, it has been revised and deferred to 2020, if approved. .

Excerpt of Exemption Criteria and Mitigation Language relevant to drinking water intakes:
http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/comments111411/attachment2_revised093011.pdf

(Note: Footnote 7: page 8: The Regional Board will consult with the Nevada Division of Environmental Protection (NDEP) when a project affects interstate waters that exist within, or flow to, the State of Nevada. The Regional Board will consult with the California Department of Public Health (CDPH) when reviewing exemption requests that may affect surface drinking water intakes.)

(Page 8):
An exemption request must be submitted to the Water Board and contain the following information acceptable to the Regional Board.

- Project Information to include:
  a. Project description including, but not limited to, proposed schedule, duration, name of pesticide, method and rate of application, spatial extent, water body, control/mitigation measures to be used, contact information.
  b. Purpose and need for project.
  c. The chemical composition of the pesticide to be used, including inert ingredients.
  d. Communication and notification plan to be implemented before, during and after the project. The plan will include documented measures to notify potentially affected parties who may use the water (ground or surface) downstream for any beneficial use. The notification plan must include any associated water use restrictions or precautions. Project proponents will provide potable drinking water where necessary and shall obtain any necessary permits from CDPH and NDEP for supply of potable drinking water.

- For projects conducted in an ONRW (e.g. Lake Tahoe) that may impact surface water intakes used for drinking water located within one-half mile of the point of application, the following additional requirements apply:
  i. Proponents will provide written response from the water purveyor(s) indicating (1) request for project modification (e.g., project design, monitoring, and/or mitigation measures) or (2) consent with the project with no continued involvement.
  ii. An estimate of the maximum foreseeable concentrations of pesticide components in any surface water intake used for drinking water supplies.
  Public notification requirements may be waived where project proponent is an agency signatory to Cooperative Agreement with DPH and evidence is provided of notification exemption.

- Spill contingency plan to address proper transport, storage, spill prevention and cleanup.

Below is the public comment offered to the CA State Water Board by TWSA staff in 2014:

Tahoe Water Suppliers Association
Protect the Source

1220 Sweetwater Road
Incline Village, Nevada, 89451
775-832-1212

TWSA Members:
Cave Rock Water System
Edgewood Water Company
Glenbrook Water Company
Incline Village GID
Kingsbury GID
Lakeside Park Association
North Tahoe PUD
Round Hill GID
Skyland Water Company
South Tahoe PUD
Tahoe City PUD
Zephyr Water Utility

5/23/2014

TWSA Comment Regarding Lahontan Region Water Quality Control Board Basin Plan Amendment – for the California State Water Board comment period ending 5/30/14.

The Tahoe Water Suppliers Association represents the majority of the area's municipal water purveyors whose source of drinking water is Lake Tahoe. Most of the members pull water directly from Lake Tahoe to service their customers. There are 160,000 public water systems in the United States. Only sixty systems in the entire nation hold filtration exemption status with the US EPA. This status defines special water treatment and watershed protection requirements. Six of those sixty filtration exempt systems are Tahoe Water Supplier Association members. It is unusual for the US EPA to grant filtration exemption status to a drinking water provider located in a watershed open to multiple uses, such as Tahoe. These six filtration exemption permits attest to the extremely high quality of Lake Tahoe's water. In the past 8 years, the TWSA has established an aggressive source water protection education program which includes the popular "I Drink Tahoe Tap" campaign. This campaign focuses on educating the public about source water protection and appreciation of the excellent tap water provided to our communities.

The regulatory revisions being implemented by the Lahontan Regional Water Quality Control Board (potentially allowing for the direct introduction of herbicides into an open water application at Lake Tahoe) are of paramount concern to the public water suppliers. We do not concur that the Substitute Environmental Document for the Lahontan Basin Plan adequately addresses the concerns for utility services and drinking water quality. Tahoe's municipal water systems are not designed to, nor are they effective at, removing chemical contaminants. They are designed to treat biological contaminants only. Our concerns focus on the long-term implications of establishing chemical controls for aquatic invasive weeds maintenance, setting an unseen precedent at Lake Tahoe. We also question the efficacy of chemical methods, seeing the risk as too large to imperil one of the purest water bodies in the world.

> For example: "No herbicides are used in the Okanagan Basin Water Board's water milfoil control program. In the late 1970s test plots of Eurasian water milfoil were treated with 2,4-D in granular form. Although 2,4-D is a systemic herbicide, taken up by the plant and capable of killing the root, repeat applications are needed, usually on an annual basis. This chemical is the same active ingredient that is found in many lawn weed killers. Another

> herbicide, Diquat, was tested once in the mid 1970s. It is the chemical equivalent of mowing the top growth of the plant and does not affect root viability. All the Okanagan lakes are used as drinking water reservoirs. Aside from citizen concern about chemicals in our water supplies, neither of these herbicides provides long term control."
> *(Source: http://www.obwb.ca/milfoil/methods-of-control/)*

And

> " Milfoil species are dicots, and therefore selective herbicides can be used to control them with minimal collateral damage to the primarily monocot native plant communities. 2,4-D, a selective herbicide, and fluridone, a non-selective herbicide, have both been used to control Eurasian watermilfoil to good effect in western Washington lakes. However, 2,4-D cannot be used in waterbodies that support salmonids (salmon and trout species). Triclopyr, another selective herbicide, has been approved for control of submerged plants as of 2008 and shows promise as an alternative herbicide for milfoil control. Endothall and Diquat, which are both contact herbicides, will control existing vegetation, but will not kill the roots, so the control is temporary."

(Source: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=9&ved=0CGwQFjAI&url=http%3A%2F%2Fyour.kingcounty.gov%2Fdnrp%2Flibrary%2Fwater-and-land%2Fweeds%2FBMPs%2FMilfoil_Myriophyllum_control.pdf&ei=ZD5-U4_VCeac8QHY7YG4Ag&usg=AFQjCNHutjZQ_BEByL0KR54Q5VrXW3YiDA&bvm=bv.67229260,d.b2U)

The TWSA has been a supporting member of the efforts of the Lake Tahoe Aquatic Invasive Species Working Group. In the past, we have provided staff resources to support water quality monitoring needs during the Asian Clam Projects in Marla Bay. We regularly attend meeting and work sessions. While acknowledging the challenge that lies ahead in successful management of Aquatic Invasive Species at Lake Tahoe, the water providers cannot support the direct introduction of any chemical agent into Lake Tahoe as a management tool for weeds.

Lake Tahoe is a Tier 3, Outstanding National Resource Water (ONRW). This is the highest designation of a non-degraded water body in the nation. Lake Tahoe is not simply a California water body; but also a Nevada water body and are federally owned waters. Tahoe is a national treasure.

"Tahoe is on a world stage environmentally for how we protect both the urban and natural worlds for future generations. Few alpine lakes which claim such awe-inspiring beauty and pristine conditions also share the complexities of being a year-round vacation destination surrounded by diverse communities. Lake Tahoe is one of just three lakes on the West Coast designated an Outstanding National Resource Water and the only one outside the National Parks system with a mix of public and private property ringed by highways and a population in the tens of thousands.

These are among the reasons Tahoe's environmental initiatives are so often used as models and drivers of environmental innovation. Our efforts to establish equilibrium between the human and natural environments provide both inspiration and instruction for communities grappling with

similar issues. When we work to protect our shores, sometimes we are serving more than our beloved lake. We are setting an example of environmental stewardship for others far and wide." *(Source: Joanne Marchetta, the Executive Director of the Tahoe Regional Planning Agency from her guest column published in the North Lake Tahoe Bonanza on March 27, 2014.)*

It is acknowledged that the Tahoe Keys Homeowners Association is developing an Aquatic Weeds Management Plan which will include an herbicide application project. How is Tahoe, as a Tier 3 ONRW, going to be differentiated from other water bodies and afforded the highest level of protection of any water body in the nation - if herbicides can be used to eradicate weeds in an open water situation?

Invasive aquatic weeds can be successfully managed using non-chemical methods which are now being rejected as too costly. The approval of the potential use of herbicides 'as a tool in the toolbox' for weed control in Lake Tahoe does not highlight innovation or stewardship. This 'tool' may be cheaper for the project proponent, but has the potential to induce a costly burden on all of the tax payers around the lake when the water purveyors must build filtration plants if herbicides and pesticides are introduced into Lake Tahoe.

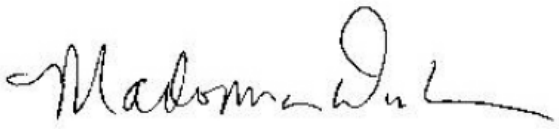
In the EPA Federal Water Quality Standards Handbook, the foundation of the water quality pollution control program mandated by the Clean Water Act – the following is written: Regulation 40 CFR.131.12(a)(3): The regulation requires water quality to be maintained and protected in ONRWs. EPA interprets this provision to mean no new or increased discharges to ONRWs and no new or increased discharge to tributaries to ONRWs that would result in lower water quality in the ONRWs. The only exception to this prohibition, as discussed in the preamble to the Water Quality Standards Regulation (48 F.R. 51402) permits States to allow some limited activities that result in temporary and short-term changes in the water quality of ONRW. Such activities must not permanently degrade water quality or result in water quality lower than that necessary to protect the existing uses in the ONRW. It is difficult to give an exact definition of "temporary" and "short-term" because of the variety of activities that might be considered. However, in rather broad terms, EPA's view of temporary is weeks and months, not years. The intent of EPA's provision clearly is to limit water quality degradation to the shortest possible time. If a construction activity is involved, for example, temporary is defined as the length of time necessary to construct the facility and make it operational. During any period of time when, after opportunity for public participation in the decision, the State allows temporary degradation, all practical means of minimizing such degradation shall be implemented.

Chemicals may dilute and degrade, but they do not disappear. The customer confidence we have built in "Tahoe Tap" cannot be replaced once chemicals are introduced into Lake Tahoe.

Lake Tahoe's Tier 3, Outstanding National Resource Water designation demands that the innovation and stewardship be paramount in the handling of invasive weeds in the Aquatic Invasive Species Management programs at Lake Tahoe.

California Water Code section 106, considers, by law, that drinking water is the highest beneficial use of waters of the state, followed by irrigation.

Chemical methods are neither temporary, nor short-termed, nor an innovative way to handle the weed problem at Lake Tahoe, nor protective of the highest beneficial use of the waters of Lake Tahoe.



Madonna Dunbar
Executive Director, Tahoe Water Suppliers Association
Resource Conservationist, Incline Village General Improvement District
Submitted on behalf of the Tahoe Water Suppliers Association
5/23/2014

The following links directly reference 2011 TWSA, NDEP and CDPH comments regarding the Basin Plan:
http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/comments051311/responses/twsa_wbresponse093011.pdf

http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/comments051311/responses/ndep_wbresponse093011.pdf

http://www.waterboards.ca.gov/lahontan/water_issues/programs/basin_plan/comments051311/responses/cdph_dw_wbresponse093011.pdf

Tahoe Keys 2016
Aquatic Macrophyte Survey Report
http://www.keysweedsmanagement.org/#methods

1.3 Summary of 2016 Survey Results
Species composition was found to be similar to that of previous years. Species occurring in the Tahoe Keys lagoons include *Myriophyllum spicatum* (Eurasian watermilfoil), *Potamogeton crispus* (curlyleaf pondweed), *Ceratophyllum demersum* (coontail), *Potamogeton richardsonii* (Richardson's pondweed), *Potamogeton foliosus* (leafy pondweed), *Elodea canadensis* (elodea), *Brasenia schreberi* (water-shield), *Ranunculus aquatilis* (white water-buttercup), and various species of Nitella., Chara., Spirogyra, and other filamentous algae. The hydroacoustic data showed that the abundance and biovolume of plants in the Tahoe Keys in 2016 was substantial and that more than 85% of the water volume was filled with plant matter. This is an increase over last year and in addition, point sampling data shows that the amount of curlyleaf pondweed has increased substantially from prior years.

Table 1. Frequency of Occurrence of Aquatic Plants in Each Basin

Species	East Basin	West Basin	Lake Tallac
Eurasian watermilfoil (*M. spicatum*)	50.5%	64.8%	60.6%
Coontail (*C. demersum*)	67.3%	69.8%	93.9%
Curlyleaf Pondweed (*P. crispus*)	12.2%	31.3%	21.2%
Leafy Pondweed (*P. foliosus*)	10.7%	27.8%	12.1%
Nitella (*Nitella sp.*)	9.7%	16.7%	3.0%
Elodea (*Elodea sp.*)	21.4%	47.7%	6.1%
Spirogyra spp.	0.5%	1.4%	0%
Richardson's Pondweed (*P. richardsonii*)	1.5%	4.6%	0%
Watershield (*B. schreberi*)	0%	0%	7.9%

Figure 1. 2016 Aquatic Plant Survey Area

2015 Tahoe Keys Aquatic Plant Baseline Survey
Purpose of 2015 Survey

The 2015 survey is a part of an on-going series of aquatic macrophyte surveys being conducted in the Tahoe Keys lagoons. The Tahoe Keys Property Owners Association (TKPOA) maintains the waterways of the Tahoe Keys lagoons and initiated the surveys as part of their maintenance and management practices. In 2014, the Lahontan Regional Water Quality Control Board issued new Waste Discharge Requirements to TKPOA (LRWQCB 2014) making the annual survey and reporting a permit requirement.

Over the past decades, the volume of weeds harvested has increased substantially from 100 cubic yards in 1984 to 18,600 cubic yards in 2014 (TKPOA 2015). In response, the TKPOA is developing the Integrated Weed Management Plan (IWMP) to outline control measures for use in the Tahoe Keys. The 2015 survey, and subsequent surveys, will provide a benchmark used to determine the efficacy of the IWMP methods and will help identify additional methods and approaches to achieve the IWMP goals and objectives.

Past aquatic macrophyte surveys of the Tahoe Keys lagoons conducted in 2009, 2011, and 2014 measured presence and absence of plant species (composition), areal cover, and estimated density of coverage. In addition to these features, the 2015 survey included determining the biovolume, which is the volume of plant matter, of submersed aquatic vegetation. The results of the 2015 survey were compared to results of the prior surveys to determine trends in growth of the aquatic macrophyte populations, if any, and possible trends in species composition/abundance.

Summary of 2015 Survey Results

Species composition was found to be similar to that of previous years. (Some shift in increased curlyleaf pondweed was seen summer 2016.) Species occurring in the Tahoe Keys lagoons include *Myriophyllum spicatum* (Eurasian watermilfoil), *Potamogeton crispus* (curlyleaf pondweed), *Ceratophyllum demersum* (coontail), *Potamogeton richardsonii* (Richardson's pondweed), *Potamogeton foliosus* (leafy pondweed), *Elodea* canadensis (elodea), *Brasenia schreberi* (water-shield), *Ranunculus aquatilis* (white water-butterbup), *Nitella spp., Chara spp., Spirogyra spp.,* and other filamentous algae. The hydroacoustic data showed that the abundance and biovolume of plants in the Tahoe Keys in 2015 was substantial and that more than 75% of the water volume was filled with plant matter.

Figure 1. 2015 Aquatic Plant Survey Area

2011-2018
Tahoe Resource Conservation District / Tahoe Keys Aquatic Plant Management Research Projects
http://tahoercd.org/aquatic-invasive-species-control-projects/

- *More on information on these type of non-chemical control projects is provided in the "Controls" Chapter.*

The Tahoe RCD is the lead implementation agency for aquatic weeds control in the Tahoe Basin. They have been the agency staffing the boat inspection program, conducting underwater surveys, monitoring, installing bottom barriers and preparing reports on projects.

Perhaps the most promising thing to occur in 2017-18 was the demonstration of a UV Light Project to kill aquatic weeds, conducted by Inventive Resources Inc. with technical support from Tahoe RCD. Initial results show plant control is possible using UV light. A full report is expected in December 2018.

New UV light treatment kills invasive species in Lake Tahoe

August 19, 2017 By Kacee Johnson
https://travelkacee.wordpress.com/2017/08/19/new-uv-light-treatment-kills-invasive-species-in-lake-tahoe *by* Kacee Johnson Aug. 17, 2017

Scientists at Lake Tahoe are testing a new way to eliminate invasive weeds using UV-C light. In initial tests, the light killed two harmful aquatic plants: Eurasian watermilfoil and curlyleaf pondweed.

Engineer John Paoluccio invented a new UV-C light treatment on invasive species in Lake Tahoe and conducted a second trial of testing on Aug. 8. The UV-C treatment targeted Eurasian watermilfoil and curlyleaf pondweed, two aggressive plant species effecting Lake Tahoe's ecosystem.

The initial pilot study of UV-C treatment began on June 24. Researchers tested a small area at Tahoe's south shore and observed that the UV-C treatment killed the invasive weeds. On Aug. 8, a secondary test covered a larger area in South Lake Tahoe.

The UV-C treatment shone a light on the Eurasian watermilfoil and curlyleaf pondweed scarring the plants' cells, said Nicole Cartwright, Aquatic Invasive Species Manager for Tahoe Resources Conservation District. The plants tried to heal the scarred area and as a result the plants ignored their remaining functions. The cells focused on healing themselves externally rather than getting nutrients to the interior of their cells. The plants cells fused together, killing the weeds.

Scientists tested the UV-C light in a closed marina as well as in open water. At the marina, Eurasian watermilfoil was targeted, and curlyleaf was targeted in open water.

"This project will span over the next two years," Cartwright said. "We don't want to make any conclusions, but the initial results look promising." Treating AIS with UV-C light is original to Lake Tahoe, according to Cartwright. "Nobody else is trying it," Cartwright said.

AIS programs in Colorado, Minnesota and Canada have contacted the TRCD to learn more about the UV-C treatment, Cartwright said.

But the idea for the treatment came from Paoluccio, Cartwright said. “We believed in his idea and wanted to get behind it,” she said.

However, some scientists believe further studies need to be performed to assess the long-term effectiveness of the treatment. “It’s important to note that the TRCD doesn’t have any scientists working for them,” said Sudeep Chandra, hydrology professor at the University of Nevada, Reno. “Their ‘scientists’ are only there to record observational data. There hasn’t been any external validation on UV light.”

Chandra said Paoluccio told him in an earlier conversation that he didn’t even know if the experiment would work. Paoluccio did not respond by the deadline to comment.

“The only proven effective way to kill invasive plants is by chemical treatment,” Chandra said. “If this UV method proves itself effective, it could completely change our ability to control weeds at Lake Tahoe.”

Currently, Lake Tahoe prohibits the use of chemicals to remove invasive weeds.

“The use of chemicals on invasive plants is too risky,” said Tom Lotshaw, spokesperson for Tahoe Regional Planning Association.

Lotshaw said that invasive weeds don’t harm humans. The cost of using chemicals in the lake to destroy invasive species would outweigh the benefit that it would have on the lake’s ecosystem.

“We’re trying to control the problem before it gets out of our control,” Chandra said. “We don’t want this to escalate to the problem that the Great Lakes have.”

More than 180 non-native species have invaded the Great Lakes, according to the National Oceanic and Atmospheric Association. A new invasive aquatic species is introduced into the Great Lakes every eight months according to NOAA.

“Tahoe only hosts two dangerous invasive plants, but we’re seeing milfoil and curlyweed spread quickly over the lake,” Chandra said. “Eurasian milfoil started at south lake and spread up to the side until reaching the north shore. It’s moving very quickly.”

While the first invasive species came to Tahoe in the early 1800s, Eurasian watermilfoil and curlyleaf pondweed are two of the newer invaders. According to the Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe, written by Chandra, Eurasian milfoil has been in Lake Tahoe since 1985 and curlyleaf since 2003.

“These are two entirely different plants,” Chandra said. “They need to be tested separately. While I’d like to believe that UV light would kill the weeds, nobody is validating the science.”

Chandra added that Eurasian milfoil and curlyleaf are treated like weeds, because they are difficult to kill. Eurasian milfoil has a turion under the sediment, which functions like a tulip bulb.

"The UV light only hits the plant above the sediment," Chandra said. "It doesn't attack the part of the plant in the sediment."

This problem is also seen in curlyleaf. Chandra said that curlyleaf doesn't have a turion but that it has roots that extend "deep in the ground." They stick around for up to seven years.

"We've reached a point where the science hasn't caught up," Chandra said. "There's no way to tell if this is the best solution. The UV light may dissipate quickly; we just do not know. We should not just be relying on one method to get rid of these invasive species; we should be using a multi-method approach.

http://www.tahoefund.org/our-projects/active-projects/uv-light-pilot-project/
Partners: Tahoe Resource Conservation District, Inventive Resources Inc., California Tahoe Conservancy

Total Project Cost: $270,000
Tahoe Fund Grant: $10,000

In an effort to spur innovation in Tahoe, the Tahoe Fund provided the initial funds for a project that will evaluate UV light as a new method to remove aquatic invasive weeds. This innovative approach will be used in a pilot program at Lakeside Marina & Beach and could change the way aquatic invasive weeds are controlled in Tahoe's watershed and beyond if successful.

Aquatic invasive weeds are a serious threat to the crystal clear waters of Lake Tahoe. Aquatic invaders such as Eurasian watermilfoil and curly-leaf pondweed have already established in the Lake. These non-native species change the natural make-up of the waters and threaten to significantly reduce the recreational use of the Lake and surrounding rivers.

A $5,000 grant to the Tahoe Resource Conservation District from the Tahoe Fund's Environmental Venture Trust helped secure $260,000 in public funding from the California Tahoe Conservancy to get the project started this year. An additional $5,000 grant will provide underwater cameras to monitor the effectiveness of the UV light.

WDID 6A091512006 for Lakewide Aquatic Invasive Plant Control Project – Final Report 2016
http://tahoercd.org/wp-content/uploads/2017/05/2016-Report-for-WDID-6A091512006.pdf

Project Background

The Tahoe Resource Conservation District (Tahoe RCD) implemented four projects in 2016 for the removal of aquatic invasive plants in Lake Tahoe and the Truckee River. Below is a summary of the activities implemented.

Lakeside Marina and Lakeside Swim Area Aquatic Plant Control

From June – October 2016, a dive-team subcontractor, Marine Taxonomic Services, LLC (MTS) of Tahoe RCD installed plant control barriers and used diver-assisted suction removal to control and remove aquatic invasive plants at Lakeside Marina and Lakeside Swim Area, South Lake Tahoe, CA. Tahoe RCD staff was onsite on a daily basis to ensure the quality of the work, and to ensure compliance with permitting requirements. Prior to treatment in 2015, these plant infestations were surveyed and delineated by researchers from UNR. Tahoe RCD staff assisted with topside duties, including post-decontamination of the plant barriers at the Meyers Watercraft Inspection Station. In total, approximately 1.5 acres of plant control treatment of Eurasian watermilfoil and curlyleaf pondweed was accomplished. Turbidity measurements did not exceed 3 NTUs within Zone 1 (25-foot perimeter of the project worksite) for the duration of the project.

Truckee River Aquatic Invasive Plant Control

Tahoe RCD contracted with University of California, Davis Tahoe Environmental Research Center to provide pre and post project monitoring. UC Davis surveyed the areas previously treated and created monitoring transects in new treatment areas. In 2015, the area treated was from Tahoe City Highway 89 Bridge downstream to behind Tahoe Raft and Gas. In this section there were scattered, patchy plants that had returned. This area was then treated in 2016 with diver assisted hand removal (Figure 3). Tahoe RCD staff and field crews installed 88- 10' X 40' barriers from behind Tahoe Raft and Gas to the 64-acre walking bridge. The barriers were installed in late August and removed in early November (Figure 4 & 5). As requested by the U.S. Forest Service Lake Tahoe Basin Management Unit we surveyed the area treated with bottom barriers for the presence of Western pearlshell mussels (*Margaritifera falcata*). We found 8 individuals that we relocated upstream prior to installing barriers. The total area surveyed was approximately 2.5 acres. A total of 2 acres was treated with .67 acres using bottom barriers (Figure 6). Continued monitoring and control in 2017 will be necessary to assess the extent of any regrowth. Turbidity measurements were taken before, during and after barriers were installed. Measurements were between 1.02-21.1 NTUs

within Zone 1 (25-foot perimeter of the project worksite) for the duration of the project (Figure 7). Due to the low water levels, there was no water flow from pool to pool, so turbidity remained localized. Methods of plant removal in 2017 will depend on the water levels and flows being released from the Tahoe City Dam.

Fleur du Lac Aquatic Invasive Plant Control

Tahoe RCD and its dive-team subcontractor, Marine Taxonomic Services installed plant control barriers in the outer harbor of Fleur du Lac on the west shore of Lake Tahoe in August 2016 (Figure 8). There has been a small but persistent Eurasian watermilfoil infestation at this location, and in 2016, it expanded to 0.1 acres in areal extent. Divers installed barriers at this location to control and eliminate all plant growth. Divers re-visted this site in September and October and used diver-assisted suction removal to eliminate any plants growing along the edges of the barriers between the outer harbor and the shoreline.

Tahoe Vista Aquatic Invasive Plant Control

This project has been initiated, but was not implemented in 2016 due to weather and contracting (Figure 9). Tahoe RCD plans to start in early 2017.

Truckee River Eurasian Water Milfoil Removal Project
The Tahoe RCD is pioneering a project on the Truckee River to control the aquatic invasive plant, Eurasian watermifoil, which has been growing prolifically there since the late 1990s. Made possible by strong partnerships, this project follows other successful removal projects that have targeted aquatic invasive plants in Lake Tahoe, particularly in Emerald Bay. Eurasian watermilfoil likely entered the Truckee River during the overflow of the dam in 1997, and has established a thriving population over the last 5-7 years. The goals of this project are to, create a baseline map of the infestation from the outlet at Lake Tahoe downstream to River Ranch at Alpine Meadows Rd, and systematically implement control efforts to remove this aquatic invasive plant within this reach of the Truckee River.

Asian Clam Control and Removal
Asian clam control in Lake Tahoe is a multi-agency, collaborative effort. Starting with a pilot project in Marla Bay and off shore of Lakeside Beach, researchers and managers looked at two different methods of control; rubber bottom barriers and diver assisted suction removal. Initial tests in the southeast portion of the Lake showed that covering clam populations with rubber barriers was effective in starving clams of dissolved oxygen, thus killing them. Expanding on these initial tests, in the Autumn of 2012, approximately five acres of rubber barrier material was deployed on a relatively low density clam population in the mouth of Emerald Bay.

Early Detection Monitoring (Veliger monitoring)
Since 2010, the Tahoe Regional Planning Agency, with assistance from the Tahoe RCD conducts veliger monitoring in Lake Tahoe, Echo Lake and Fallen Leaf Lake. Veligers are the larval stage of bivalve mollusks which includes quagga and zebra mussels, two potential invaders of Lake Tahoe. Monitoring is an essential element to ensure that the Watercraft Inspection Program has been effective in preventing quagga and zebra mussels from establishing populations in Lake Tahoe. Ten locations are surveyed monthly from late June until the end of September; eight locations in Lake Tahoe include Elks Point, Tahoe Keys, Emerald Bay, Meeks Bay, North Tahoe Marina, Sand Harbor, Obexers Marina, and Cave Rock along with Fallen Leaf Lake and Echo Lake. Sampling consists of eight vertical plankton tows at each site. The samples are then sent to a laboratory to be analyzed. All of the samples to date have returned with no zebra or quagga mussel veligers present.

An overview of Tahoe agency programs was offered in 2014. The link to the presentation is:
http://tahoercd.org/wp-content/uploads/2014/05/AllPresentations_May2014AIS-public-forum.pdf

2016 Dye Tracer Study in Tahoe Keys
In 2016, the earlier Rhotamine Dye study test was replicated in the Tahoe Keys.
A Final Report was published in 2017. Below is correspondence describing the project:

Final Report:
Submitted to Lahontan Regional Water Quality Control Board
September 16, 2016
on Behalf of the Tahoe Keys Property Owners Association
By Lars W.J. Anderson, Ph.D.

RE Waiver and Investigative Order R6T-2016-0028
(Rhodamine WT Dye Applications in the Tahoe Keys Lagoons)

Purpose of this study:

This study was initiated to determine movement and dissipation of a water-soluble dye Rhodamine WT (RWT) under two conditions and in three sites in the Tahoe Keys Lagoons: (1) Interior to the West Channel; (2) two double curtain barrier "contained" sites located in the south western area of the Tahoe Keys Main Lagoon. The West Channel site was chosen to assess potential movement of herbicide residues is they were to reach the proximity of the West Channel. The double-curtained sites were included to determine the ability of the curtains to contain water-soluble materials such as herbicides, and thereby prevent or retard their movement beyond the curtain barriers. Taken together, the information from this study will be useful in development contingency plans that could be initiated in order prevent potential herbicide residues from entering Lake Tahoe.

May 25, 2016

Kirk J. Wooldridge
General Manager
Tahoe Keys Property Owners Association
356 Ala Wai Boulevard
South Lake Tahoe, CA 96150
KWooldridge@tahoekeyspoa.org

Waiver of a Report of Waste Discharge and Investigative Order No. R6T-2016-0028 to Submit Technical Reports for use of Rhodamine WT Tracer Dye in Tahoe Keys Lagoon / Lake Tahoe, Tahoe Keys Property Owners Association (TKPOA), El Dorado County

The Lahontan Regional Water Quality Control Board has reviewed the Tahoe Keys Property Owners Association (TKPOA) plan of operation submitted for the above referenced project, and pursuant to Water Code section 13269, is waiving the issuance of waste discharge requirements. This waiver is consistent with the Water Quality Control Plan for the Lahontan Region (Basin Plan) and is in the public interest. This waiver is conditional upon the project being conducted consistent with TKPOA's plan of operation, which is detailed in Enclosure 1. Failure to adhere to the submitted information will result in the revocation of this waiver.

Waiver is in the Public Interest

TKPOA has indicated the WT Tracer dye study is supported by many interested stakeholders, such as the Tahoe Water Suppliers Association, League to Save Lake Tahoe, and the Tahoe Area Sierra Club. The dye is used as a surrogate for aquatic herbicides and the study is needed to understand the projected fate and transport of aquatic herbicides in the waters.

TKPOA previously conducted a similar study in 2011 using the same dye, but in different areas of the TKPOA lagoons. Dr. Lars Anderson submitted a technical report on behalf of TKPOA (see Enclosure 2, Final Report: Rhodamine WT Dye Study-Tahoe Keys, March 23, 2012) which discussed the findings of the dye movement and dissipation from October 13, 2011 to November 16, 2011.

Discharge is Low-Threat

I understand that the work will consist of use of fluorimeter instrumentation to assess direction of flow, transport, and dissipation of extremely low concentrations (<10 ppb) of

United States Environmental Protection Agency (USEPA)-approved Rhodamine WT tracer dye. Based on the information submitted, the discharge does not adversely affect the beneficial uses of the receiving water. The Rhodamine WT tracer dye has been approved by USEPA for use in surface waters up to 100 ppb, and up to 10 ppb near water intakes. There are no water intakes in the vicinity of the proposed dye studies, but as a precaution, the maximum concentration of dye in the study is 10 ppb, and dissipation, dilution and breakdown of Rhodamine WT dye is expected to bring dye concentrations to below 1 ppb.

The discharge complies with all applicable water quality objectives. At 10 ppb maximum concentration the dye is not visible in the shallow waters of Tahoe Keys Lagoon, so the Rhodamine WT dye does not violate the Basin Plan color objective for Lake Tahoe which states that: "Waters shall be free of coloration that causes nuisance or adversely affects the water for beneficial uses." Rhodamine WT dye is neither toxic or biostimulatory at 10 ppb or less concentration. No beneficial uses will be adversely affected.

In addition to the use of low concentrations, TKPOA plans to use best practicable treatment or control of the dye to ensure that pollution or nuisance will not occur. Double barriers contain the dye at two dye injection sites and the third site will be extensively monitored. Implementation of these steps will ensure that any impacts are minimized.

Monitoring and Reporting Requirements

Pursuant to California Water Code section 13267, TKPOA is required to submit technical reports as scheduled in the operation plan in Enclosure 1. The following specific information must be included in the final technical reports:

a) Map of the plume's concentrations, areal extent, and depth profile at hourly intervals until the maximum concentration of Rhodamine WT is equal to or less than 1 ppb, as determined from the static sampling and any mobile sampling efforts. Analysis must include discussion on the relative impacts of dilution, dispersion and degradation on the dye concentration.

b) All sampling and analytical results shall be included in the report.

c) A brief summary of any operational problems encountered before, during, or after the dye application.

d) Analysis of the influence of environmental factors (e.g. water temperature, wind speed and direction, solar radiation, aquatic plants) on the movement and degradation of the dye.

e) Summary report of individual dye applications and conclusions.

f) Analysis of the influence of environmental factors on the dye and subsequent recommendations for the best season and conditions for potential use of aquatic pesticides at each test location.

This information is necessary to understand how potential application of aquatic herbicides within the Tahoe Keys could move into Lake Tahoe. The burden, including the costs of these reports, bears a reasonable relationship to the need for the reports and the benefits to be obtained. Failure to submit this information could result in the being liable civilly, in accordance with Water Code section 13268.

Thank you for your efforts to protect water quality. If you have any questions please contact me at (530) 542-5412 (patty.kouyoumdjian@waterboards.ca.gov), or Bruce Warden, Environmental Scientist, at (530) 542-5416 (bruce.warden@waterboards.ca.gov).

PATTY KOUYOUMDJIAN
EXECUTIVE OFFICER

Enclosures: 1) Proposed Tahoe Keys Rhodamine WT Dye Dissipation and Movement Study, May 11, 2016
2) Rhodamine WT Dye Study - Tahoe Keys, Final Report, March 23, 2012
3) Fact Sheet under section 13267

cc (via email):

Dennis Zabaglo, Tahoe Regional Planning Agency
Madonna Dunbar, Tahoe Water Suppliers Association
Darcie Goodman-Collins, League to Save Lake Tahoe
Harold Singer, Tahoe Area Sierra Club
Joel Trumbo, California Department of Fish and Wildlife
Penny Stewart, California Tahoe Conservancy
Nicole Cartwright, Tahoe Resource Conservation District
John Thiel, South Tahoe Public Utility District
Jason Burke, City of South Lake Tahoe
Jacques Landy, US EPA Region 9
Geoff Schladow, UC Davis Tahoe Environmental Research Center
Sudeep Chandra, University of Nevada at Reno
Rick Lind, Sierra Ecosystems Associates
Whitney Brennan, California Tahoe Conservancy

BTW/ma/T: TKPOA 2016 Rhodamine Dye Waiver & 13267
File Under: WDID 6A09089000

2011 Dye Tracer Study in the Tahoe Keys

With the LRWQCB revised Basin Plan Amendment, the potential use of herbicides or pesticides in Lake Tahoe became more real. Initial research was conducted in summer 2011 by Dr. Lars Anderson to try to understand water movement in and out of the Tahoe Keys.

This information was gathered in conjunction with aquatic invasive species (AIS) surveys (aquatic plants and fishes) to analyze potential uses of herbicides/pesticides for AIS control. Dr. Anderson conducted several tests of dispersal rates of the traceable Rhotamine WT Dye between July and August 2011. Final reports have not been published, but the TWSA Board was briefed in depth by Dr. Anderson on the study in spring 2012. The initial test results show great variability in how quickly and how far the water movements were between the channelized Tahoe Keys and the open lake environment.

In May 2012 a radio interview by Dr. Anderson described the project. Lars Anderson is a plant physiologist whose specialty is aquatic weeds. He has recently retired from a multi-decade career with the United States Agricultural Research Service. His home base has been at the University of California at Davis where he has led efforts throughout California to slow or halt the spread and negative impacts of aquatic invasive weeds. In his retirement Anderson has continued to be involved with efforts to stop the spread of aquatic invasive weeds within Lake Tahoe: *http://tahoeproject.org/environment/ais/214-aquatic-weeds-lars-anderson-interview-1*

Excerpts are below:

Boat traffic in the areas where work was conducted was minimal. Project locations were selected at or near the ends of lagoon channels to avoid watercraft interference. At no time during the project were residents with boat slips in the work area actively using their boats (see Attachment D for sample photos).

Literature Search:

Details of the literature search described above can be found in the 2011 Tahoe Keys Aquatic Plant Management Research Project Report dated December 15, 2011.

Dye Dissipation Study:

In 2011 there were two injections of Rhodamine WT (fluorescent dye) in the Tahoe Keys lagoons to address the following objectives:

1. Determine Fate and Movement of Herbicide Surrogate
2. Determine the retention time and movement of the water-soluble fluorescent dye Rhodamine WT as an indicator of residence time and movement of aquatic herbicides.
3. Compare retention time and movement of Rhodamine WT in several typical aquatic weed infested locations including: Tahoe Keys marine, Ski Run, Lakeside Marina and adjacent near-shore, Meeks Bay, and weed-infested site adjacent to the Truckee dam.
4. Use data from this dye study to develop proposed aquatic herbicide evaluation protocols and monitoring protocols (e.g. location and timing of pre- and post-herbicide application water sampling).
5. Use data from this dye study to help understand potential dispersal patterns for plant propagules (stem fragments, turions) and invasive clam/mussel larvae.
6. Provide summary report of results and recommendations

The results of the dye studies are summarized here and provided in detail in Attachment E.

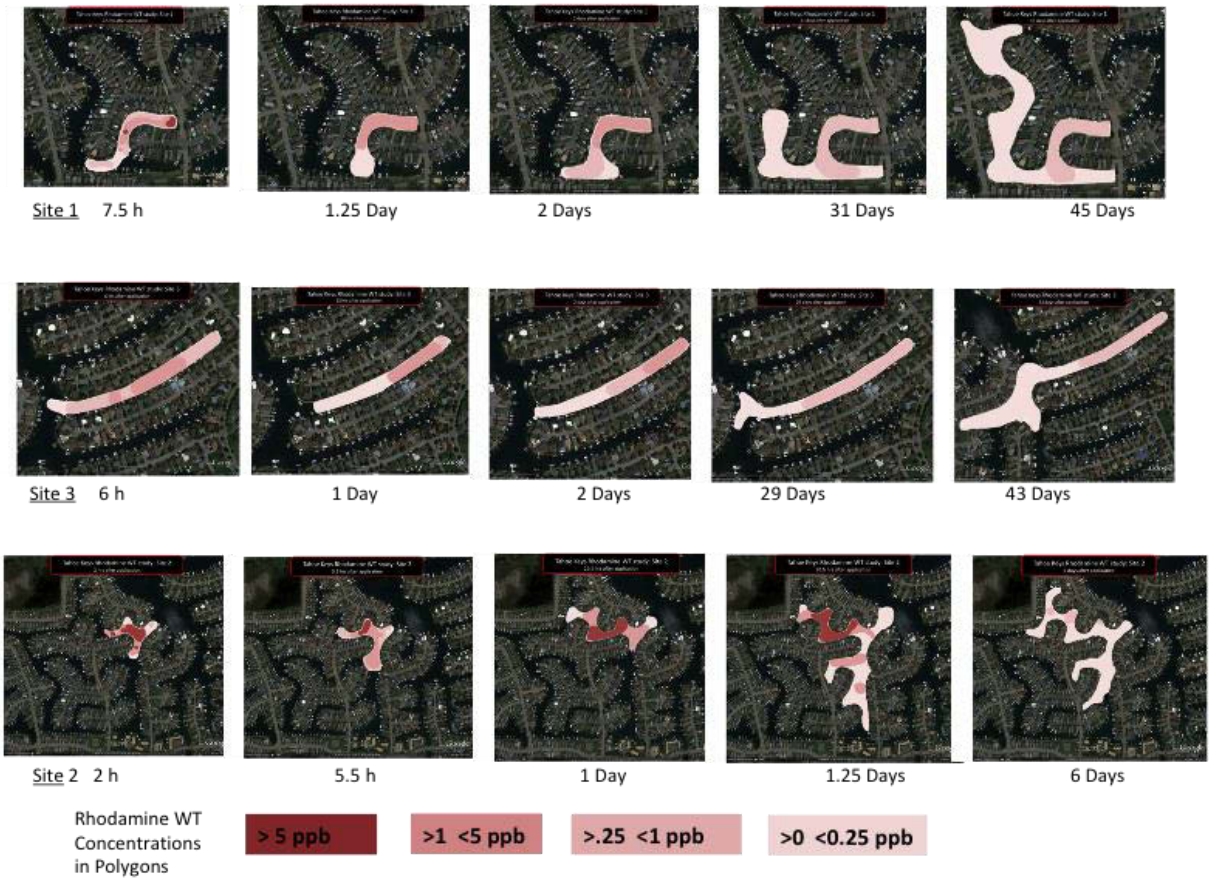
Summer Dye Application:

- Dead-end sites had long residence time: >30 days
- Dead-end sites had diurnal vertical mixing
- Open sites have very short residence time: Few hours
- Cold water influx from lake probably generated a southern and western flow
- Multiple dead-end sites could be used to compare efficacy of herbicides if approved for use. **These sites comprise approximately 70% of open water.**
- **These results suggest that late spring is the best time to use herbicides in dead-end sites.**

Fall Dye Application:

- Dead-end sites had long residence time: >30 days - Similar to summer characteristics
- Dead-end sites had diurnal vertical mixing, but more rapidly mixed than summer
- Open sites had much longer residence time than in the summer (less water movement) Residence time: *weeks*, not a few hours
- Water appears to exiting the Keys very slowly - the opposite of summer conditions
- **Results suggest that fall is best time to sustain herbicide concentrations in "open sites" (approximately 30% of the Keys).**

Rhodamine WT Dye Dispersion (Sites 1-3)-Summer



2011- 2013 Tahoe Keys Aquatic Invasive Species Studies

TAHOE
RESOURCE CONSERVATION DISTRICT
870 EMERALD BAY ROAD SUITE 108 • SOUTH LAKE TAHOE, CA 96150 • 530.543.1501 PH • 530.543.1660 FAX

2013 FINAL REPORT
TAHOE KEYS AQUATIC PLANT MANAGEMENT RESEARCH PROJECT

March 6, 2014

Submitted To:
Tahoe Regional Planning Agency
Patrick Stone
128 Market Street
Stateline, NV 89449

Tahoe Keys Property Owners Association
General Manager/Water Quality AIS Subcommittee
356 Ala Wai Boulevard
South Lake Tahoe, CA 96150

Prepared By:
Tahoe Resource Conservation District
Jim Brockett
870 Emerald Bay Road, Ste. 108
South Lake Tahoe, CA 96150

The 2013Final Report provide the results and accomplishments of the Tahoe Keys Aquatic Plant Management Research Project during the 2013 calendar year, which represents the third and final year of this three-year research project. The purpose of this research project was to provide a scientific basis for operational management of invasive and nuisance aquatic plants at Lake Tahoe, specifically in the Tahoe Keys lagoons. This was accomplished through three objectives:

1. Conduct a comprehensive literature search and produce an annotated bibliography on methods for management of aquatic invasive plants and potential non-target effects pertinent to Lake Tahoe and the Lake Tahoe Basin.
2. Determine efficacy and feasibility of currently available non-chemical methods for management of *Myriophyllum spicatum* (Eurasian watermilfoil) and *Potamogeton Crispus* (Curlyleaf pondweed) in typical infestations within the Tahoe Keys lagoon areas.
3. Monitor pre- and post- non-chemical treatment benthic invertebrate communities in areas of the Tahoe Keys targeted for aquatic plant management to evaluate changes after testing methods of non-chemical treatments.

Project Summary:

Year 1 (2011):

In 2011, benthic barriers were placed in six different locations throughout the Tahoe Keys lagoons and water movement was studied in three areas using a non-toxic fluorescent dye. A full report of project

activity in 2011 can be found in the *2011 Tahoe Keys Aquatic Plant Management Research Project Report* dated December 15, 2011. The locations of barrier placement sites and dye application areas are shown in the following diagram:

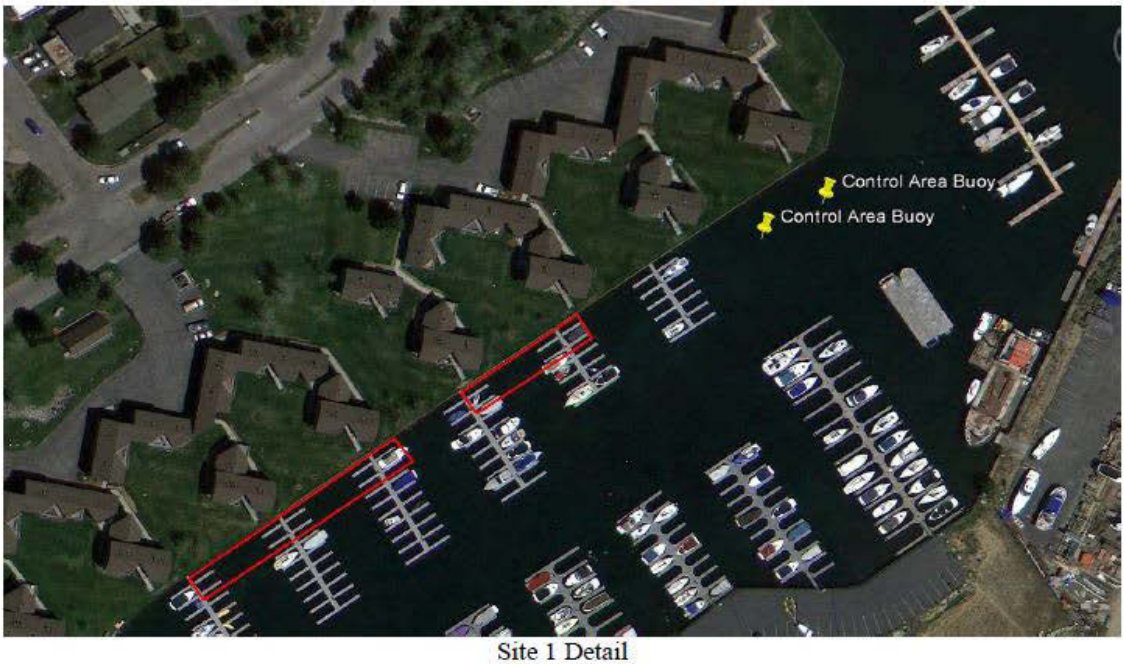
Barrier sites were selected to minimize interference with recreational uses and to represent a mix of submerged aquatic plants that include curlyleaf pondweed, Eurasian watermilfoil, and nuisance coontail. Two bottom barrier materials were used in this project for comparison of their effectiveness in controlling plant populations: a synthetic material composed of a woven plastic tarp with holes for permeability and a jute material that is a woven sheet of natural plant fibers.

Year 2 (2012):

A full report of project activity in 2012 can be found in the *2012 Tahoe Keys Aquatic Plant Management Research Project Report* dated March 14, 2013. Deployment of all bottom barriers was originally planned to occur in 2011; however barrier deployment at two of the jute barrier sites (Site 1 and Site 4) was postponed until 2012. This was a result of a relatively late start date (July 22, 2011) in 2011.

The maps below show the location and detail of sites 1 and 4.

Tahoe Keys Sites 1 and 4



Site 1 Detail

Site 4 Detail

Jute barriers were deployed at Site 1 and Site 4 in May 2012, and the following table summarizes all barrier deployment and removal conducted in 2011 and 2012:

	Material	Planned SF	Actual SF	Deployed	Removed
Site 1	Jute	9,200	11,400	5/21 – 5/23, 2012	n/a
Site 2	Synthetic	8,600	8,600	7/27 - 8/2, 2011	9/28/2011
Site 3a	Synthetic	7,500	7,500	8/8 - 8/11, 2011	9/29/2011
Site 3b	Jute	6,900	6,900	8/22 - 8/24, 2011	n/a
Site 4	Jute	10,000	11,250	5/17 – 5/21, 2012	n/a
Site 5	Synthetic	7,300	7,300	7/22 - 7/26, 2011	9/26/2011
Site 6	Synthetic	13,000	7,000	8/2 - 8/5, 2011	9/27/2011
Site 7	Jute	10,300	10,300	8/25 - 8/26, 2011	n/a
Jute Total		36,400	39,850		
Synthetic Total		36,400	30,400		

In addition to benthic barrier placement and removal, additional significant activity associated with the Tahoe Keys Aquatic Plant Management Research Project conducted during CY 2011 and 2012 includes:

- Literature search with respect to aquatic invasive plant control
- Benthic macroinvertebrate study
- Dye dissipation study

Please refer to the annual reports for those years for details.

Year 3 (2013):

2013 was the final year of the Tahoe Keys Aquatic Plant Management Research Project.

The primary activities of the Tahoe Keys Aquatic Plant Management Research Project in CY 2013 were:

1. Jute barrier ballast removal
2. Aquatic plant recolonization survey
3. Continued warm water fish control pilot study

Jute Barrier Ballast Removal

The jute barriers that were deployed in 2012 required ballast weight to hold the material to the lake bottom. Re-bar rods were used rather than sandbags in 2012 to avoid any impact from unwashed sand in the sandbags. Unwashed sand can result in the release of fine particles into the water column that are known to impact water quality and water clarity.

In May, 2012, approximately 220 pieces of 10 foot long re-bar were used to hold the jute material to the lake bottom at sites 1 and 4. Billowing jute was observed at site 4 in July of 2012, and an additional 100 pieces were deployed at site 4 in July 2012.

In July 2013, contract divers retrieved all re-bar from sites 1 and 4. The jute material was not completely decomposed, however it was significantly reduced and its integrity was weak. Silt and plants covered approximately 80% of all jute surface at both sites and it was determined that the ballast weight could be safely removed with no risk of the jute billowing up and potentially interfering with watercraft traffic.

No issues were encountered during re-bar removal.

Aquatic Plant Recolonization Survey

An aquatic plant recolonization study was conducted by Dr. Lars Anderson in September 2013. A full copy of this report will be provided under separate cover.

From Dr. Anderson's report:

> Summary
>
> 1. The most consistent pattern in macrophyte distribution is the predominance of *C. demersum* in areas with water depths >10 ft. at least within those sites sampled, and particularly in Site 1 (Table 1). For example, *M. spicatum* accounted for about 52% of the all plants found near the bulkhead in Site 1, but less than 3% in samples taken 25-30 ft away from the bulkhead in deeper water (>12 ft deep).
>
> 2. There appears to be no significant differences in relative abundance of the species within the barrier areas and in areas adjacent to those sites. However, there appears to be some increasing trend in presence of *E. canadensis* within some of the bottom barrier areas. Due to the high variability within sites, this is probably not significantly different and may be due to the late season and diminished abundance of *M. spicatum* and possibly *P. cripus*.

3. Only one small fragment of *P. crispus* was found in the entire sampling effort. Since the biomass of this plant typically declines in late summer, its absence isn't surprising.

4. The few pieces of jute found in a few samples were decaying rapidly and were permeated with sediment.

5. Regardless of the prior barrier deployment, there was an abundance of macrophyte growth in all sites, including the presence of emergent spikes with inflorescences) on *M. spicatum* in near-shore areas of some sites.

Warm Water Fish Pilot Control Project Summary:

Warm water fish control conducted by the California Department of Fish and Wildlife continued in CY 2013. Results from this effort will be provided at a later date under separate cover.

Turbidity Monitoring:

Turbidity and water quality monitoring for the Tahoe Keys Aquatic Plant Management Research Project was completed as required by the Lahontan Regional Water Quality Control Board, Section 401 Water Quality Certification conditions as follows:

Turbidity resulting from the project must not exceed either condition 1 or 2, whichever is the greater limit:

1) Turbidity must be 3 Nephelometric Turbidity Units (NTU) or less, or
2) Turbidity must be no more than 10% above background turbidity, determined by measurements made within one hour before project activity and one-half hour after.

Turbidity monitoring was conducted throughout the project when required, and there was no activity in 2013 that required turbidity monitoring.

Recreational Impact:

Boat traffic in the areas where work was conducted was minimal during all three years of project activity. Project locations were selected at or near the ends of lagoon channels to avoid watercraft interference. At no time during the project were residents with boat slips in the work area actively using their boats and this project had no impact on recreational boating.

Literature Search:

Details of the literature search described above can be found in the *2011 Tahoe Keys Aquatic Plant Management Research Project Report* dated December 15, 2011.

Dye Dissipation Study:

In 2011 there were two injections of Rhodamine WT (fluorescent dye) in the Tahoe Keys lagoons to address the following objectives:

1. Determine Fate and Movement of Herbicide Surrogate
2. Determine the retention time and movement of the water-soluble fluorescent dye Rhodamine WT as an indicator of residence time and movement of aquatic herbicides.
3. Compare retention time and movement of Rhodamine WT in several typical aquatic weed infested locations including: Tahoe Keys marine, Ski Run, Lakeside Marina and adjacent near-shore, Meeks Bay, and weed-infested site adjacent to the Truckee dam.
4. Use data from this dye study to develop proposed aquatic herbicide evaluation protocols and monitoring protocols (e.g. location and timing of pre- and post-herbicide application water sampling).
5. Use data from this dye study to help understand potential dispersal patterns for plant propagules (stem fragments, turions) and invasive clam/mussel larvae.
6. Provide summary report of results and recommendations

The results of the dye studies are provided in detail in the *2012 Tahoe Keys Aquatic Plant Management Research Project Report* dated March 14, 2013.

Benthic Macroinvertebrate (BMI) Monitoring:

The final stage of benthic macroinvertebrate monitoring associated with the Tahoe Keys Aquatic Plant Management Research Project was conducted in November 2012. The final BMI report from the University of Nevada, Reno can be found in the *2012 Tahoe Keys Aquatic Plant Management Research Project Report* dated March 14, 2013.

Conclusions:

This three-year project has given us the opportunity to investigate the efficacy of mechanical control methods of aquatic invasive plants, water movement patterns, and benthic impacts in the Tahoe Keys lagoons. We hope that these data will help to inform an integrated aquatic plant management plan in the Tahoe Keys.

The Tahoe Keys lagoons comprises approximately 174 acres of surface water. During the past three years, we were able to test the treatment of aquatic plants with bottom barriers of approximately 0.75 acre using jute bottom barriers and approximately 0.75 acre using synthetic benthic bottom barriers. There were no observable impacts to the benthic macroinvertebrate community or to recreational boating activity due to project activity. Contract divers were employed to deploy and recover bottom barriers in the Tahoe Keys and the cost of these barrier treatments were approximately:

- Synthetic barriers: $100K per acre
- Jute barriers: $65K per acre

Synthetic barriers and jute barriers were both effective at suppressing submerged aquatic plants in the short term of less than 12 months. However, plant recolonization rates showed that after a period of 12-24 months, the plant density within the treatment areas was similar to the density in untreated areas. Therefore, bottom barriers may be useful in preventing the growth of aquatic plants around a dock or within a boat slip for the duration that the barriers are in place. In order to be an effective treatment for control aquatic plants in the Tahoe Keys lagoons, the entire infestation area would need to be treated in order to prevent or reduce recolonization from adjacent areas.

While a direct extrapolation of the per acre costs to deploy barriers may preclude inclusion of potential savings associated with scales of magnitude, a rough estimate for a comprehensive benthic barrier treatment throughout the entire Tahoe Keys lagoons is approximately $17.4M with synthetic barrier

treatment or $10.44M with jute barrier treatment. It is estimated that current harvesting costs for the Tahoe Keys are $260,000 per year. If barrier treatment were to be used in place of mechanical plant harvesting, financial ROI could occur in approximately 67 years for synthetic barriers and 43.5 years for jute barriers. However, prior control work has shown that multiple years of barrier treatment are required to control most aquatic invasive plant infestations. Barrier treatment in the second and potentially even third year of comprehensive control tends to require less effort as plant density is reduced but additional years of barrier treatment could extend the financial ROI for the Tahoe Keys to in excess of 100 years. It should be additionally noted that even when localized eradication is achieved, the seed bed of aquatic invasive plants can persist for long periods of time and where localized control is conducted, multiple years of diver-assisted removal may be necessary to ensure that the plant population is not able to reestablish.

Mechanical treatment of aquatic invasive plants (bottom barriers and diver-assisted removal) in other areas of Lake Tahoe has proven to be very effective – even to the point of localized eradication. However, the areas where invasive plant control effectiveness has been high are in open-lake locations such as Emerald Bay and Lakeside Beach. Control results in enclosed, man-modified areas like marinas have been less effective at reducing plant infestations over the long-term. This is due to differences in substrate (very silty in enclosed areas and sandy in open-lake areas), plant density (typically higher in enclosed areas), and recolonization rates (higher likelihood in closer proximity to untreated areas). As a result of these factors, it is likely that mechanical methods alone (bottom barriers and diver-assisted removal) would not be effective as an aquatic plant control strategy in the Tahoe Keys.

Summary:

The 2013 project efforts in the Tahoe Keys lagoons included completion of barrier ballast material removal, survey and analysis of aquatic invasive plant recolonization, and continued warm water fish pilot control activity. Tahoe RCD has provided effective project oversight from 2011 through 2013 to achieve the identified project objectives.

This project demonstrated excellent cooperation, communication and coordination among agencies, contractors and the Tahoe Keys POA. Regular coordination meetings have been highly effective and on-site oversight provided real-time information to project managers about logistical challenges. There were no substantive complaints from homeowners during this project.

Perchlorate
Several communities around the lake, including Incline Village, Kings Beach, Glenbrook and the City of South Lake Tahoe provide community fireworks shows annually at the 4th of July holiday and at other large events. These shows are conducted by professional fireworks providers and are staged from barges anchored several hundred yards off shore. Event organizers require the next day cleanup of any firework debris, several include underwater dive cleanups. Perchlorate as a potential drinking water contaminant has entered the discussion surrounding these events. TWSA staff has conducted research and continues to monitor the situation surrounding fireworks use. Personal use of fireworks is banned in the Tahoe Basin.

In 2014, several citizens filed a lawsuit regarding debris from the displays. The parties reached an agreement to allow the fireworks displays to continue.
http://www.rgj.com/story/news/2014/04/01/south-tahoe-fireworks-will-continue/7162969/
More than 30 years of tradition will live on after opposing sides in a lawsuit reached a settlement that will allow the popular Fourth of July fireworks show at South Lake Tahoe to proceed as planned. The pact reached during negotiations in Sacramento, which will also allow for a Labor Day pyrotechnics display at the lake, was lauded Tuesday as a major plus for a tourism destination struggling through the impacts of the recession and ongoing drought.

"It's a good day for the south shore and a good day for all of Lake Tahoe," said Nevada Lt. Gov. Brian Krolicki, who was among many pushing for an out-of-court settlement to avoid the potentially staggering economic consequences of canceling fireworks celebrations attended by thousands.

Last week, directors of the Lake Tahoe Visitors Authority voted to cancel sponsorship of the two shows unless the lawsuit filed in November by a Zephyr Cove couple was not settled by this Friday.

Plaintiffs Joseph and Joan Truxler sued the Visitors Authority and the company that puts on the shows, Pyro Spectaculars North, Inc., alleging the two fireworks shows pollute Lake Tahoe and violate the Clean Water Act. The couple claim to have picked up 8,000 pieces of fireworks debris left from the shows since last July. An attorney for the Visitors Authority said last week he felt the authority would prevail in court but that the risk was too great, with the lawsuit claiming fines of up to $75 million were possible. Even an ultimate win might involve costly appeals lasting years, attorney Lew Feldman said.

Under the settlement, the authority will ratchet up post-show cleanup activities and make a hotline available for residents to report fireworks debris. Taking the lead role in permitting the show will be the Tahoe-Douglas Fire Protection District, whose chief Ben Sharit described required clean-up as an important component.

Joan Truxler said Tuesday the pact accomplishes the goals she and her husband sought by filing the suit in U.S. District Court. She said it was never their intent to force cancellation of the shows. "We're thrilled," Truxler said. "The residents of South Lake Tahoe really wanted their fireworks and we wanted the fireworks too."

Central to the settlement, Truxler said, was increased oversight of the fireworks displays and plans to establish a "beautification committee" to aid in cleanup, not just immediately after the shows but possibly year-round. Avoiding cancellation of the shows prevents a crushing hit to businesses large and small in the south Tahoe area, supporters said. "It would have been in the millions of dollars. It's

hard to say exactly but it would affect us a great deal," said Patrick Ronan, a resort operator who chairs the Lake Tahoe Visitors Authority. "It's huge for Lake Tahoe," Ronan said of events he characterized not only as vital holiday money makers but as attractants for tourism year-round."

Wildlife and Domestic Animals
The Tahoe Basin is home to many species of native, introduced, adapted and domestic animals. The significance to drinking water includes the potential of bacterial contamination from animal defecation/feces. Due to large population sizes, the main threats include: 1) domestic dogs and 2) colonies of Canadian Geese, which inhabit local beaches and defecate at the shoreline.

TWSA Dog Waste Education Campaign
TWSA staff's ongoing beach and stream monitoring points to no significant impact on drinking water quality from wildlife. Dr. Marc Walker, University of Nevada Reno faculty, conducted extensive studies on dog feces and water quality, between 2004 and 2007 at Burke Creek.

His study revealed that once feces have desiccated, there is no ongoing bacteriological impact on water quality. This report is available on request.

TWSA efforts on the '*They Drop It, You Drink It'* dog waste awareness campaign now includes a custom dog waste dispenser with biodegradable bags. These units are given to dog owners after they sign a pledge to pick up more dog waste.

TWSA provides funding for bulk waste dispensers, bags and custom signage for high use public dog areas. As of October, 2017 there were 75 units installed on the east, south and north shores of Lake Tahoe including Hidden Beach, Tunnel Creek (Nevada State Park), Burke Creek, Third Creek, Bijou Meadows, Van Sickle Bi-State Park and the new Tahoe City and Tahoe Vista Dog Parks. TWSA commits funds for 30,000+ refill bags annually.

This program seems to have a positive effect on watershed conditions but this has not been scientifically proven.

Excerpt from **Burke Creek Final Report 2011**
http://ntcd.org/nv_ourtahoewatershed/documents/Burke%20Creek%20Final%20Report.pdf

Dog Waste and Water Quality

Dog waste was ranked as the 5th most important concern in the community survey for the Oliver Park GID. Community residents complained of dog waste littering the trails along Burke creek and around their neighborhood. Dog waste is also a concern from a water quality perspective. Fecal Coliform bacteria which are found in the feces of warm-blooded animals, including humans, pets, livestock, beavers, and birds, can be a human health hazard. This is especially valid in the case of Burke creek which enters Lake Tahoe at Nevada Beach, one of the most popular recreation sites in the Basin.

Fecal Coliform is measured in colony forming units (CFU)counted per 100 milliliters of water (CFU/100ml). CFU are roughly equivalent to the number of bacteria cells. The Lahontan Regional

Water Quality Control Board standard for fecal coliform is 20 counts per 100 ml for a single occurrence. In 2010, the fecal coliform at the mouth of Burke creek were measured at 49 CFU's, more than double the water quality standard and the highest level measured in any creek in the Basin. Figure 11 shows the fecal coliform measurements for 15 south shore monitoring sites from 2010. The other highly contaminated site, South Zephyr Creek, is located near a horse-back riding stable and has had numerous violations in the past.

While the fecal coliform numbers from 2010 are impressive, they are an improvement from 2009 when over 60 CFU were detected. Prior to the 2010 measurements, a dog waste station was installed near the parking lot as an Eagle Scout project. Water quality improvement for Burke Creek over the past year could be attributed to the dog waste station.

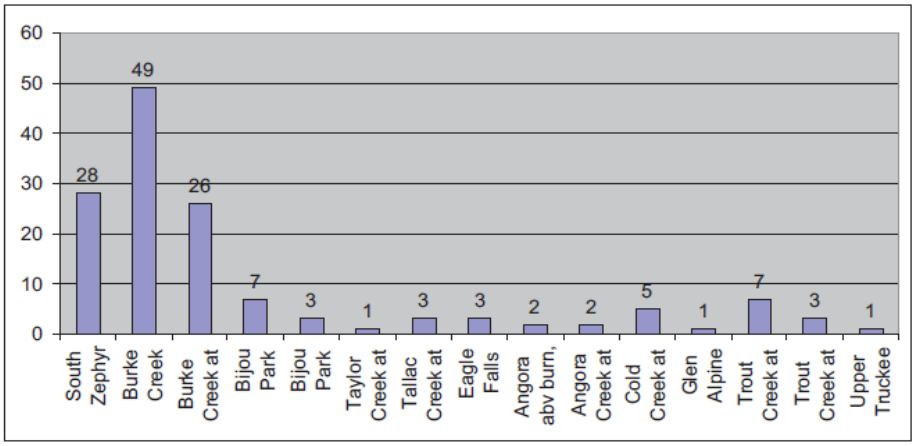


Figure 11. Fecal Coliform CFU's for 15 Monitoring Sites. Source: "Snapshot Day" 2010*.
**This figure contains incomplete labels but is un-editable.*

During the CWP survey, residents of the Oliver Park GID asked for improvements in signage directing dog walkers on how to dispose of dog waste properly and greater access to waste containers. Many dog owners use the clean-up bags supplied by the dog waste station, but then leave these bags along the trail rather than disposing of them properly.

IVGID Goose Patrol Team
http://inclinerecreation.com/outdoor_recreation/beaches/geese_patrol

IVGID uses a volunteer Goose Patrol team of approximately 40 dogs and human volunteers to haze and chase geese from District property. Dogs on the Geese Patrol wear red vests and owners have special identification authorizing them to be at the beaches. Arriving at a variety of times throughout the day, the dogs chase the geese back into the water. Because of their efforts, fewer geese come to the beaches or stay at the beaches. Cleanup from the geese droppings has been greatly reduced, hence saving labor and staff resources.

Grazing – Historical Impacts *http://water.epa.gov/polwaste/nps/success319/ca_bigmeadow.cfm*

Under the Porter-Cologne Act, the USFS manages grazing allotments in accordance with a State Water Resources Control Board-certified water quality management plan. The plan sets forth an iterative process that governs the implementation, monitoring and revision (as appropriate) of BMPs used to control nonpoint source pollution. If BMPs are not effective—even after revision—the USFS can choose to mitigate the water quality impact, refine water quality standards and/or cease the activity. All resource activities are managed under the limitations provided in a USFS site-specific environmental assessment developed by an interdisciplinary team of experts. The USFS-LTBMU develops allotment-specific management plans in cooperation with its grazing permittees.

In the decade prior to the grazing ban (1999), USFS-LTBMU tried to mitigate the impacts on water quality from cattle grazing by installing BMPs such as cattle stream crossings and cattle exclusion fencing upstream of the crossings. Within the protected stream areas, the USFS-LTBMU planted vegetation and stabilized streambanks using cobbles and erosion control cloth. The USFS-LTBMU conducted its own water quality monitoring to assess the effectiveness of the various BMPs.

In the areas where cattle weren't excluded, the USFS implemented the following BMPs: off-stream water sources, rest rotation, reduced herd size and shortened grazing season. Despite these efforts, water quality continued to violate the FC bacteria objective. In 1999, the USFS-LTBMU informed the permittees who grazed the Meiss Meadows area that "a viable grazing strategy cannot be developed that would likely meet the state-mandated water quality standards..." As a result, the USFS permanently ceased all grazing on the Meiss Meadows area, which includes the Big Meadow Creek and Upper Truckee River basins.

Results
Removing livestock from the area allowed the waterbodies to recover. The USFS collected and analyzed approximately 43 samples at three separate locations in Big Meadow Creek during 2000, 2001, 2002 and 2008. FC levels have declined and now meet the water quality objective of less than a log mean of 20 units/100 mL (Figure 2). Similarly, the USFS collected and analyzed approximately 103 surface water samples from the Upper Truckee River (above Christmas Valley) during the years 2000, 2001, 2002, 2003, 2004 and 2008. Like Big Meadow Creek, FC levels in the Upper Truckee River have declined steadily since 1999 and now meet the water quality objective.

These significant reductions in FC bacteria counts restored the water contact recreation use, prompting the Lahontan Water Board to remove 4.5 river miles of Upper Truckee River and 1.4 river miles of Big Meadow Creek from California's CWA section 303(d) list of impaired waters in 2010.

Grazing - 2013 U.C. Davis Study
http://news.ucdavis.edu/search/news_detail.lasso?id=10636

http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0068127

Limited livestock grazing is available seasonally in the Tahoe Basin. A new study released in 2013 by U.C Davis states cattle grazing and clean water can coexist on national forest lands, according to research by the University of California, Davis. The study, published today in the journal PLOS ONE, is the most comprehensive examination of water quality on National Forest public grazing lands to date."There's been a lot of concern about public lands and water quality, especially with cattle grazing," said lead author Leslie Roche, a postdoctoral scholar in the UC Davis Department of Plant Sciences. "We're able to show that livestock grazing, public recreation and the provisioning of clean water can be compatible goals."

Grazing Animals: Baldwin Grazing Allotment - Site Closed to Grazing
http://www.fs.fed.us/r5/ltbmu/documents/projects/BGAMP/FINAL_Baldwin_Allotment_EA_20090723.pdf

The Lake Tahoe Basin Management Unit (LTBMU) permanently ended authorized livestock grazing on the Baldwin Allotment in order to meet state and federal resource standards and achieve desired conditions. The proposal included an amendment to the 1988 LTBMU Land and Resource Management Plan to close the Baldwin Grazing Allotment to eliminate grazing in the future.

The Baldwin Grazing Allotment was located in El Dorado County on the south shore of Lake Tahoe in the Fallen Leaf Management Area. The U. S. Forest Service Lake Tahoe Basin Management Unit (LTBMU) managed the Baldwin Grazing Allotment in the Tallac Creek watershed. The allotment was approximately 200 acres and the only grazing allotment on the lakeshore of Lake Tahoe. The allotment is dissected by Tallac Creek, which provides inflow to Lake Tahoe and supports native and introduced fish species. Wetland and riparian areas provide habitat for wildlife species, such as willow flycatcher and sensitive plant taxa, including *Botricium spp.* and *Epilobium spp.* The beach pasture was also adjacent to a known Tahoe yellow cress population, which is identified in the conservation plan as a medium priority restoration site, and a population recreational beach facility.

Logging
There are no commercial logging operations in the Tahoe Basin. Tree removal is restricted (permit required) by TRPA for trees greater than 12" in diameter. Most logging is conducted by one of the designated Fire Districts, in relation to forest fuels reduction projects. These operations are mitigated through measures such as special operational and equipment requirements for work on steep slopes and in Stream Environment Zones (SEZs). Most work is conducted in late fall, early winter and early spring. On-site prescribed burns are currently the main method for removal of forest biomass.

Cabin Creek Biomass Facility Project
http://www.placer.ca.gov/departments/communitydevelopment/planning/biomasstoenergyfacility

A hi-tech biomass burning facility is under consideration by Placer County, CA, but the preferred location of Kings Beach, CA was rejected in July 2011 due to community opposition. The Biomass Plant Facility is slated for placement next to Placer County's Cabin Creek MRF Facility, between Tahoe City and Truckee, CA. This would allow both the processing/grinding of forest debris at close proximity to the facility using the material for energy production.

Cabin Creek Environmental Impact Report (EIR)
The Final EIR was released for public review on December 4, 2012. The Planning Commission considered, then approved the project at their December 20, 2012 public hearing. An appeal was filed regarding the Commission's action.

Project Location: Eastern Regional Materials Recovery Facility and Transfer Station: 900 Cabin Creek Road, Truckee, Placer County, California 96161. Assessor's Parcel Number (APN): 080-070-016

Project Description: Placer County is proposing to construct a two-megawatt (MW) wood-to-energy biomass facility at the Eastern Regional Materials Recovery Facility (MRF) and Transfer Station that would use a gasification technology. The entire Eastern Regional MRF and Transfer Station site is approximately 290 acres and includes four County-owned parcels (APNs: 080-010-031, 080-010-033, 080-070-017, and 080-070-016). The proposed project would be located on a two-acre site in the southernmost area of property and entirely within APN 080-070-016. The site is located within the unincorporated portion of Placer County, California, approximately two miles south of Interstate 80 (I-80) at 900 Cabin Creek Road, 0.30 miles west of State Route (SR) 89. The site is in Section 28, Township 17 North, Range 16 East, Mount Diablo Baseline and Meridian. Site access is via Cabin Creek Road, off of SR 89.

The proposed project would include construction of an approximately 11,000 square-foot, two-story structure that would house the power generating and emissions control equipment, two 400 square-foot pads to accommodate transformer and phase-shifting equipment, and an approximately one acre material storage area. The storage area would include a 7,000 square-foot open air pole canopy structure to allow materials drying before use in the energy generation process. Additional on-site improvements would include six to eight parking spaces, a paved vehicle circulation area that includes new driveways on Cabin Creek Road and the access road to Tahoe Area Regional Transit (TART) and County Department of Public Works facilities located on the site, an aggregate base haul road south of the material storage area, storm water treatment facilities (including an infiltration trench and detention basin), retaining walls and utility improvements/extensions.

VII. ANNUAL WATERSHED ACTIVITIES SUMMARY

This chapter provides a summary of the major findings or changes within the watershed related to: lake biology, invasive species, recreation, landownership or zoning changes, water quality monitoring programs, research and wildfires.

2017-18 average year, drought conditions from 2013 to 2017
From 2013 to 2017, extreme drought conditions were seen on much of the U.S. West Coast. In 2015, the lowest snowpack ever was recorded for the Sierra Nevada in 500 years. In 2016, precipitation levels returned to a normal year, however drought conditions remained throughout CA. Then, in a turnaround, the 2016-2017 winter was record setting for precipitation. When California facing one of the most severe droughts on record, Governor Brown declared a drought State of Emergency in January 2014 and directed state officials to take all necessary actions to prepare for water shortages.

Some emergency measures have remained in place to address long-term conservation and efficiency. The California Water Board maintains a Water Conservation Portal:
https://www.waterboards.ca.gov/water_issues/programs/conservation_portal

California Water Conservation and Drought Planning Statutes

Assembly Bill (AB) 1668 and Senate Bill (SB) 606 - May 31, 2018
AB 1668 and SB 606 build on Governor Brown's ongoing efforts to make water conservation a way of life in California. SB 606 and AB 1668 establish guidelines for efficient water use and a framework for the implementation and oversight of the new standards, which must be in place by 2022. The two bills strengthen the state's water resiliency in the face of future droughts with provisions that include:

- Establishing water use objectives and long-term standards for efficient water use that apply to urban retail water suppliers; comprised of indoor residential water use, outdoor residential water use, commercial, industrial and institutional (CII) irrigation with dedicated meters, water loss, and other unique local uses.
- Providing incentives for water suppliers to recycle water.
- Identifying small water suppliers and rural communities that may be at risk of drought and water shortage vulnerability and provide recommendations for drought planning.
- Requiring both urban and agricultural water suppliers to set annual water budgets and prepare for drought.

At Lake Tahoe, in 2014/15, the California water purveyors enacted emergency ordinances and water use restrictions based on Executive Order from the California Governor. In 2015-16, some restrictions were eased as the area water providers were able to predict adequate supply for 3 years. In 2017, drought restrictions were lifted, but the State maintained focus on the 20% by 2020 conservation goals.

The State of California relaxed its mandatory water conservation measures and is allowing water providers to self-certify their individual water supplies, demands, and conservation levels.
http://ca.gov/drought

Agency actions are noted in the earlier chapter, (Action Highlights).

The State of Nevada did not declare drought emergency, but encouraged voluntary reductions and the Governor convened the Nevada State Drought Forum in 2015. *http://drought.nv.gov*

Record Precipitation: Atmospheric Rivers Pushed Precipitation Total to 89.7 inches since October 1, 2016. *https://mavensnotebook.com/2017/04/13/this-just-in-northern-sierra-precipitation-sets-water-year-record*

April 13, 2017

Never in nearly a century of Department of Water Resources (DWR) recordkeeping has so much precipitation fallen in the northern Sierra in a water year. DWR reported today that 89.7 inches of precipitation – rain and snowmelt – has been recorded by the eight weather stations it has monitored continuously since 1920 from Shasta Lake to the American River basin. Today's total surpassed the previous record of 88.5 inches recorded in the entirety of Water Year 1983. The region's annual average is 50 inches.

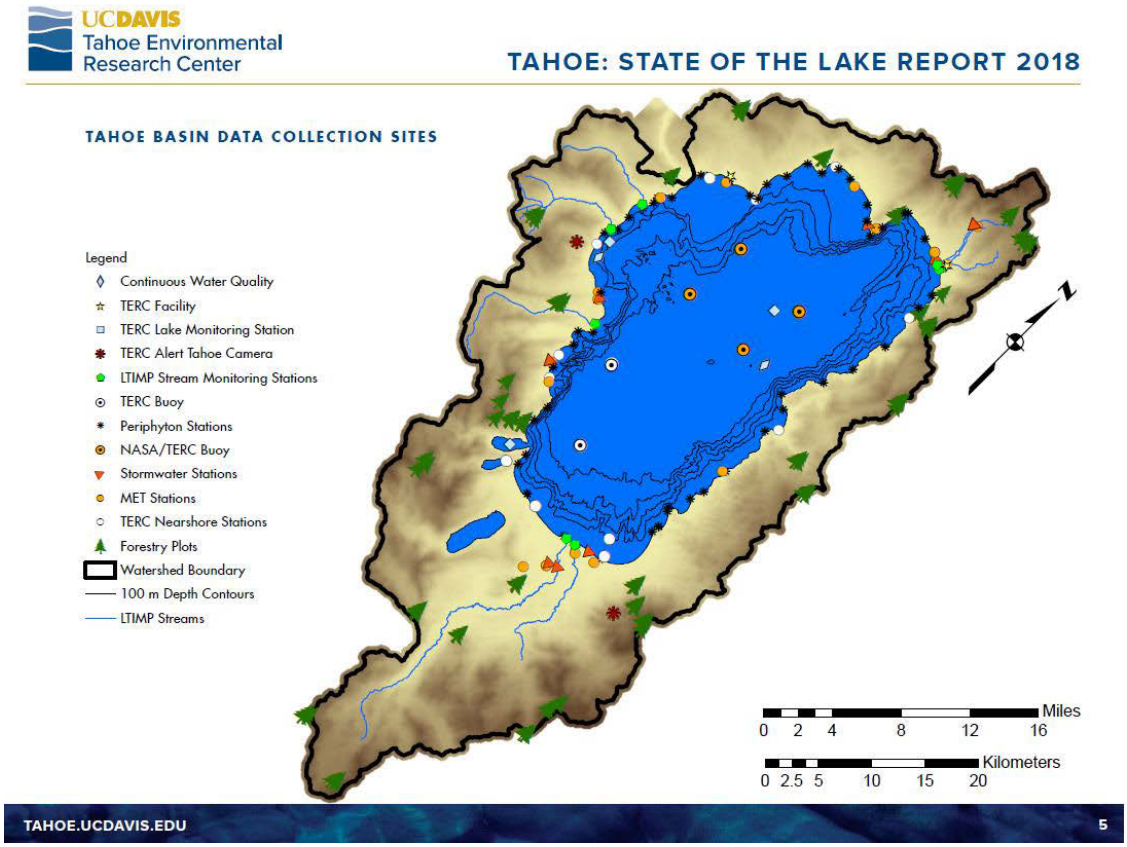
California traditionally receives 30 to 50 percent of its annual precipitation from atmospheric rivers (ARs), long and relatively narrow "rivers in the sky" laden with moisture that blow in from the Pacific. The West Coast experienced 46 ARs between October 1 and March 31, the first six months of Water Year 2017. Nearly one-third of the total were "strong" (13) or "extreme" (3) ARs.

DWR's 5-station San Joaquin index is keeping pace with Water Year 1983's record total of 77.4 inches in the region. Today's total of 68.2 inches among the stations is 194 percent of the average precipitation recorded by today's date during the water year and far exceeds the San Joaquin annual average of 40.8 inches.

The six-station index in the Tulare Basin, often called ground zero of California's five-year drought, which officially ended in most of California on April 7, has recorded 178 percent of the amount of precipitation that normally falls by this date during an average water year. Total precipitation so far is 45 inches, about 1.5 times the average annual precipitation of 29.3 inches in the basin.

The snow water equivalent of California's snowpack is far above average throughout the Sierra Nevada — 176 percent of the April 13 average. DWR will conduct its final snow survey of the season on May 1 at Phillips Station in the Sierra 90 miles east of Sacramento.

University of California-Davis "State of the Lake Report (SOTL) 2018, 2017 and 2016"
http://terc.ucdavis.edu/stateofthelake



In 2015, TWSA became a sponsor at the $2500 level for the production of this report.

The *UC Davis Tahoe: State of the Lake Report* informs nonscientists about the most important factors affecting lake health and helps influence decisions about ecosystem restoration and management within the Lake Tahoe Basin. The report was funded by the California Tahoe Conservancy, the Lahontan Regional Water Quality Control Board, the Tahoe Fund, the Tahoe Lakefront Owners Association, the Tahoe Regional Planning Agency, the Nevada Division of Environmental Protection, the Tahoe Water Suppliers Association, the League to Save Lake Tahoe and the Incline Village Waste Not Program, and individual donations.

Annually in August, the University of California–Davis (UC Davis) issues the "*Tahoe: State of the Lake Report"*. The University of California, Davis, has conducted continuous monitoring of Lake Tahoe since 1968, amassing a unique record of change for one of the world's most beautiful and vulnerable lakes. The *State of the Lake Report* summarizes how natural variability, long term change and human activity have affected the lake's clarity, physics, chemistry and biology over that period. The data reveals a unique record of trends and patterns – the result of natural forces and human actions that operate at time scales ranging from days to decades. These patterns tell us that Lake Tahoe is a complex ecosystem, behaving in ways we don't always expect.

The long-term data set collected on the Lake Tahoe ecosystem by U-C Davis and its research collaborators is a valuable tool for understanding ecosystem function and change. *Tahoe: State of the Lake Report* presents the most recent year's data in the context of the long-term record.

2018 SOTL Executive Summary:
After a year marked by extreme weather and plunging clarity levels, the UC Davis Tahoe Environmental Research Center today released its annual Tahoe: State of the Lake Report. The report dated 2018 summarizes data collected in 2017 as part of the Center's ongoing, decades-long measurement programs, while also presenting current research on emerging issues. This includes updates about the dramatic change in Lake Tahoe's clarity in 2017, a study to characterize the nearshore and its impacts on algae, climate change indications, forest health and restoration, and an upcoming comparative study between Lake Tahoe and Lake Geneva.

"While 2017 may be viewed as an anomalous year, it has reinforced the fact that progress toward environmental restoration of Lake Tahoe will be punctuated by extreme years in future decades," said Geoffrey Schladow, director of the UC Davis Tahoe Environmental Research Center, or TERC. "Monitoring these extreme years and applying the lessons learned will be critical to ensuring that the lake and its watershed has the resilience needed to thrive under future conditions."

Clarity
Lake Tahoe's average annual clarity in 2017 was at its lowest level, 59.7 feet, since regular measurements began in 1968. This was likely due to the one-two punch of the end of a five-year drought followed by a winter of record-high precipitation levels that extended well into the spring. More sediment washed into the lake in 2017 than the previous five years combined. Clarity readings from the first half of 2018 indicate that clarity is back in its normal range, suggesting 2017 was an outlier. Nonetheless, the report said the decline highlighted the reality that extreme climatic and hydrologic events will become more common in the future and that current monitoring efforts need to be reviewed and upgraded to prepare for them.

An ecological approach to clarity
Past efforts to restore lake clarity primarily have focused on land-use management. The report said recent research shows a parallel ecological approach could accelerate progress. For example, a pilot project in Emerald Bay is testing whether removing invasive Mysis shrimp could restore the native food web and help sustain clarity improvements.

Record-busting weather
Winter monthly air temperatures were cooler than recent years, but average temperatures were warmer during summer. In 11 of the 12 months, air temperatures were higher than the 1910-2017 average.

Lake temperature was the warmest on record. Surface water temperatures in July 2017 were the warmest ever recorded at 68.4 degrees, which was 6.1 degrees more than in 2016.

Lake temperature was the warmest on record. Surface water temperatures in July 2017 were the warmest ever recorded at 68.4 degrees, which was 6.1 degrees more than in 2016.

Water Year 2017 (Oct. 1, 2016-Sept. 20, 2017) was the second wettest on record, with 68.9 inches compared to the long-term average of 31.6 inches.

Nitrogen and phosphorus loads were also at record levels in 2017 due to high streamflow. Suspended sediment was also high, particularly in Ward and Blackwood creeks.

Climate Change
TERC climate change researchers are applying downscaled future climate projections to the Tahoe basin. The results suggest air temperatures will rise by 7 to 9 degrees Fahrenheit between now and the end of the century. The watershed will also dry considerably, particularly on the north and east sides, adding to forest stress and wildfire risk.

The long-term data set collected on the Lake Tahoe ecosystem by the University of California, Davis and its research collaborators is an invaluable tool for understanding ecosystem function and change. It has become an important guide for responsible management by elected officials and public agencies tasked with restoring and managing the Tahoe ecosystem. This is, in large part, because it provides an independent basis for assessing the progress toward attainment of Tahoe's restoration goals and desired conditions; scientific assessment of how elements of the system are evolving in response to large-scale drivers; and builds our shared understanding of the natural processes that drive the ecosystem.

The UC Davis Tahoe Environmental Research Center (TERC) is constantly using new approaches to enrich the long-term data record for Lake Tahoe. These include real-time measurements at over 25 lake stations; long-term assessment of 84 forest plots at varying elevations; remote-sensing from autonomous underwater vehicles, satellites, helicopters, and aerial drones; and the deployment of a suite of numerical models. Chosen approaches focus on quantifying changes that are happening and understanding what actions and measures will be most effective for control, mitigation, and management.

This annual Tahoe: State of the Lake Report presents data from 2017 in the context of the long-term record. While we report on the data collected as part of our ongoing, decades-long measurement programs, we also include sections summarizing current research on important, emerging issues. These include: the dramatic change in Lake Tahoe's clarity that occurred in 2017; a new ecology-based approach to restoring lake clarity; an intensive study of the lake's nearshore region to characterize both the physical processes that take place there and their impacts on attached algae; the health of the basin's

forests and actions to imbue resilience to forest restoration efforts; some initial indications of how climate change will impact air temperature, precipitation, and soil dryness; and a comparative study initiated between Lake Tahoe and Lake Geneva, two lakes that were at the forefront of launching the field of limnology in the 19th century.

The clarity of Lake Tahoe declined in 2017 to its lowest level since regular measurements commenced in 1968. The data suggest that this was due to the combined effects of the accumulation of sediment during a five-year drought that ended with a winter of record high precipitation levels that extended late into the spring.

More sediment was washed into the lake in 2017 than the combined amounts from the previous five years. The clarity conditions were particularly poor in late summer and fall when the unusually warm lake conditions may have trapped sediment-reducing fine particles near the lake surface.

Indications from clarity readings in the first half of 2018 are that the clarity is back in its normal range, and that the result for 2017 can be considered to be an outlier. However, 2017 highlighted the reality that extreme climatic and hydrologic events will become more common in the future. The adequacy and the extent of present monitoring and predictive capabilities need to be reviewed and upgraded. It is these extreme years that can provide the information most needed to plan future restoration and infrastructure projects.

Efforts to restore Lake Tahoe's clarity have focused on land-use management. The improvements in winter clarity over the last 10 to 20 years are evidence that this approach has been working. However, recent research has shown that a parallel ecological approach may accelerate progress. Test data show that the removal of the invasive Mysis shrimp results in the return of the native zooplankton Daphnia, coinciding with many meters of clarity improvement in both summer and winter. A pilot project in Emerald Bay is testing whether Mysis numbers can be reduced sufficiently to sustain such a clarity improvement.

Project UPWELL was a unique, philanthropy-funded collaboration between researchers from UC Davis, Stanford University, and the University of British Columbia. By pooling equipment, it was possible to install a curtain of almost 100 instruments to measure the enormous internal waves that transport nutrients from the depths of Lake Tahoe to feed the attached algae (periphyton) that cover the shoreline rocks. Currents, temperature, oxygen, and nitrate were measured for over two months to supplement the data from TERC's Nearshore Water Quality Network. Periphyton growing on artificial substrates were also measured to determine what limits growth.

Lake Tahoe's forests were stressed during the drought, making trees more prone to insect and pathogen attacks. Forest surveys undertaken in 2009 and 2017 (before and after the drought) show increased mortality in all three elevation zones (lower montane, upper montane, and subalpine). Mountain pine beetle was a significant cause of mortality in large stands of sugar pine in lower montane forests, particularly on the north shore. TERC's forest and conservation biology lab collected seeds from diverse sugar pine trees within the Lake Tahoe Basin that survived drought and mountain pine beetle attacks and are therefore likely more resilient. By germinating those seeds and rearing them in a new lathe house, 10,000 trees will be available to revegetate impacted stands on public and private lands.
In future years, these conservation collections will be expanded to include other species. Surveys of the forest have also shown the value of active forest management. Stands that received no forest treatments (thinning, prescribed fire, etc.) had much higher populations of mountain pine beetle compared to stands that received treatments.

Our climate change researchers are currently applying downscaled future climate projections to the Tahoe Basin. Using an ensemble of four models that capture the range of uncertainty, and assuming that the atmospheric carbon dioxide does not decline until the end of the century (called the RCP 8.5 scenario) temperatures could rise from 7 to 9 °F across the basin by the end of the century. Soil dryness expressed as "climatic water deficit," may increase by over 100 percent on the north and east parts of the basin.

The impact of these changes on the lake and the other aquatic resources are the subject of ongoing research. Knowledge of the circulating currents (or gyres) in Lake Tahoe is important for understanding how contaminants are moved around the lake. A new turbulence probe on the UC Davis autonomous glider "Storm Petrel" is currently being tested in Lake Geneva, Switzerland.

Tahoe measurements in 2019 will form the basis of a comparative study between these two famous lakes. The long-term trend shows rising air temperatures and a reduction in the number of days with below-freezing temperature. In 2017, monthly air temperatures were generally cooler than recent years during winter, but warmer during summer. In 11 out of 12 months, the monthly air temperatures were higher than the 1910-2017 average. Water Year 2017 was the second highest precipitation year with 68.9 inches, compared to the long-term average of 31.6 inches. January and February were particularly wet. This resulted in the lake level rising 5.7 feet, between January 1 and July 7, to within an inch of the top.

The volume-averaged lake temperature continues to increase. In 2017, the lake was slightly warmer than the previous two years, making it the warmest ever.

The absence of deep mixing for the sixth year in a row contributed to the storage of heat. The July surface water temperature was the warmest ever recorded at 68.4 °F, an astounding 6.1 °F above the 2016 value due largely to unusually low wind speeds. The length of the stratified season (the period of time when the lake exhibits summer-like water temperature conditions) also continues to increase. Since 1968, this period has increased by 26 days.

In 2017, peak snowmelt occurred on April 25, over 5 weeks later than the previous year. This was due to the extremely large snowpack and an extended precipitation season.

The input of stream-borne nutrients (nitrogen and phosphorus) and suspended sediment were all at record levels in 2017 due to the high streamflow. The suspended sediment load from the Upper Truckee River exceeded the load for the previous five years. The levels of nutrients building up at the bottom of the lake continue to rise, in large part due to the absence of deep mixing. This internal cycling is an important source of nutrients for phytoplankton growth, particularly nitrate.

Phosphorus, which was at its lowest level in 2009, has been increasing steadily over the last eight years. It is currently at levels not seen since the 1980s. However, as in the case of nitrate, a large factor in this increase is the absence of deep mixing.

Biologically, the primary productivity of the lake has increased dramatically since 1959. In 2017, there was an increase in primary productivity to 237.2 grams of carbon per square meter. By contrast, the biomass (concentration of algae in the lake) has remained remarkably steady over time. The annual average concentration for 2017 was 0.67 micrograms per liter. For the period of 1984-2017the average annual chlorophyll-a concentration in Lake Tahoe was 0.70 micrograms per liter. From an abundance viewpoint, diatoms were the most common algal group (40 percent of the cells). Whereas the small Cyclotella gordonensis diatom, which has proliferated in recent years and previously contributed to low summer clarity, was present in extremely low concentrations for 2 017. The attached algae around the shoreline were also present in relatively low concentrations, particularly when measured at the standard height of 1.6 feet below the water surface. However, this is misleading as the rapid water level rise meant that the measurements were taken on rocks that had been out of the water weeks earlier. The measurements at 3.3 feet depth showed significantly heavier growth. Highest growth was generally at the more urbanized locations.

For the 12th straight year, TERC continued to expand its education and outreach offerings. During 2017, TERC recorded 14,204 individual visitor contacts. The majority represented student field trips and visitors to the Tahoe Science Center at Incline Village.

This report is available in its entirety on the UC Davis Tahoe Environmental Research Center website (http://tahoe.ucdavis.edu/stateofthelake/).

Previous year: for some parameters means data collated in terms of the water year, which runs from October 1 through September 30; for other parameters, it means data for the calendar year, January 1 through December 31.

2017 SOTL Executive Summary:

This annual Tahoe: State of the Lake Report presents data from 2016 in the context of the long-term record. While we report on the data collected as part of our ongoing, decades-long measurement programs, we also include sections summarizing current research that is being driven by the important questions of the day. These include: the causes of the increasing levels of filamentous algae seen on the shoreline; the health of Lake Tahoe's forests in response to drought; climate change and its impacts on the lake physics and the entire lake ecosystem; the driving force behind the variability of water quality around the lake's nearshore regions; a first look at what is happening in the very deepest parts of the lake; and the threat of invasive species spread by in-lake boating activities.

In recent years Tahoe has been subject to an increase in algal mats washed up on its shoreline. These algae, or metaphyton, are likely the result of changing nutrient conditions that favor their growth. While the precise cause is still being studied, there appears to be an association with areas of high Asian clam density, such as the south shore. Through filter feeding, Asian clams can effectively concentrate the available nutrients, providing ideal conditions for species such as Zygnema and Spirogyra.

While the agency-led boat inspection program is doing an excellent job in preventing new invasive species from entering Lake Tahoe, recent data are showing that boating activities may be exacerbating the spread of species that are already in the lake. While the role of in-lake transport has long been recognized for the spread of aquatic plants, the discovery and treatment of a satellite population of Asian clams adjacent to the boat ramp at Sand Harbor indicate that certain boating activities (such as filling and emptying ballast tanks) may also be important vectors.

The number of dead and dying trees at Tahoe and throughout the Sierra Nevada have been increasing as a result of interacting, complex factors. Drought stress, insect attack, and disease all interact to contribute to this decline in forest health, with direct implication for fire safety, carbon sequestration and biological diversity. A network of 84 forest monitoring sites throughout the basin is helping our understanding of the drivers of change. A new NASA instrument headed for the International Space Station in 2018, ECOSTRESS, is likely to provide further data to help understand these changes.

Climate change is an overarching factor. The long-term record shows that the warming that has been recorded since 1911 is impacting the watershed, the streams and the lake itself in numerous, interconnected ways. Summers are lasting longer and the winter period for lake mixing is becoming shorter. While the average water temperature in the lake continues its warming trend, the July water temperatures fell by 2.9 degrees this year. Because of the availability of our extensive data set, we can show that this was due simply to a large increase of winds in June and July and cooler than usual air temperatures.

What is harder to understand is the impact of climate change on the lake's ecology and how this ties in with lake clarity. In 2016, the tiny alga, *Cyclotella gordonensis*, returned in very high concentration in the upper 50 feet of the lake during summer. Its reappearance always coincides with a major decline in clarity, and it was responsible for the 17-foot decline in summer clarity. The fact that winter clarity improved by almost 12 feet, in what was an average precipitation year, provides support that many of the stormwater improvement projects around the lake are working.

It is sometimes believed that a poor measure of water quality at a location along Tahoe's nearshore is the result of poor management, a leaking pipe, or a problem waiting for a solution. What the Nearshore Network shows, using data measured continuously from around the lake, is that part of what we may be experiencing is normal system behavior. Combining the measured data with a wave model, we have been able to produce the first maps showing the variation in turbidity (water cloudiness) around the lake for

each season. In many parts of the lake, turbidity standards may be exceeded simply by natural processes such as wave breaking.

New technology is allowing us to venture to the bottom of the lake and "see" it in greater detail than ever before. Layers of sediment that are coating rock formations are clearly evident. Temperature measurements from over 1,500 feet deep show just how quiescent the water is, with temperature fluctuations only one one-hundredth (1/100) of a degree. At the same time, however, heat from the earth is gradually warming the bottom of the lake at a rate of 0.054 °F per year.

Precipitation during Water Year 2016 was at the long-term average for Lake Tahoe. Lake level rose over 20 inches in 2016 bringing the lake back above its natural rim and allowing flow into the Truckee River. With summer evaporation, however, lake levels briefly dropped below the rim again, before winter caused the lake to rise again. The volume-averaged lake temperature continues on a rising trend. In the last four years, the lake has warmed at an alarming rate of 0.5 degrees per year, 14 times faster than the long-term warming rate.

The absence of deep mixing for the fifth year in a row contributed to the storage of heat. At the same time, the maximum daily summer temperature was the coolest recorded in the last 18 years. The length of the stratified season (the period of time when the lake exhibits summer-like conditions) also continues to increase. Since 1968 this period has increased by almost 26 days. The date on which spring snowmelt started was March 29. This date has moved up by 19 days since 1961.

The input of stream-borne nutrients (nitrogen and phosphorus) to the lake increased in 2016 due to the higher precipitation over the previous four years. However, the levels of nutrients building up at the bottom of the lake continues to rise, due to the absence of deep mixing. This internal cycling is an important source of nutrients, particularly nitrate. When this factor is combined with the generally declining rate of lake phosphorus, it appears as if the lake may be transitioning to a point where nitrogen is once again becoming the limiting nutrient for algal growth.

This year the annual average Secchi depth, a measure of lake clarity, continued the long-term halt in clarity degradation. The value for 2016 was 69.2 feet (21.1 m), a decrease of 3.9 feet over 2015, but this is well above the lowest value recorded in 1997 of 64.1 feet (19.5 m). Year-to-year fluctuations are the norm, and the long-term goal should be viewed as attaining a level of clarity that on average meets the basin's standards. Winter (December-March) clarity improved by 11.7 feet to 83.3 feet (25.4 m), despite the average amount of precipitation. Summer (June-September) clarity in Lake Tahoe in 2016 was 56.4 feet (17.2 m), a 16.7-foot decline over the value from 2015. The large concentrations of Cyclotella are the direct cause of this.

2016 SOTL Scientists: Lake Tahoe Experienced a Record-Breaking Year in 2015 (*July 28, 2016)*
Lake Tahoe experienced a year like no other in 2015, according to scientists from the UC Davis Tahoe Environmental Research Center in its annual *Tahoe: State of the Lake Report,* released today. The report summarizes how natural forces, long-term change and human actions have affected Lake Tahoe's clarity, physics, chemistry and biology over time. It presents data collected in 2015 and puts them in the context of the long-term record. Continued warm and dry conditions contributed to several record-breaking measurements. Among them:

- **Climate change:** While precipitation was near average, only 6.5 percent of it fell as snow, the lowest amount ever recorded. Only 24 days had below-freezing average air temperatures, the lowest on record.

- **Lake Temperature:** The lake's average temperature is rising at its fastest rate yet. In 2015, the volume-average temperature increased 0.48 degrees F over 2014. The authors write that in the past four years, "the lake has warmed at an alarming rate of over 0.3 degrees F/year." That's 15 times faster than the long-term warming rate**.** Also, the average surface temperature was the warmest on record, 53.3 degrees F.
- **Mixing:** Deep mixing that a lake undergoes in the winter is crucial for adding oxygen to the depths and redistributing nitrogen that tends to accumulate at the bottom. However, Lake Tahoe failed to mix to its full depth for the fourth year in a row. Its mixing depth in 2015 of 262 feet is the lowest recorded. This lack of deep mixing also led to the highest average nitrate levels ever recorded in the lake, 20.6 micrograms per liter. This marked a recent shift from the relatively constant nitrate concentrations that persisted for much of the 35 year record**.**
- **Algae and lake level:** Attached algae around the lake's margins were at record-low levels, due largely to the low lake level, which fell by 9 inches in 2015. Lake Tahoe was below the natural rim 364 days in 2015, so no water could flow into the Truckee River. "The occurrence of rising air temperatures Lake Tahoe has been known about for many years now, and with it the warming of the lake. What is different this year is that we are seeing more aspects of the lake's internal physics changing, and that is bound to alter the ecology." – Dr. Geoffrey Schladow, TERC Director
- **Clarity affected by low snow-to-rain ratio:** Average annual clarity was 73.1 feet in 2015, a 4.8-foot decrease from the previous year, a measurement announced in April 2016. The decline was due in part to warmer inflowing water. The annual average clarity was still more than 9 feet greater than the lowest recorded average of 64.1 feet in 1997. The measurement marks the depth at which a 10-inch white disk, called a Secchi disk, remains visible when lowered into the water.

2016 SOTL Executive Summary:
This annual *Tahoe: State of the Lake Report* presents data from 2015 in the context of the long-term record. While the focus is on data collected as part of our ongoing, decades-long measurement programs, we have also included sections summarizing current research on the drivers of variability of water quality around the lake's nearshore regions, the periphyton covering many parts of the rocky shoreline, forest health, new techniques for determining the lake's metabolism, stream water intrusions, the unnoticed seiche waves, and the identification of climate change as a driving process in eutrophication.

Dissolved oxygen in Tahoe's waters is emerging as major topic of concern. It is recognized in many ecosystems around the world that one of the impacts of climate change is the potential for the formation of dead zones, where all the available oxygen has been consumed. Research is being conducted but more needs to be done to better understand what processes are at play to keep oxygen well distributed in the lake's hypolimnion (deep waters). Are the nutrient reduction strategies embedded in the TMDL sufficient to provide the lake the resilience it needs to withstand even longer droughts in the future? Can studying the lake's metabolism yield new understanding of how warmer water temperatures are changing the conditions at the base of the food web?

In the last 4 years the lake has warmed at an alarming rate of over 0.3 °F/year, 15 times faster than the long-term warming rate. The average surface water temperature was 53.3 °F (11.8 °C), making 2015 the warmest year yet recorded. The maximum daily summer surface water temperature in 2015 was similar to the previous year, and for the winter-time maximum, it was the warmest surface water temperature observed for the length of the record. Lake Tahoe did not mix to its full depth in 2015, the fourth consecutive year in which this has occurred. Instead, the maximum depth of mixing was only 262 feet (80 m), reached between February and March. The lack of mixing was due to a fourth year of above average lake stability, driven by the generally warmer weather. The upper 330 feet of the lake stayed stratified for 189 days, three weeks longer than what was typical when the record began.

The input of stream-borne nutrients (nitrogen and phosphorus) to the lake was low again in 2015 due to the low precipitation and subsequent run-off. The last four years have all had nutrient and particle loads a factor of four to five below the long-term mean. Overall in-lake nitrate concentrations have remained relatively constant over the 33 years of record. In 2015, however, the volume-weighted annual average concentration of nitrate-nitrogen reached an all-time high of 20.6 micrograms per liter, exceeding the previous high of 20.0 micrograms per liter set in 2014. This increase is in part due to the record low mixing this year; nutrients from the bottom of the lake were not brought up to levels where they can be utilized by phytoplankton. The lack of deep-water mixing allows a continued build-up of nitrate in the deep water. Surprisingly, in-lake phosphorus concentrations which had been on a long-term decline, displayed an increase in 2015, to the highest level in the last six years.

The low level of snowfall compared to rain this year caused the water entering the lake to be warmer in 2015, and this introduced fine particles closer to the surface. Summer (June-September) clarity in Lake Tahoe in 2015 was 72.8 feet (22.2 m), a 4.2 foot decline over the value from 2014.

About Lake Tahoe and the Tahoe Basin

- Maximum depth: 1,645 feet (501 meters), making it one of the deepest lakes in the world
- 2nd deepest lake in the United States
- Average depth: 1,000 feet (305 meters)
- Lake surface area: 191 square miles (495 square kilometers)
- Watershed area: 312 square miles (800 square kilometers)
- Length: 22 miles (35 kilometers)
- Width: 12 miles (19 kilometers)
- Length of shoreline: 75 miles (120 kilometers)
- Volume of water: 39 trillion gallons
- The daily evaporation from Lake Tahoe (half a billion gallons) would meet the daily water needs of 5 million Americans. Evaporation from the lake surface during the year equals approximately 52 inches of water, with August being the month of maximum evaporation. One inch of evaporation is equivalent to 3.5 billion gallons.
- The number of algal cells in Lake Tahoe is approximately 30 million trillion
- Number of inflowing streams: 63, the largest being the Upper Truckee River
- Number of large lakes worldwide with annual clarity exceeding Tahoe's: 0
- Number of outflowing streams: one, the Truckee River, which leaves the lake at Tahoe City, California, flows through Truckee and Reno, and terminates in Pyramid Lake, Nevada.
- Outflow from Lake Tahoe into the Truckee River stopped for 364 days in 2015.
- Length of time it would take to refill the lake: about 600 years
- Average elevation of lake surface: 6,225 feet (1,897 meters)
- Highest peak in basin: Freel Peak, 10,891 feet (3,320 meters)
- Latitude: 39 degrees North
- Longitude: 120 degrees West
- Age of the lake: about 2 million years
- Permanent population: 55,000 (2010 Census)
- Tourist population: 4.5 million (2010 Lake Tahoe Basin Prosperity Plan)
- Vehicle miles traveled (VMT) on a midsummer's day: about 2,000,000 miles

TERC Education Programs

Each year, TERC works to improve the exhibits and increase the offerings available. During 2015 TERC developed a new exhibit, a mobile app, curriculum, games, and a 3-D movie that aids in the mission to provide engaging exhibits and interactive hands-on educational activities. Interactive touchscreens for the new "Lake Tahoe in Depth" exhibit allow visitors to examine real-time conditions all around the lake. The "Citizen Science Tahoe" app allows anyone using a smart phone to report conditions they see at the beach. New curriculum, such as the algal growth experiment, teaches students about nutrients that affect the blueness of Lake Tahoe. A game called "Pollution Adds Up," teaches students about the cumulative impacts of non-point source pollution. Finally, TERC's newest 3-Dmovie "Let's Go Jump in the Lake" is now available for viewing at the Tahoe Science Center. TERC's augmented reality (AR) sandbox exhibit, originally developed as part of a National Science Foundation grant, has spread far beyond its home in our Tahoe Science Center. This spring, a new portable version went to Washington, D.C., where it was featured at the White House Water Forum, the USA Science and Engineering festival, and the Center for National Science Funding event at the Congressional Rayburn Building. Since debuting in 2014, the three original AR sandboxes—located at TERC, the Lawrence Hall of Science, and ECHO Lake Aquarium and Science Center—have inspired over 150 users across the globe to build their own sandboxes. Used as an educational tool, AR sandboxes can teach students and visitors about geomorphology, topography, hydrology, and landforms. Experience the AR sandbox in person at the Tahoe Science Center or visit www.ARsandbox.org to learn more.

The Thomas J. Long Foundation Education Center (TERC) at Incline Village, averages 12,000+ contacts annually. In addition, TERC hosts monthly public lectures and workshops, makes presentations to local organizations and takes a limited number of visitors out on research vessels. TERC organizes and hosts annual events and programs including Children's Environmental Science Day, Science Expo, Youth Science Institute, Trout in the Classroom program, Project WET workshops, Summer Tahoe Teacher Institute and a volunteer docent training program. Several new exhibits were developed including upgrades to the interpretive signage located in the Native Plant Demonstration Garden outside the Tahoe City Field Station; addition of two aquariums at the Eriksson Education Center in Tahoe City; the Virtual Watershed Sandbox and Clarity Model Interactive exhibit in Incline Village; and the 3D movie "Lake Tahoe in Depth" for viewing in the Otellini 3D Visualization Lab in Incline Village.

Citizen Science App

https://citizensciencetahoe.org

The "Citizen Science Tahoe App," launched in August 2015, encourages beach-goers to take a couple of minutes to report beach and lake conditions. The information is shared with scientists and provides a more in depth look of conditions around the lake. An updated version was published in 2017.

RECREATION ACTIVITIES

Aquatic Invasive Species (AIS):
"A non-indigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural or recreational activities dependent on such waters." (NANPCA 1990).

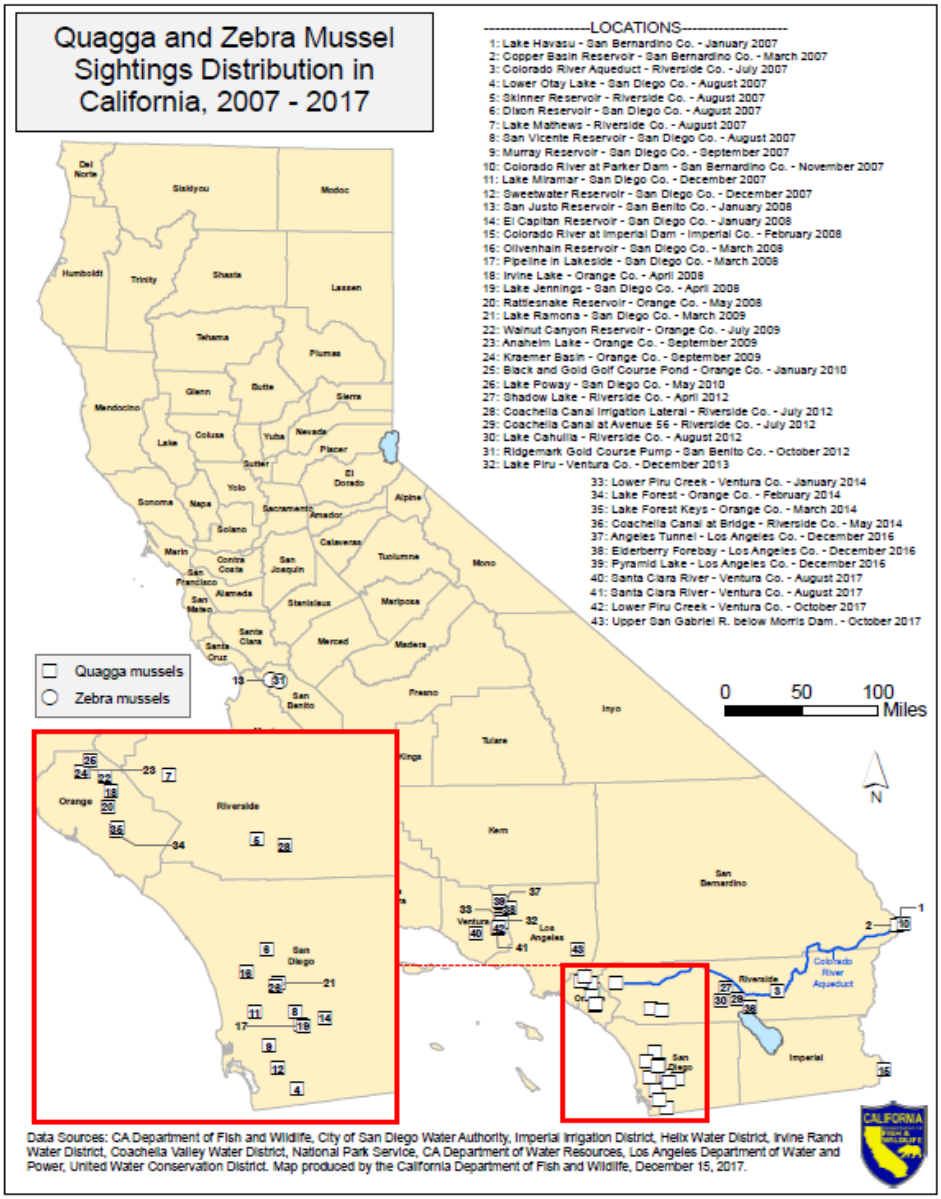
Tahoe AIS prevention efforts are working. 2018 marks the 10 year anniversary of the Tahoe Boat Inspection Program, and 10 years of front-line defense against new invasive species.

Lake Tahoe continues to test negative for the presence of Quagga or Zebra mussels.

Species of Concern:
Present in Lake Tahoe:
Eurasian watermilfoil
Curlyleaf pondweed
Asian clam
Largemouth bass
Smallmouth bass
Bluegill sunfish
Black crappie
Bullhead catfish
Bullfrog

NOT in Lake Tahoe:
Zebra mussel
Quagga mussel
New Zealand mudsnail
Spiny water flea
Didymo (rock snot)

Not Detected in Lake Tahoe but Detected in the Lower Truckee River:
New Zealand Mud Snails



https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=140819&inline

10th Anniversary of Tahoe Boat Inspection Program
https://tahoeboatinspections.com/ten-years-of-fighting-aquatic-invasive-species-at-lake-tahoe/

2018 marks the tenth anniversary of Lake Tahoe's Watercraft Inspection Program. Under the program, every motorized watercraft is inspected to ensure it is clean, drained, and dry and not carrying aquatic invasive species before launching at Tahoe. Thanks to diligent boaters and watercraft inspectors, no new aquatic invasive species have been detected in Lake Tahoe since the program began 10 years ago.

Of the nearly 8,000 vessels watercraft inspectors examined this boating season, 44 percent of them arrived clean, drained, and dry. Eleven watercraft were found carrying invasive mussels and 40 were harboring other species. This exemplifies the excellent work by the inspectors, but also that watercraft continue to be a vector of aquatic invasive species. Each fouled vessel was decontaminated prior to launching in Lake Tahoe. The largest number of decontaminations occur on vessels containing standing water, which may contain unwanted seeds, plant fragments, or microscopic larvae.

Boaters are encouraged to continue to be a part of the solution by cleaning, draining, and drying their vessel before launching in any waterbody. This includes both motorized and non-motorized watercraft.

This July, Tahoe Resource Conservation District (Tahoe RCD) watercraft inspectors intercepted a pontoon boat harboring multiple aquatic invasive species of concern. An inconspicuous crack in the pontoon allowed water and vegetation to enter, and several invasive species then grew within.

The boat came from Eastern United States and was inspected at the Alpine Meadows watercraft inspection station on Highway 89 in California. Staff discovered standing water, adult quagga and zebra mussels, aquatic vegetation, New Zealand mudsnails, and multiple other species inside the pontoon system. After discovery of the invasive species, inspectors coordinated with California Department of Fish and Wildlife and performed a full decontamination of the vessel to kill and remove all invasive species.

"This incident is the perfect example of how boats are the number one transport mechanism for aquatic invasive species," said Christopher Kilian, program manager at the Tahoe RCD. "This is a good reminder that you could unknowingly transport invasive species and highlights the importance of being diligent when practicing Clean, Drain, and Dry techniques before travelling to a new location."

"They may hide on the hull, in your bilge, on your anchor, in your ballast system, or in this case: inside a pontoon. We'd like everyone to keep this in mind as they travel to other waterbodies or prepare for inspections." All watercraft are required to be inspected prior to launching in Tahoe.

On July 18, the reverse bucket of the personal watercraft was found to have attached adult quagga mussels.

When quagga mussels are found on board a boat, the decontamination process includes a hot water (140 degrees Fahrenheit) wash of all toys, life jackets, skis, wakeboards, anchors, and lines.

All boats without an intact Tahoe inspection seal are required to get an inspection during daylight hours. Boats with intact inspection seals are permitted to launch at all open launch facilities; however,

inspections are only available at Cave Rock and Lake Forest boat launch ramps. Boaters are encouraged to confirm hours and inspection locations at TahoeBoatInspections.com or by calling 888-824-6267.

Quagga mussel size scale in inches. Adult quagga to the far right has smaller mussels attached to exterior of shell.

A new invasive species introduction in Lake Tahoe could have devastating impacts. Without natural predators, invasive species multiply quickly and can colonize the lake, as well as docks, water pipes, filtration systems, piers, ramps, and boats. They destroy fish habitat, impair boat engines, and negatively impact water quality and recreation, thus posing serious threats to the ecology, recreation, infrastructure, and economy of the Lake Tahoe Basin.

To learn how to clean, drain, and dry your vessel and prepare for a watercraft inspection, please visit www.TahoeBoatInspections.com. For non-motorized watercraft preparing to boat in the Lake Tahoe Region, please visit www.TahoeKeepers.org to learn more.

2014-2016 Aquatic Invasive Species Public Forums Held
http://tahoeboatinspections.com/category/news

Annually, a multi-agency public forum was held to provide updates on Aquatics Invasive Species research and eradication.

2013 Detection of New Zealand Mud Snails in lower Truckee River
New Zealand mud snails (NZMS) were detected near Reno in the lower Truckee River in spring 2013.
http://www.ktvn.com/story/22410534/new-zealand-mud-snails-invading-truckee-river

After the initial detection in 2013 of New Zealand Mudsnails in the Truckee River, Nevada Department of Wildlife (Chris Crookshanks) conducted a survey of the river from the CA/NV state line to some point east of Reno. Unfortunately, they found quite a few of the invasive mudsnails. In some locations, the densities were relatively high; however, it should be noted that they were not doing formal counts, just noting presence or absence. *(Source: Pers. comm. T. Crimmens, TAHOE RCD)*

In Nevada, NZMS occur in the Salmon Falls Creek drainage, Beaver Dam State Park, Lake Mead National Recreation Area and the Lower Colorado River, Maggie Creek and a small portion of the Humboldt River near Carlin, NV.

2017: The AIS Challenge at Lake Tahoe
http://www.keeptahoeblue.org/download/document/634/2017_ais_challenge.pdf

Photos: League to Save Lake Tahoe (left), peterspain.com (right)

AUGUST 2017

A brief history of aquatic invasive species at Lake Tahoe

In 2008, with some of the most destructive aquatic invasive species (AIS) known, quagga and zebra mussels, approaching Lake Tahoe's doorstep, Lake Tahoe Basin partners jumped into action to launch the nation's most comprehensive boat inspection program. Now nine years later and with no invasions, the Lake Tahoe AIS Program is widely considered a national model for how to effectively keep new AIS from entering a water body.

However, prior to shutting the door on new AIS in 2008, nearly 30 non-native species had already made their way into the lake. Documentation of these species and their locations around the lake began in the mid-1990s even though many were introduced (both intentionally and accidentally) many decades prior. Since their introduction, they have established into infestations and are spreading rapidly, altering the environment in ways that could change Tahoe forever.

Aquatic invasive plants, warm water fish and invertebrates have the adaptive ability to make their surroundings more hospitable for themselves and other invasives, while simultaneously threatening the well-being of Tahoe's native species. These AIS are thriving in the lake right now. By cycling nutrients, altering food webs, preying on native species and covering pristine beaches with clam shells and mats of weeds, they threaten a $5 billion economy while destroying the unique clarity that makes Lake Tahoe an annual destination for over 24 million visitors. The good news is that Tahoe agencies have a plan in place to systematically control these species and take back the lake.

Plan for the control of aquatic invasive species at Lake Tahoe

In 2015, researchers at the University of Nevada, Reno, completed a comprehensive plan to control AIS already established in the waters of Lake Tahoe. This ecologically-based approach to prioritizing species and infestation sites identified two aquatic plants, Eurasian watermilfoil and curlyleaf pondweed, and warm water fish, as the primary targets for control work in the immediate future. Emphasis also remains on early detection and rapid response to any new satellite infestations of aquatic invasive plants and Asian clams.

Coupled with other factors such as feasibility, permitting and project cost, a five year action list was developed to aid in the search for funding needed to complete the job.

A Eurasian watermilfoil infestation in one of three Crystal Shores marinas.
Photo on left taken July 2015 prior to the placement of bottom barriers
Photo on right taken 2016 after control treatment was complete.
Photos: Tahoe Resource Conservation District

Tahoe Taking Action - 2017

Control of AIS is a multi-year endeavor that seeks to reduce the impacts from aquatic invaders to a point of insignificance. An integrated approach using numerous techniques is essential to success. Work taking place in 2017 is fueled by public/ private partnerships and funding sources including California Tahoe Conservancy (SB630 and Prop 1), League to Save Lake Tahoe, Nevada Division of State Lands, Proposition 84, Tahoe Fund, Tahoe Regional Planning Agency, Truckee River Fund, and numerous private contributions. Below are some projects underway in Lake Tahoe today.

Tahoe Using New Innovative Technology

Lead: Tahoe Resource Conservation District

Tahoe RCD and Inventive Resources, Inc. are embarking on a project using ultraviolet light to treat aquatic invasive plants in Lake Tahoe. Ultraviolet-C light works by damaging the DNA and cellular structure of invasive plant life that currently threatens the health of the lake. While this technology needs further field testing to determine its full potential, ultraviolet light could augment Tahoe RCD's methods, especially in low-water years, in tight spaces within marinas, or in river systems.

Success at Crystal Shores

Lead: Tahoe Resource Conservation District

Crystal Shores marinas are now weed-free. After three years of treatment using bottom barriers and diver-assisted suction removal, surveys show no new plants sprouting this season. Moving forward, this site will receive annual surveys to maintain the success and catch any new potential infestations early. Early detection of the infestation and the rapid response by public and private partners to begin treatment was critical for the success of this project.

Asian Clams at Sand Harbor State Park

Lead: Tahoe Regional Planning Agency/Nevada Division of State Lands

A control project began in mid-June at Lake Tahoe Nevada State Park, Sand Harbor, to treat a small, isolated population of Asian clams before it spread to an unmanageable level. The project consists of covering approximately 4 acres of the lake bottom near the boat ramp with thin rubber barriers which is intented to suffocate the clams. While boating in the area, please do not anchor within the project to avoid ripping or tearing the barriers.

Tahoe Keys Passes Special Assessment to Combat Weeds

Lead: Tahoe Keys Property Owners Association

The Tahoe Keys Property Owners Association (TKPOA) is proud to announce a nearly 2/3 "FOR" vote was achieved in April 2017authorizing up to $2.4 million over 4 years to test various ways to control the invasive weeds in the Tahoe Keys lagoons, including bottom barriers, plant fragment control methods, laminar flow aeration and other innovative approaches. The "FOR" vote also authorizes the TKPOA to propose a small-scale, pilot test to assess the effectiveness of aquatic herbicides on the invasive plants, if permitted.

Eyes on the Lake Volunteers Take Action

Lead: League to Save Lake Tahoe

Tahoe's citizen science monitoring program, Eyes on the Lake, is comprised of volunteers reporting presence and absence of aquatic invasive plants. In 2016, volunteers identified two new invasive weed infestations and reported them to resource managers. Both locations are receiving control work this season because of these dedicated volunteers.

INVASIVE SPECIES PROGRAM
LAKE TAHOE EIP

2016: The AIS Challenge at Lake Tahoe
http://www.keeptahoeblue.org/download/document/507/ais-challenge-2016.pdf

Photos: League to Save Lake Tahoe (left), peterspain.com

August 2016

Tahoe Taking Action

In 2015, a comprehensive plan to control aquatic invasive species (AIS) already established in the waters of Lake Tahoe was completed. This ecologically-based approach to prioritizing species and infestation sites identified two aquatic plants, Eurasian watermilfoil and curlyleaf pondweed, as well as warm water fish, as the primary targets for control work in the immediate future. Coupled with other factors such as feasibility, permitting and project cost, a five-year action list was developed to aid in the search for funding needed to complete the job.

Work taking place in 2016 is fueled by public/private partnerships, including sources such as California Tahoe Conservancy, Nevada Division of State Lands (NDSL), U.S. Fish and Wildlife Service and numerous private contributions, but more will be needed to reach the finish line. Currently, $1 million has been secured, leaving another $11 million unfunded to accomplish all of the work identified in the five-year action list.

Control of AIS is a multi-year endeavor that seeks to reduce the impacts from these aquatic invaders to a point of insignificance. An integrated approach using numerous techniques is essential to success and the work highlighted here is a continuation of previous control projects that will be followed up by effectiveness monitoring and further research into improved techniques for control moving forward.

Sites slated for control work in 2016 include:

- Lakeside Marina and beach
- Tahoe City Dam
- Truckee River
- Crystal Shores Marina
- Tahoe Keys

Three marinas located in Crystal Bay were identified in the AIS Implementation Plan as high priorities for control work due to the presence of both Eurasian watermilfoil and warm water fish. Since 2014, Tahoe Resource Conservation District has partnered with NDSL and the three homeowners' associations of Crystal Shores to tackle aquatic invasive plant infestations. Financial support from NDSL and the homeowners of Crystal Shores East have provided the critical multi-year funding to effectively apply integrated treatment methods for long-term control. To date, two acres have been surveyed and treated with bottom barriers and SCUBA diver-assisted suction and hand removal. Further monitoring and control actions will continue in 2016.

Additionally, the threat from Asian clams looms. 2016 will see continued research into innovative techniques to control infestations and prevent further spread by focusing on small satellite populations like those in Emerald Bay and Sand Harbor.

A Eurasian watermilfoil infestation in one of three Crystal Shores marinas. Photo taken July 2015 prior to the placement of bottom barriers. Photo: Tahoe Resource Conservation District

Seeking Solutions in the Tahoe Keys

The 172 acres of lagoons and channels within the Tahoe Keys are nearly 100 percent choked by aquatic plants, serving as a "nursery" for AIS to the rest of Lake Tahoe. The Tahoe Keys Property Owners Association (TKPOA) is taking a lead role among public, commercial and other private owners in spearheading approaches to address the problem. The complexity of the Tahoe Keys' built environment, its extensive recreational use and the presence of native species requires more intricate and sustained efforts to make progress and protect Lake Tahoe.

The TKPOA recently completed two plans to address the AIS challenge. The Integrated Management Plan focuses on in-water activities while the Non-point Source Water Quality Plan tackles land-based issues, such as nutrient loading from landscape practices that are feeding the weed problem. These plans are adaptive and will be updated annually through review by a multi-stakeholder working group. Control actions are predominantly funded by TKPOA members, who have already committed over $500,000 for work in 2016.

2016 Control Actions

1. Bottom Barrier Trials
Many individual property owners are stepping up to the challenge by agreeing to place individual barriers under their private docks and boat slips to address areas of the infestation otherwise not easily accessible by traditional methods. About 20 owners have installed over 50 barriers that will be monitored throughout and after the 2016 growing season to determine effectiveness and the potential to expand the trials in future years.

2. Managing the spread of fragments
The current practice of "harvesting" aquatic plants to allow recreational access in the lagoons produces thousands of viable plant fragments that can spread and establish elsewhere in Lake Tahoe. Skimmer boats are used to collect

Tahoe Keys Property Owners Association staff skim aquatic invasive plant fragments left behind from AIS "harvesting" operations. Photo: TKPOA

fragments before they leave the Tahoe Keys. In 2016, the TKPOA will pilot the use of three new skimmer boats and will modify current practices to reduce the amount of fragments entering the Lake.

To prevent fragments from hitchhiking on boats leaving the Keys, a boat back-up station was installed near the channel. Prior to leaving the Tahoe Keys Lagoons, informational signs direct Keys boaters to reverse their propeller and back up to dislodge fragments.

3. Learning more about the unique environment in the Keys
Extensive monitoring has been undertaken to learn more about water movement within and out of the Keys lagoons as well as the availability of nutrients in the water and sediments feeding aquatic plants. Additional sampling of both native and invasive aquatic species will help inform which control methods will best achieve management goals.

Looking Ahead

Methods of AIS control used successfully elsewhere in the nation will continue to be researched and considered for pilot tests during future years. Currently a proposal for a one-time application of approved herbicides used effectively in other water bodies is being developed and reviewed by stakeholders and agency staff. Details of the trial are still being determined and work would not commence until 2017 or 2018 at the earliest. Other innovative methods, such as ultraviolet light, are also being investigated for future trials.

Aquatic invasive plants pulled from Tahoe Keys.
Photo: Tahoe Keys Property Owners Association

We Must Continue the Fight

The collaboration among public agencies, nonprofit organizations and private entities has Lake Tahoe on the road to success, but more must be done. An unrelenting and determined effort to address priority sites identified in recently completed management plans is already underway, as is an examination of new and innovative tools. Additional funding for research, monitoring and continued control efforts is needed to stay ahead of one of the largest threats to Lake Tahoe's famed water quality. The AIS Challenge continues. Join the fight.

**References and contact information to get involved can be found at keeptahoeblue.org/ais-challenge-2016*

2015: The AIS Challenge at Lake Tahoe
http://www.tloa.net/files/6914/4225/8657/AIS_Challenge_FINAL.pdf

August 2015

A Brief History of Aquatic Invasive Species at Lake Tahoe: The Tipping Point?

In 2008, with the threat of invasion from some of the most destructive aquatic invasive species (AIS) known (quagga and zebra mussels) approaching Lake Tahoe's doorstep, Basin partners jumped into action to launch the nation's most comprehensive boat inspection program. Now seven years later and with not one new invasion, the Lake Tahoe AIS Program is widely considered a national model for how to effectively keep new AIS from entering a water body. This $1.5 million per year program (funded by user fees and public dollars) has inspected 43,000 boats and decontaminated 21,000 boats while finding hundreds of potential invaders threatening Lake Tahoe, including mussels on twelve boats in 2014.

However, prior to shutting the door on new AIS in 2008, nearly 30 non-native species had already made their way into the Lake. Documentation of these species and their locations around the Lake began in earnest in the mid-1990s even though many were introduced (both intentionally and accidentally) many decades prior. Since their introduction, they have established into prolific infestations and are spreading rapidly, altering the environment in ways that could change the Lake Tahoe we know forever.

Key Invasive Species of Concern (year introduced)[2]	
Signal Crayfish (invertebrate)	late 1800s
Mysid Shrimp (invertebrate)	1960s
Eurasian Watermilfoil (plant)	1970s
Bass, Bluegill, Goldfish (warm water fish)	1970s
Asian Clams (invertebrate)	2002
Curlyleaf Pondweed (plant)	2003
American Bullfrog (amphibian)	2004

Aquatic invasive plants, warm water fish and invertebrates have the adaptive ability to make their surroundings more hospitable for themselves and other invasives, while simultaneously threatening the wellbeing of Tahoe's native species. These AIS are thriving in the Lake right now. By cycling nutrients, altering food webs, preying on native species and covering pristine beaches with clam shells and mats of weeds, they threaten a $5 billion economy while destroying the unique clarity that makes Lake Tahoe an annual destination for over three million visitors. The good news is that Tahoe now has a plan in place to systematically control these species and take back the Lake.[1]

Photos (clockwise from top left):
Tahoe Resource Conservation District (TRCD), peterspain.com, TRCD

Implementation Plan for the Control of AIS within Lake Tahoe

Researchers at the University of Nevada, Reno developed the Implementation Plan in collaboration with the Lake Tahoe AIS Coordination Committee and with review by an AIS expert panel of individuals from academic, management and regulatory backgrounds. They designed the Implementation Plan to serve as an ecologically-based approach to prioritizing species, locations and strategies for removal and control of AIS at Lake Tahoe for the next three to five years. Seven of the most damaging species were categorized into **three categories** of management recommendations.

Category 1 Species | Feasible Control Action

- Eurasian Watermilfoil (plant)
- Curlyleaf Pondweed (plant)
- Warm Water Fish

Resources should be focused on these species first because there are existing control methods that have been used successfully at Lake Tahoe and removal of these species may lead to the reduction of other AIS in the Lake.

Eurasian watermilfoil and curlyleaf pondweed grow rapidly and spread easily, forming dense mats of vegetation. These infestations inhibit recreation, cycle nutrients into the water column leading to increases in algal growth, decrease water clarity and provide habitat for invasive warm water fish. Warm water fish in turn alter the food web through predation, decreasing the biodiversity of native fish species.

Originating on the south shore of Lake Tahoe, Eurasian watermilfoil was identified at 13 sites around the Lake in 1995, increasing to 18 sites in 2012. Curlyleaf pondweed was identified at two sites in 2003 and now occupies eight sites as of 2012.

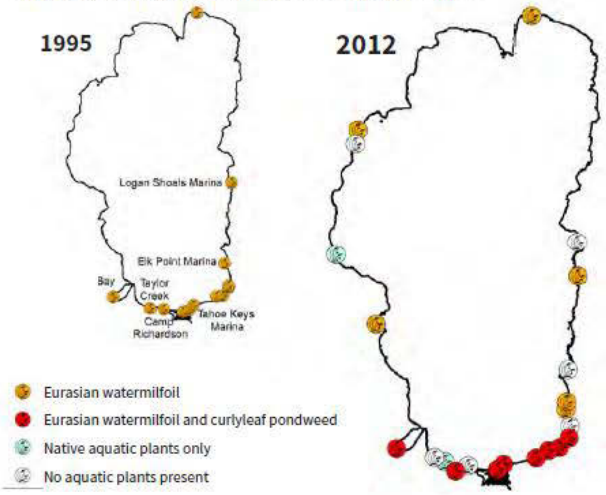
Both aquatic invasive plants spread through fragments transported by currents and boats as well as by root structures, seed and in the case of curlyleaf pondweed, by clone structures called turions. In 2006, invasive warm water fish species were found in 12 of 19 sites surveyed, but current distribution is unclear.

Recommended Action: Control

Efforts to remove a nearly 6 acre infestation of Eurasian watermilfoil in iconic Emerald Bay proved successful through a multi-year comprehensive strategy using bottom barriers to block out sunlight, followed by SCUBA diver-assisted suction and hand removal of plants. As of 2015 there are no longer aquatic invasive plants at this site. This methodology has been used effectively at other infestations in Lake Tahoe including lakeside of the Tahoe City Dam where a quarter acre infestation was removed in 2014. Mechanical removal of warm water fish using electro-shocking has decreased these fish populations in the short term. Multi-year treatments are recommended to occur in concert with aquatic invasive plant removal efforts. All control efforts need to include post-project monitoring to assess effectiveness.

Photos: Phil Caterino (left), California State Parks (right)

Spread of Invasive Aquatic Plants in Tahoe



Category 2 Species | Potential Control Action

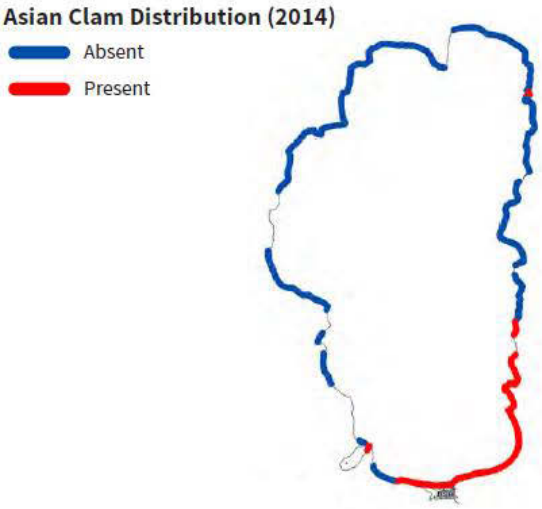
- American Bullfrog (amphibian)
- Signal Crayfish (invertebrate)

There are existing control methods that have proven to reduce populations of these species but the long-term feasibility of these methods for use at Lake Tahoe is still unknown.

American bullfrogs have been observed along the south shore since 2004, including several breeding populations. Signal crayfish populations dominate the nearshore zone around the entire Lake with the highest densities along the west and north shores. Both species are voracious predators that significantly alter the food web, while crayfish can also provide a food source for invasive warm water fish species.

Recommended Action: Increased Monitoring
Crayfish are currently being commercially harvested but it is unknown if this action is significantly reducing populations. It is unclear at this time if American bullfrog populations are increasing in Tahoe and what unwanted effects may be occurring. Increased monitoring of both species will assist in guiding future control actions. In areas where bullfrogs persist, proposed future projects should include monitoring and potential control actions. [2]

Asian Clam Distribution (2014)



Category 3 Species | No Feasible Control

- Mysid Shrimp (invertebrate)
- Asian Clams (invertebrate)

At this time, no control method that is allowed at Lake Tahoe has been proven to be successful in effectively reducing populations.

Mysid shrimp were intentionally introduced into Lake Tahoe in the 1960s as a food source for game fish (kokanee salmon and lake trout). They now persist in high densities (300 individuals per square meter) throughout the lake. They dramatically alter the native food web and have been proven responsible for fisheries collapse in other regions. There are no known control methods for mysid shrimp.

In 2002, researchers found low densities (two to 20 individuals per square meter) of Asian clams in a small section of the southeastern portion of the Lake, but by 2014, populations had spread along approximately 13 miles of shoreline from Cave Rock to Baldwin Beach (including a six acre satellite population at the mouth of Emerald Bay), with densities reaching 5,000 individuals per square meter in some areas. Once established, Asian clams dominate the lake bed and have been associated with algal blooms. Their shells also wash up on beaches in large numbers, affecting aesthetics and usability.

Recommended Action: Research Control Methods
Small scale control actions in areas where Asian clams are causing negative impacts to water quality should still be implemented while continuing to research a combination of control methods for future use. [2]

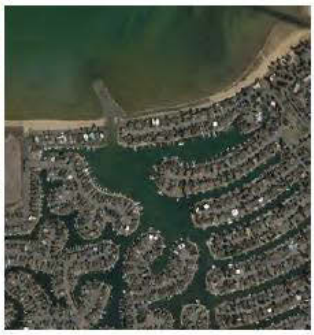
Photos, from top: Carl D. Howe , licensed under CC BY-SA 2.5; Wikipedia user MdE, licensed under CC BY-SA 3.0

Site Prioritization for Control Actions | Category 1 Species

A decision support tool was developed, with factors including fish/plant interactions, infestation size, human visitation and satellite populations. **The goal is to reduce overall expansion of these species in Lake Tahoe**

1. Tahoe Keys Main Lagoon | 2. Tahoe Keys Marina | 3. Meeks Bay | 4. Ski Run Marina & Channel
5. Tahoe City Dam | 6. Lakeside Marina | 7. Regan Beach | 8. Taylor Creek | 9-11. Crystal Bay Marinas 1,2,3

These ecologically-driven priorities will be further refined in an action list based on factors such as cost and feasibility.



Tahoe Keys

The Tahoe Keys is a large private homeowners development and commercial marina completed in the 1960s within the Upper Truckee meadow. It consists of 1,529 homes covering 372 acres of land and 172 acres of interconnected waterways, with three outlets to Lake Tahoe. Several AIS were introduced beginning in the 1970s and 80s that have now become established populations and a potential source for spread to the rest of Lake Tahoe.

Two of these invasive aquatic plant species, Eurasian watermilfoil and curlyleaf pondweed, along with a nuisance native aquatic plant, coontail, now occupy nearly 100 percent of the waterways. The environment created within the Tahoe Keys provides the perfect habitat for invasive warm water fish and the potential introduction of other AIS. Any efforts for long-term control of these species in Lake Tahoe are contingent upon control within the Tahoe Keys.
The Tahoe Keys Property Owners Association (TKPOA) invests $400,000 per year to "harvest" these plants in order to maintain use of the channels. A better solution is needed and the TKPOA has recently completed an Integrated Weed Management Plan (IWMP) to address this problem.

Recommended Action
The IWMP recommends a suite of control actions including the placement of bottom barriers, shifts in landscape practices to reduce nutrient inputs and targeted herbicide application (among others). The implementation of this plan still requires regulatory agency approvals and extensive environmental review with a target date for action no sooner than 2017. [3]

We Must Continue the Fight

The Lake Tahoe AIS Program, a partnership composed of 40 agencies and organizations, has successfully prevented new introductions of AIS into Lake Tahoe since 2008 and provides the framework for successful implementation of AIS control actions moving forward.

The recent development of two science-based control plans for Lake Tahoe and the Tahoe Keys offers the guidance needed to systematically and comprehensively stop the assault of AIS on Lake Tahoe. Additionally, the recent passing of California Senate Bill 630 (SB630) provides funding from private pier and buoy leases, a portion of which is directed to AIS control efforts at Lake Tahoe. With the combination of best available science, extensive public education, agency collaboration and private sector participation solving the AIS Challenge is within reach.

We must continue to make progress. The next step is to secure the additional funding needed to expand and improve the control efforts to protect the Lake.

Information in this overview is drawn from the following management plans.

1. TRPA (Tahoe Regional Planning Agency). 2014. Lake Tahoe Region Aquatic Invasive Species Management Plan, California - Nevada. 35 pp. + Appendices.

2. Wittmann, M.E. and Chandra, S. 2015. Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe. Lake Tahoe AIS Coordination Committee, July 31, 2015. Reno, NV. 52 pp.

3. August 2015. Draft Integrated Weed Management Plan for the Tahoe Keys Lagoons. Prepared by Sierra Ecosystem Associates for the Tahoe Keys Property Owners Association.

You can make a difference.
Contact one of these organizations or agencies to get involved.

KEEP TAHOE BLUE
League to Save Lake Tahoe

TAHOE REGIONAL PLANNING AGENCY

TAHOE FUND

TAHOE LAKEFRONT OWNERS' ASSOCIATION

Photos (clockwise from top left): League to Save Lake Tahoe, League to Save Lake Tahoe, Map data ©2015 Google, Tahoe Resource Conservation District

2015 - Lake Tahoe Aquatic Invasive Species Implementation Plan
http://tahoercd.org/wp-content/uploads/2015/08/Implementation-Plan-AIS-Final-7_31_2015.pdf

Additional AIS Resources at: http://tahoercd.org/tahoe-aquatic-invasive-species-resources/

In July 2015, the *Implementation Plan for the Control of Aquatic Invasive Species within Lake Tahoe* by Marion E. Wittmann, Ph.D. & Sudeep Chandra, Ph.D. (University of Nevada Reno), written in collaboration with the Lake Tahoe Aquatic Invasive Species Coordination Committee, was released.

Excerpts from the Summary are below:

Substantial changes to the economy, water quality, aesthetic value, and recreational pursuits are currently occurring in part due to the unwanted impacts of aquatic invasive species (AIS). In 2009 and again in 2014, the Aquatic Nuisance Species Task Force (ANS Task Force), an intergovernmental organization dedicated to preventing and controlling aquatic nuisance species, approved a Lake Tahoe Region Aquatic Invasive Species Interstate Management Plan (LTAIS Management Plan). The LTAIS Management Plan identifies threats and quantifies economic damages posed by AIS, develops management strategies for AIS in the Tahoe Basin, and supports one of the nation's most rigorous recreational boat inspection programs.

This current document, referred to as "the implementation plan" is intended as an extension of the LTAIS Management Plan and should be used as a guide for resource managers at Lake Tahoe to identify and prioritize species, specific locations and strategies for the implementation of AIS removal and control. The information provided here is intended to guide the prioritization of control strategies and is not intended to be a comprehensive treatment of all issues related to AIS in the Lake Tahoe region.

The implementation plan supports the goals of the LTAIS Management plan by providing the following:

1. Identification of AIS that are candidates for control in Lake Tahoe,
2. A comprehensive description of the history of aquatic invasions and control activities in Lake Tahoe or elsewhere. Based on this information, an assessment of feasible control or management options are identified by species group,
3. An ecologically based framework to prioritize (a) species and (b) specific sites for control or removal efforts in Lake Tahoe over 3-5 year period,
4. Efficacy monitoring recommendations,
5. Identification of key knowledge gaps, and
6. Next steps related to research and management of AIS.

This implementation plan was formally reviewed by an external expert panel comprised of individuals with extensive academic, management or regulatory backgrounds concerning AIS. This implementation plan was also reviewed by members of the Lake Tahoe Aquatic Invasive Species Coordination Committee (LTAISCC). The LTAISCC is a bi-state collaborative of local, state and federal agencies, research institutions and stakeholder groups which developed the LTAIS Management Plan and manages AIS issues in the Tahoe Basin.

Through the development of this implementation plan, seven aquatic invasive species groups were determined under guidance from the LTAIS Management Plan and the AISCC. These groups include: warm water fishes (various species), plants (Eurasian watermilfoil, curlyleaf pondweed), invertebrates (Asian clam, mysid shrimp, signal crayfish), and an amphibian (American Bullfrog).

A comprehensive history of the invasion of each of these species and the control actions taken to date within the Tahoe Basin and elsewhere was provided. Using this information, as well as information from the peer-reviewed published literature, an assessment of the feasibility of management actions for each of species group was provided. Feasible management actions were qualified into three classifications:

Feasible control actions

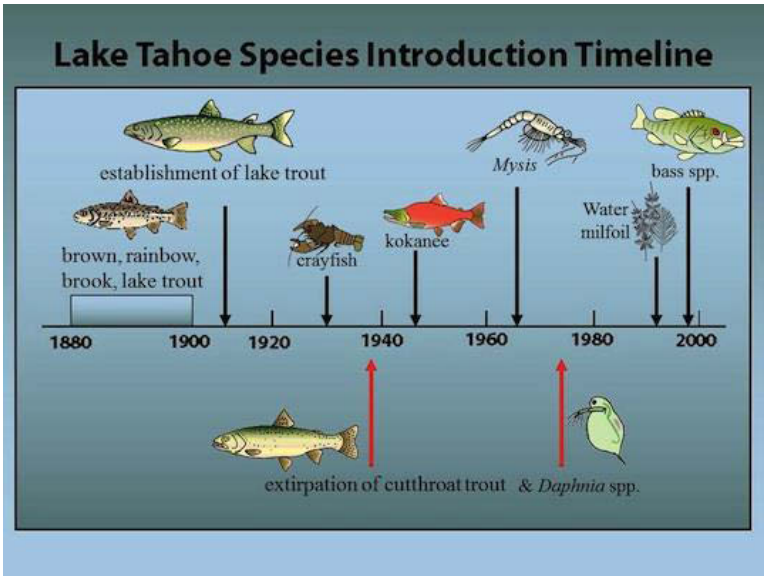
- Eurasian watermilfoil
- Curlyleaf pondweed
- Warm water fish

Potential control actions

- Signal crayfish
- American bullfrog

No feasible control options at this time

- Mysid shrimp
- Asian clam



An ecologically-based framework was used to determine a site prioritization for aquatic invasive plants and warm water fish in the Tahoe Basin.

The metrics used in the prioritization model included:

(1) fish-plant interactions,
(2) size of infestation,
(3) human use (by recreational boaters), and
(4) location of infestation.

Other factors of major significance concerning the control of AIS such as suitability of the receiving habitat, proximity to sensitive native species, or potential impact of control actions on the surrounding environment are vital components of site selection, but are not included in this model due to lack of available data.

Sites with the highest prioritization included the Tahoe Keys (East and West). These sites received the highest priority largely as a result of the immensity of nuisance aquatic plant infestations, as well as the intensity or recreational boater visitation. Other highly prioritized sites included Meeks Bay, Ski Run Marina and Channel, and Lakeside Marina and swim area. Emerald Bay was not highly prioritized for immediate control action because of recent successful efforts to remove all Eurasian watermilfoil biomass. This site is indicated as a priority for post-treatment surveillance monitoring.

At present, only non-chemical methods are allowed for the control of all AIS in Lake Tahoe. This is due to the special status designation for Lake Tahoe and States of California and Nevada with rules* prohibiting the use of chemical additions to the watershed.

*(*2017 Editor Note: The statement was as of publication in July 2015. As of Sept. 2015, Lahontan RWQCB regulatory review and approval of a Waste Discharge Exemption, could allow herbicide use There is an active proposal under consideration by LRWQCB for a pilot test of herbicides in May/June 2018 at the Tahoe Keys. A decision is anticipated early 2018.)*

Suggestions are provided for all AIS considered in this document for immediate implementation actions, the development of future control strategies or technologies, and the consideration of chemical control methods, where appropriate.

Major knowledge gaps identified include the need for:

- A consistent lake-wide surveillance program with central data storage,
- Efficacy monitoring associated with each management action taken,
- Development of specific metrics to quantify the success of the overall AIS management/implementation program at Tahoe, and
- As a majority of the AIS considered here are nearshore species, an integration of the Tahoe AIS management program with the Lake Tahoe Nearshore Management plan.

Recommendations for "next steps" include a call for the development of: a nearshore surveillance and monitoring program, metrics to evaluate the progress of AIS control actions carried out in the lake, a research plan to address data gaps, the exploration or development of new strategies or technologies for the control of AIS in Lake Tahoe, and an alignment of available resources with the priorities recommended in this implementation plan.

Background and Aquatic Invasive Species Problem Statement

Lake Tahoe is well known for its remarkable clarity and aesthetic beauty. Since the 1960s, the clarity has declined due to progressive cultural eutrophication and the loading of fine sediments from an increasingly urbanized and developed watershed. As a result of this clarity loss, a significant amount of public and private funding has been utilized to implement conservation programs to improve lake water quality.

Along with changes to Tahoe's clarity, there have been alterations to the lake's biological community over time (Figure 1). Biological organisms can play a very important role in maintaining ecosystem integrity and function. Lake Tahoe's biological organisms can live both in the open water, where clarity has been measured over time, but also in both the lake's deep and nearshore waters where there has been significant degradation measured in recent years (Heyvaert et al. 2013).

Today nearly 30 non-native aquatic species are established in the Lake Tahoe watershed, including plants, fish, invertebrates, and an amphibian. An analysis of potential AIS economic impacts to both recreation/ tourism/property values, and increased boat/pier maintenance costs in the Lake Tahoe Region was estimated to be $22.4 and $78 million per year respectively (TRPA 2014). However, these estimates do not, and were not intended to capture the potential economic effects on ecological function for the sensitive and unique biological community in Lake Tahoe.

Of particular recent concern, and the result of the development of this implementation plan, is the establishment and within-lake spread of a number of unintentionally introduced species. Lake Tahoe's water quality, aesthetic value, and recreational pursuits are currently threatened by the unwanted effects of non-native aquatic plants, fish, invertebrates, and other species. These non-native aquatic organisms are considered 'invasive' when they threaten the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural or recreational activities dependent upon such waters (ANSTF 2012).

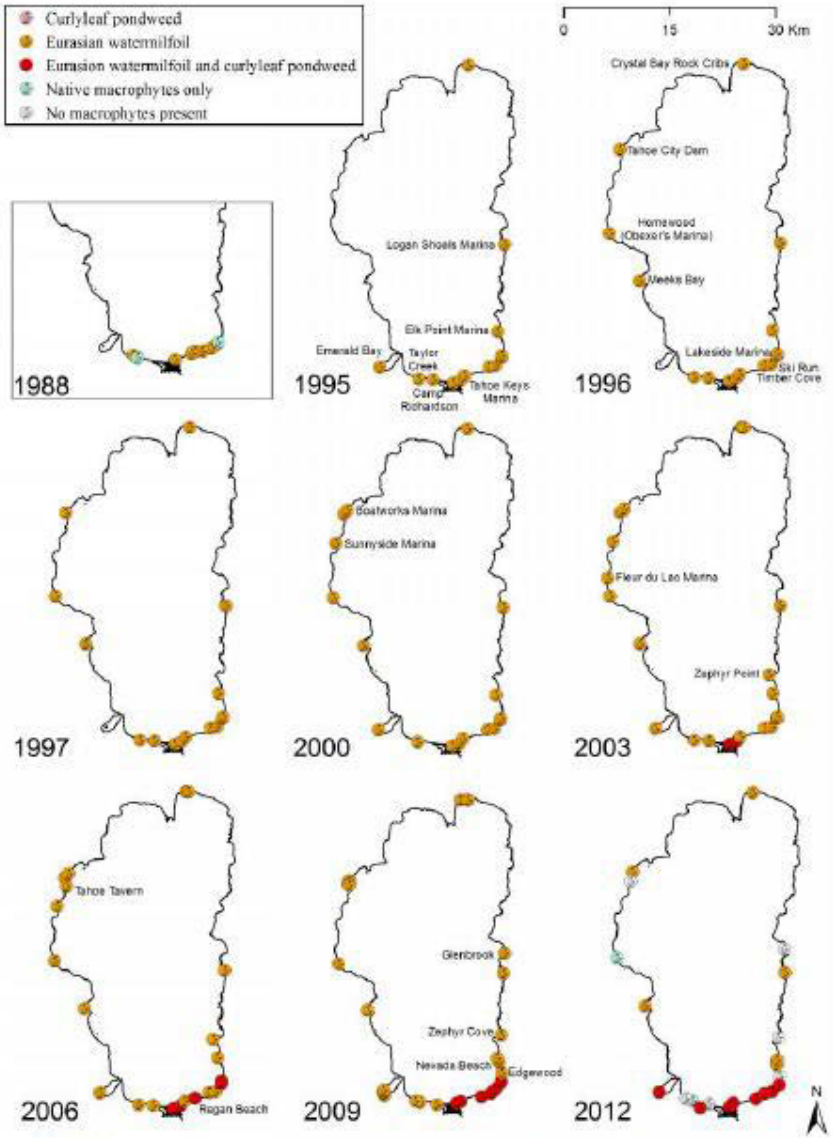


Figure 2. Distribution of Native and non-native aquatic plant presence and absence in Lake Tahoe, 1988 – 2012. Data from 1988 panel after Hackley and Loeb (1988). 1995 – 2006 surveys by L.W.J. Anderson, USDA-ARS, 2009 surveys by P. Caterino, 2012 surveys conducted by SEA, Inc. Note, only 2012 survey data contains native species information and absences, all other surveys only indicate only presence of non-native plant populations.

Boating: Aquatic Invasive Species - Potential Importation of Quagga/Zebra Mussels & Spread of Existing AIS

Watercraft are the largest source for spreading Aquatic Invasive Species (AIS) into new waterways. Inspections are an essential part of preventing this inadvertent transport of alien species into the pristine waters of Lake Tahoe. Invasive species have devastating environmental and economic impacts on industries, communities and native species populations. Most invasive species do not have predators to keep their populations in balance and, once introduced, are difficult, if not impossible, to eradicate.

Mandatory watercraft inspections can stop aquatic invasive species, such as Quagga mussels, BEFORE they enter the water. Inspectors are looking for any plant or animal, dead or alive, that may pose a risk to Lake Tahoe and the surrounding waters. Tahoe has one of the stricted programs in the nation. Primary species of concern include:

- Zebra and Quagga mussels
- New Zealand mudsnails
- Spiny waterflea
- Hydrilla and other highly invasive plants, some of which are already present in California and/or Nevada waters

Boat transport is one method of transport for aquatic invasive weeds within Tahoe. The Tahoe Keys is attempting education and control of fragment transport with a boat backup station installed onsite. Compliance is sporadic however.

There is new information that the spread of Asian Clams is affected by ballast water draw and release at Tahoe. A very small, new population at Sand Harbor receive bottom barrier treatment in summer 2017. There is new outreach to boaters to fill up ballast water at least a mile from shore, to mitigate the transport of Asian Clam veligers in the ballast water.

From the State of the Lake Report 2017 (pg.6.17):
The Nevada Division of State Lands has commenced a project to control the emergence of a satellite population of Asian clams adjacent to the boat ramp at Sand Harbor State Park, Nevada. While Asian clams are now widespread along the southern shore of Lake Tahoe, their recent appearance at one of the most scenic locations on the north shore would seem puzzling. A multi-agency boat inspection program prevents new invasive species from entering the lake from outside. The currents in the lake are such that the rapid transport from south to north is inconceivable.

The most likely scenario is that Asian clams are now being transported within Lake Tahoe by boats. The boating activity that seems to have the greatest potential for this is wakeboarding. A boat outfitted for wakeboarding would typically fill its ballast tanks with up to 600 gallons of water. If this water happened to be drawn from a clam infested area in summer, it is very possible that veligers (the larval offspring) would also be drawn in. At the end of a fun day, if the ballast tanks were emptied at a different, clam-free area, then in-lake transport would have occurred.

Two obvious actions can prevent this accelerated spread from occurring. First, all filling and emptying of ballast tanks should take place at least one mile from shore. The deep waters there are less likely to contain veligers, and any would invariably sink to the cold depths where they cannot reproduce. Secondly, it would be extremely prudent to require that all ballast tanks be equipped with filters that can effectively remove all particulate material.

What are Quagga and Zebra mussels & how many waterbodies are known to be infested with them?
Quagga (Dreissena bugensis) and Zebra (Dreissena polymorpha) mussels are destructive aquatic invasive species that grow to about 1 inch in diameter. They can be larger than 1 inch or they can even be microscopic. They reproduce quickly and in large numbers. Once established, eradication is often difficult or impossible.

The small, freshwater bivalve mollusks are triangular with a ridge between the side and bottom. It has black, cream or white bands, and often features dark rings on its shell almost like stripes. Quagga and Zebra mussels are native to the Ukraine and Russia. Zebra mussels were first discovered in the Great Lakes in 1988, and a year later, Quagga mussels were discovered in the same area. It is believed they arrived in America via ballast water discharge that contained their free swimming larva called veligers. Since 2007, these species have been found in Lake Mead, Lake Havasu, the Colorado River drainage and other significant and also small western U.S. water bodies.

What is the environmental impact of the Quagga and Zebra mussel?
Quagga and Zebra mussels will upset the food chain by consuming phytoplankton that other species need to survive. They are filter feeders that consume large portions of the microscopic plants and animals that form the base of the food web. One adult mussel can filter up to 1 liter of water per day. Their consumption of significant amounts of phytoplankton from the water decreases zooplankton and can cause a shift in native species and a disruption of the ecological balance of entire bodies of water. In addition, they can displace native species, further upsetting the natural food web. Quagga and Zebra mussels have few natural predators in North America. It has been documented that several species of fish and diving ducks have been known to eat them, but these species are not an effective control. In some cases, the mussels concentrate botulism toxin causing bird die offs.

What is the economic impact of the Quagga and Zebra mussel?
A recent study by the U.S. Army Corps of Engineers estimates a mussel invasion could cost Tahoe's tourism economy more than $22 million per year. Quagga and Zebra mussels can colonize on hulls, engines and steering components of boats and other recreational equipment. If left unchecked, the mussels can damage boat motors and restrict cooling. They also attach to aquatic plants and submerged sediment and surfaces such as piers, pilings, water intakes and fish screens. In doing this they can clog water intake structures hampering the flow of water. They frequently settle in massive colonies that can block water intake and threaten municipal water supply, agricultural irrigation and power plant operations. U.S. Congressional researchers estimated that an infestation of the Zebra mussel in the Great Lakes area cost the power industry $3.1 billion in the 1993-1999 period, with an economic impact to industries, businesses and communities of more than $5 billion. California could spend hundreds of millions of dollars protecting the state's water system from a Quagga/Zebra infestation.

Quagga Mussel and AIS Impacts to Nevada's Waters
http://www.ndow.org/uploadedFiles/ndoworg/Content/Boat/Aquatic_Invasive_Species/AIS-Threats-Nevada-Waters.pdf

Nevada currently has a variety of AIS inhabiting waterways. Other species of concern are purple loosestrife, tamarisk, Eurasian milfoil, curlyleaf pond weed, didymo (alga), Asian clams, Asian carp, common carp, New Zealand mud snail, tilapia, and various aquarium fish.

Some economic impacts for Nevada AIS include:

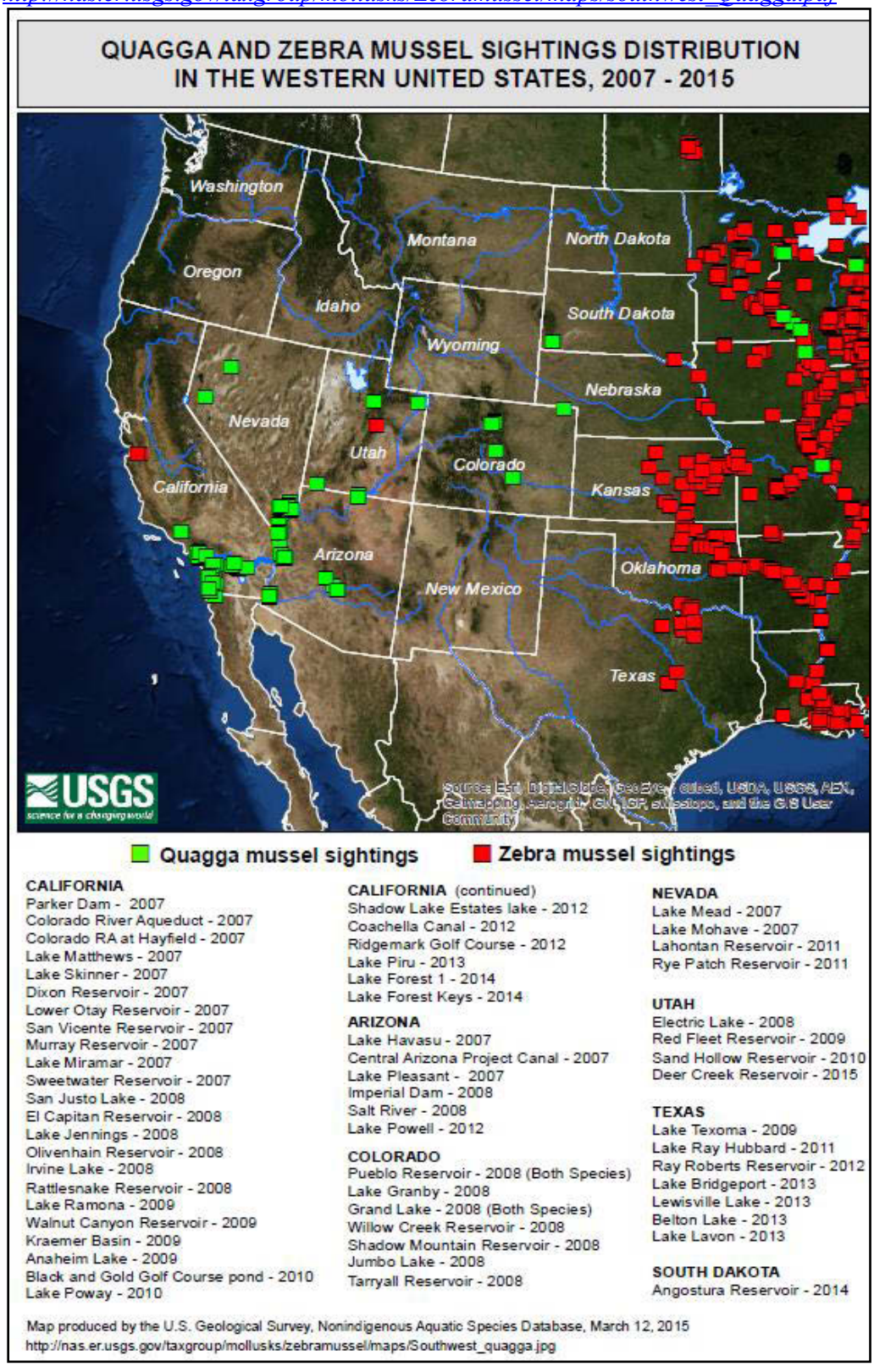
- $1 million year Hoover Dam annual budget for Quagga mussel control (BOR Per. Comm. 2011)

- $172,600 annually for chlorination additions at Southern Nevada Water Authority: removal of Quagga's from one drinking water intake tunnel $340,000: routine maintenance and removal $6,000: proposed chemical control $560,000: research on the invasion $300,000 (SNWA Per. Comm. 2011).

- $3-5 million to retrofit the water filtration system at NDOW's Lake Mead Fish Hatchery due to Quagga infestation.

The discovery of Quagga mussel contamination in Lake Havasu, Lake Mead, and the Colorado River Basin created an emergency need in 2008 for the Tahoe area to address prevention. Recent studies (by researchers at TERC/UC Davis/UNR) indicate the survivability potential is real for these species if introduced to Lake Tahoe. If established at Lake Tahoe; Quagga mussels or Zebra mussels could cause profound changes to the alpine lake's sensitive ecosystem. The mussels could clog water intakes, cover boats and piers, and litter pristine beaches with sharp shells and decaying, reeking biomass.

A map of mussel detections is available at:
http://nas.er.usgs.gov/taxgroup/mollusks/Zebramussel/maps/southwest_Quagga.pdf



Product of the University of Nevada, Reno, 2008

KEEP INVASIVE MOLLUSKS OUT OF LAKE TAHOE: CLEAN, DRAIN, AND DRY YOUR BOAT EVERY TIME

Invasive Aquatic Mollusks:

Asian Clam *(Corbicula fluminea)*
Size: 1 to 1 1/2 inches (25 to 40 mm)
Food: These clams filter particles suspended in water, including bacteria, algae, and detritus.
Preferred Habitat: silt, sand, and gravel in near-shore areas from approximately 10 to 30 feet (4 to 10 m)
Primary Means of Introduction: intentional release of aquarium clams, angler bait dumping, microscopic larvae transferred via un-drained boats

Already present in South Lake Tahoe

Photo Credit: U.S. Geological Survey, Florida Integrated Science Center

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Zebra Mussels *(Dreissena polymorpha)* and Quagga Mussels (*Dreissena bugensis*)
Size: 1/4 to 1 1/2 inches (5 to 40 mm)
Food: These mussels filter particles suspended in water, including bacteria, algae, and detritus.
Preferred Habitat: hard substrate from 10 to 200 feet (4 to 60 m)
Primary Means of Introduction: Adults attach to watercraft and fishing gear, and microscopic larvae are transferred in water of un-drained boats.

Currently **not present in Lake Tahoe**; however, quagga mussels were recently discovered in Lake Mead. Please **clean, drain, and dry** your fishing gear and watercraft. **Both mussels have devastating impacts on aquatic ecosystems.**

New Zealand Mudsnails *(Potamopyrgus antipodarum)*
Size: Small! 1/10 to 1/5 inch (2 to 6 mm)
Food: periphyton (algae)
Preferred Habitat: silt, sand, cobble, and aquatic vegetation at depths from 13 to 130 feet (4 to 40 m)
Primary Means of Introduction: attached to watercraft and fishing gear, larvae in water of un-drained watercraft

Currently **not present in Lake Tahoe**, but have invaded many areas of the West. Please help to keep these invaders out of Lake Tahoe! More information on how to prevent the spread of New Zealand Mudsnails is available from the California Department of Fish and Game: http://www.dfg.ca.gov/invasives/mudsnail/

Photo Credits: R. Draheim, Portland State University Center for Lakes and Reservoirs

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Invasive species cause serious economic and ecological damage to aquatic ecosystems.

The Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG) is currently working to prevent invasions in Lake Tahoe. The public is invited to attend meetings and encouraged to volunteer!

For more information, please go to http://www.tahoercd.org/AquaticInvasives.php, or contact the Tahoe Resource Conservation District (TRCD) at 530-543-1501, ext. 113

CLEAN ! DRAIN ! DRY ! – Aquatic Invasive Species Education/Control Programs

LAKE TAHOE BOAT INSPECTORS FIGHT AGAINST INVASIVE SPECIES

http://tahoeboatinspections.com/new-weapons-available-to-lake-tahoe-boat-inspectors-in-fight-against-invasive-species

August 29, 2016

Lake Tahoe, Stateline, NV— Smartphones became Lake Tahoe's first line of defense against the introduction of new aquatic invasive species this summer. As part of recently launched partnerships with agencies around the West, the *Lake Tahoe Aquatic Invasive Species* Program receives real-time updates from other land managers about vessels traveling to Lake Tahoe from waters with a high risk of containing invasive species. The data-sharing app used by partner agencies acts as an early warning system for Tahoe's watercraft inspectors.

Since 2009, Tahoe Regional Planning Agency (TRPA) has enforced mandatory watercraft inspections at Lake Tahoe, which has prevented the introduction of new aquatic invasive species. Aquatic invasive species can damage Tahoe's ecosystem and degrade recreational experiences for residents and visitors.

"We continue to find several boats each year with various aquatic invasive species, and the watercraft inspection program is poised to discover what the next threat could be," said Dennis Zabaglo, aquatic resources program manager at TRPA. "We're using every weapon at our disposal, and these regional partnerships are a critical link to conserving the health of Lake Tahoe."

So far this year, inspectors in the Lake Tahoe Region have conducted more than 7,300 inspections and decontaminated more than 3,500 vessels. Complete numbers are expected to be released as the 2016 boating season winds down.

In 2016 thus far, Lake Tahoe watercraft inspectors have prevented four boats containing quagga mussels from launching on the lake. The most recent discovery took place this month at the boat inspection station in Meyers. Quagga mussels have caused significant environmental damage in U.S. waterways, including the Great Lakes and Lake Mead. In addition, 20 boats have been found with other invasive species, including New Zealand mudsnails, during the inspection process at Lake Tahoe.

"Our inspection staff work hard to prevent new introductions of aquatic invasive species into Lake Tahoe, Fallen Leaf Lake, Echo Lake, and now Donner Lake," said Nicole Cartwright, AIS program coordinator with the Tahoe Resource Conservation District (Tahoe RCD), "with over 20 vessels found harvesting invasive species, this validates their efforts and the importance of our program."

The Tahoe Regional Planning Agency (TRPA) and Tahoe Resource Conservation District (Tahoe RCD) have the lead roles in a region-wide management plan for the prevention of the introduction of Aquatic Invasive Species (AIS) to the Lake Tahoe Basin.

In 2008, TRPA and Tahoe RCD began a large-scale, mandatory, lake-wide campaign to educate and boaters on the AIS threat to Lake Tahoe and provide mandatory inspection of boats by trained inspectors before launching at public and private ramps.

Boat inspections are conducted at off-site locations in the summer at key entrance points to the Tahoe Basin.

It is mandatory to undergo inspection off-site, then proceed with an intact seal from the inspection site before launching from a ramp at Lake Tahoe. Ramps are gated and locked when inspectors are not present. Boaters pay a sliding scale fee annually, based on boat size and type, to defray costs on the inspection program.

Decontamination is provided off-site if the inspector determines a high level of risk. Boats are cleaned with 140 degree F water and chlorine solution. Significant federal and state grant funding has supported the inspection program to date.

Fallen Leaf Lake, located adjacent to Lake Tahoe, maintains its own inspection program.
Any trailered boat wanting to launch at the Fallen Leaf Lake Marina must have a green Fallen Leaf Lake inspection seal in order to launch. Boats without an inspection seal or those with a Lake Tahoe inspection seal will be required to get an inspection and decontamination from the Meyers, Homewood or Spooner Summit inspection station prior to arriving at the marina; fees for the decontamination process will apply. All boats with an intact green Fallen Leaf Lake inspection seal can go directly to the marina to launch and do not need to get an inspection at a roadside inspection station. If you have any questions, you can call the Hotline at 888-824-6267.

In 2011, voluntary inspections were more stringently implemented in California areas just outside the Tahoe Basin, at Donner Lake and Boca/Stampede Reservoirs. This program is coordinated and staffed by Tahoe RCD.

Nevada Boat Inspections
http://www.ndow.org/Boat/Aquatic_Invasive_Species
Under the direction provided in Assembly Bill 167 by the Nevada State Legislature in 2011, NDOW was provided authority to implement an Aquatic Invasive Species (AIS) Prevention Program.

The goals of the program are to prevent the spread of AIS threatening Nevada's waterways and to prevent new introductions of AIS. Implementation of the program includes the development and approval of AIS regulations, seasonal inspection and decontamination stations, monitoring, coordination with stakeholders and government entities, and AIS prevention education and outreach for the public. The program is funded through collection of an AIS watercraft decal and federal assistance grants. In 2014, NDOW began watercraft inspection stations seasonally at Lahontan Reservoir, Rye Patch Reservoir, and Wildhorse Reservoir.

In Nevada, Zebra mussels are not currently present; however, Lake Mead National Recreation Area discovered Quagga mussels in Boulder Basin in 2007. Since that time, the mussels have spread throughout the lower Colorado River system. With the exception of Lake Mead National Recreation Area and the lower Colorado River, adult mussels have not been found in Nevada, however, in April 2011, Lahontan and Rye Patch Reservoirs in Northern Nevada tested positive for the presence of Quagga mussel veligers (larvae). Subsequent sampling since that time has not found any veligers or adult mussels. These water-bodies are within a few hours' drive of Lake Tahoe.

Tahoe Boat Inspection Program Highlights

https://tahoeboatinspections.com/ten-years-of-fighting-aquatic-invasive-species-at-lake-tahoe

2018 marks the 10 year anniversary of the Tahoe Boat Inspection Program. Watercraft are the largest source for spreading aquatic invasive species (AIS) into new waterways. Mandatory inspections stop aquatic invasive species, such as quagga mussels, BEFORE they enter the water. Please do your part to protect Lake Tahoe and plan ahead for mandatory boat inspections. Invasive species have devastating environmental and economic impacts on industries, communities, and native species populations. Most invasive species do not have predators to keep their populations in balance and, once introduced, are difficult if not impossible to eradicate.

Of the nearly 8,000 vessels watercraft inspectors examined this boating season, 44 percent of them arrived clean, drained, and dry. 11 watercraft were found carrying invasive mussels and 40 were harboring other species.

This exemplifies the excellent work by the inspectors, but also that watercraft continue to be a vector of aquatic invasive species. Each fouled vessel was decontaminated prior to launching in Lake Tahoe. The largest number of decontaminations occur on vessels containing standing water, which may contain unwanted seeds, plant fragments, or microscopic larvae.

TWSA Involvement

TWSA has been involved in the Aquatic Invasive Species and Boat Inspection process/working group since the threat of AIS emerged in the region as a major concern in 2007. TWSA staff provides ongoing education and outreach to the public at local events, on the threat these species pose to drinking water quality. In summer 2009, 25 large format aluminum signs with Quagga mussel information were sponsored by TWSA for installation at public access points. These signs are still on location.

The **Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG)** is a diverse group of agencies, community members and scientists dedicated to early detection and rapid response, prevention and control of aquatic invasive species in the Tahoe Basin. TWSA staff became actively involved in working with TRPA and Tahoe RCD as a member of the working group, focusing on the AIS inspection program protocols, public education and outreach.

This group conducts research in the Tahoe Keys, Emerald Bay and Lake Tahoe.
Information about these projects is included later in this report.

TRPA Ordinances Regarding Invasive Species
In October 2008, the TRPA Governing Board revised the TRPA Code of Ordinances to prohibit the transportation of invasive species. TRPA Code of Ordinances, Chapter 79.3 contains regulations relating to the prevention of invasion by aquatic invasive species.

Invasive species are defined in the TRPA Code as:
…species, both aquatic and terrestrial, that establish and reproduce rapidly outside of their native range and may threaten the diversity or abundance of native species through competition for resources, predation, parasitism, hybridization with native populations, introduction of pathogens, or physical or chemical alteration of the invaded habitat. Through their impacts on natural ecosystems, agricultural and other developed lands, water delivery and flood protection systems, invasive species may also negatively affect human health and/or the economy. Aquatic invasive species shall include but not be limited to: Zebra mussel (Dreissena polymorpha), Quagga mussel (Dreissena bugensis), Eurasian water milfoil (Myriophyllum spicatum L.), curlyleaf pond weed (Potamogeton crispus L.), and large mouth bass (Micropterus salmoides).

TRPA Code of Ordinances, Chapter 79.3 A - Relates to the transport, introduction and launching of watercraft that is contaminated with aquatic invasive species:

Prohibition: The transport or introduction of aquatic Invasive Species into the Lake Tahoe Region is prohibited. Further, the launching of any watercraft contaminated with Aquatic Invasive Species into the waters of the Tahoe Region is prohibited.

TRPA Code of Ordinances, Chapter 79.3. B - Makes it mandatory to submit to the inspection of watercraft prior to launching when an inspector is present, makes decontamination mandatory when the watercraft is judged by an inspector to be contaminated, and closes boat launching facilities when an AIS inspector is not present:

(1) An owner operator of a Boat Ramp or other Boat Launch Facility (exclusive of single family residences) shall close the ramp or facility to launching of watercraft at all times when the provisions of subsection (2) have not been or cannot otherwise be provided or met.
(2) All watercraft, motorized and non-motorized, including but not limited to boats, personal watercraft, kayaks, canoes and rafts, shall be subject to an inspection prior to launching into the waters of the Lake Tahoe Region to detect the presence, and prevent the introduction, of Aquatic Invasive Species. An inspection under this section is valid only if performed by a trained inspector pursuant to Tahoe Regional Planning Agency standards and requirements for Aquatic Invasive Species inspections.
(3) All watercraft inspected in subsection (2) shall be subject to decontamination if determined necessary by an inspection under 79.3 B (2). A watercraft shall launch only if the required decontamination is performed and completed by a trained individual pursuant to TRPA standards and requirements for Aquatic Invasive Species decontamination and launch is authorized by a trained inspector pursuant to TRPA's standards and requirements for Aquatic Invasive Species Inspections.
(4) All watercraft inspected in compliance with subsection (2) and decontaminated in compliance with subsection (3) are subject to a fee to pay for the inspection and/or decontamination and other program costs.

Tahoe Resource Conservation District (Tahoe RCD) Invasive Species Program
The Invasive Species Program at the Tahoe Resource Conservation District is divided into the Terrestrial Invasive Weed and Aquatic Invasive Species sub-programs, which focus on the removal and abatement of terrestrial and aquatic invasive species. The Tahoe RCD is the coordinator for the Lake Tahoe Basin Weed Coordinating Group and the Lake Tahoe Aquatic Invasive Species Working Group. These working groups are comprised of diverse agencies and community members dedicated to protecting the Lake Tahoe Basin from invasive species through education, research, prevention, early detection, rapid response, and control.

Aquatic Invasive Species Sub-Program
The Tahoe RCD Aquatic Invasive Species (AIS) Program was formed after the January 2007 discovery of Quagga mussels in Lake Mead, Lake Havasu, and the Colorado River Basin. The AIS Program serves as chair for the Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG). Funding received from the Bureau of Reclamation for the removal and monitoring of aquatic weeds in Emerald Bay and Ski Run Marina supported some of the program's first efforts.

The AIS Program has grown extensively since 2007, following the Lake Tahoe Aquatic Invasive Species Working Group mission. The group is working to prevent new introductions into Lake Tahoe such as Quagga and Zebra mussels, and performs monitoring, research, control, and removal of existing invasive species. This requirement has put the Tahoe RCD in the spotlight for coordination of the Watercraft Inspection Program at Lake Tahoe. LTAISWG partners are continuing research of aquatic invasive species in Lake Tahoe to better support resource management decisions in the Tahoe Basin.

Lake Tahoe's Blue Boater Program
In 2009, watercraft inspections were broadened to include "Blue Boating" criteria aimed at reducing pollution from emissions, noise, and sewage discharges. However, in 2010, due to the TRPA Shorezone Ordinance revocation, only AIS inspection has continued at Lake Tahoe.

Tahoe RCD Watercraft Inspection Sub-Program Highlights
http://tahoercd.org/wp-content/uploads/2014/07/CEQA_Final_Env_Doc_Lakewide_AIS_Project_SIGNED.wAttachments.pdf

Tahoe RCD coordinates Lake Tahoe's Watercraft Inspection Program by providing qualified inspectors at designated inspection stations, offering technical support for private launches, trainings, and decontamination of watercraft. The Watercraft Inspection Program was implemented in 2008.

In 2014, Tahoe RCD finalized the CEQA lakewide permit for invasive species projects.

NOTICE OF DETERMINATION

To: Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, CA 95814

From: Tahoe Resource Conservation District
870 Emerald Bay Road, Suite 108
South Lake Tahoe, CA 96150

County Clerk
County of El Dorado
360 Fair Lane
Placerville, CA 95667

Subject: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code

Project Title: Lake-Wide Aquatic Invasive Plant Control Project

2014042043	Nicole Cartwright	(530) 543-1501 Ext 111
State Clearinghouse Number	Contact Person	Phone Number

Project Location: Lake Tahoe, California and Nevada

Project Description: The Tahoe Resource Conservation District, on behalf of the Tahoe Aquatic Invasive Species Coordination Committee (AISCC), will conduct aquatic plant control and management throughout suitable habitat areas in Lake Tahoe, California and Nevada and the Truckee River between the dam at Lake Tahoe to River Ranch at Alpine Meadows Road. The Project Area will include suitable habitat areas infested with submerged aquatic plants within the Lake Tahoe shorezone, typically up to 11 meters in depth, and within the Truckee River. The Proposed Project is intended to continue aquatic invasive plant control efforts in locations where previous efforts have been successful, expand control efforts to include all known infestation areas, and to allow for rapid response to detections of new aquatic plant infestations.

This is to advise that the Tahoe Resource Conservation District Board has approved the above described project on July 23, 2014 and has made the following determinations regarding the above described project:

1. The project will not have a significant effect on the environment.
2. A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures were made a condition of the approval of the project.
4. A mitigation monitoring plan was adopted for this project.
5. A statement of overriding conditions was not adopted for this project.
6. Findings were not made pursuant to the provisions of CEQA.

Veliger Monitoring Program

In 2010, a veliger monitoring program was initiated by the Tahoe Regional Planning Agency, with assistance from the Tahoe RCD. Veligers are the larval stage of bivalve mollusks which includes Quagga and Zebra mussels, two potential invaders of Lake Tahoe. Monitoring is an essential element to ensure that the Watercraft Inspection Program has been effective in preventing Quagga and Zebra mussels from establishing populations in Lake Tahoe. Ten locations are surveyed biweekly from late June until the end of September; the eight locations in Lake Tahoe include Elks Point, Tahoe Keys, Emerald Bay, Meeks Bay, North Tahoe Marina, Sand Harbor, Obexers Marina, and Cave Rock along with Fallen Leaf Lake and Echo Lake. Sampling consists of eight vertical plankton tows at each site. The samples are then sent to a laboratory to be analyzed. All of the samples to date have returned with no Zebra or Quagga mussel veligers present**.**

Tahoe RCD Boat Inspection Program – other lakes, other programs

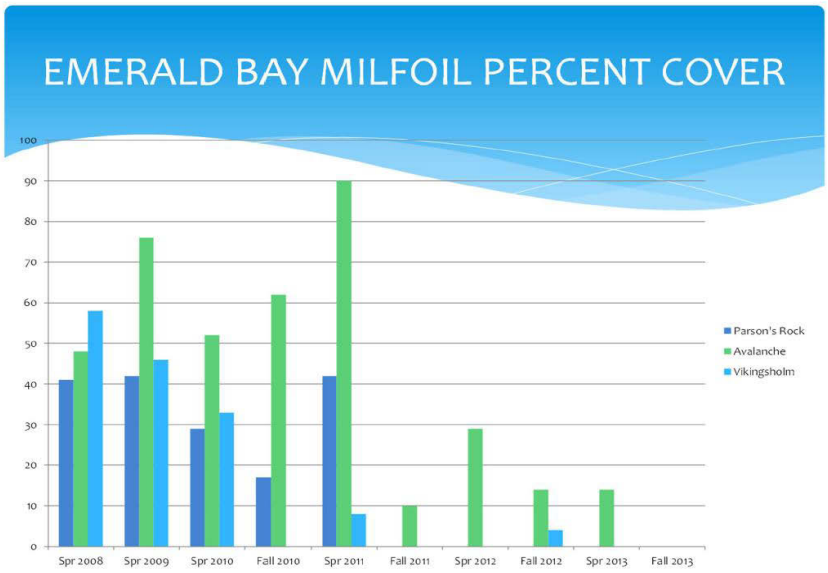
The Tahoe RCD's Lake Tahoe Watercraft Inspection Program had another successful season of protecting Lake Tahoe, Fallen Leaf and Echo Lake from the introduction of new aquatic invasive species. Inspections were performed at our five inspections locations. Approximately 15,000 boats are inspected annually.

Since the addition of convenient off-highway locations enabled boaters to receive their watercraft inspections and decontaminations when entering the Lake Tahoe Basin, marinas and boat launches were freed up from being the busiest locations for inspections.

This prevention effort also includes a more rigorous non-motorized watercraft inspection and education (The Tahoe Keepers Program) process at ramp facilities, US Forest Service kiosks and Fallen Leaf Lake. Paddlers were also educated about self-inspecting and decontaminating canoes, kayaks and paddleboards.

Tahoe RCD Aquatic Invasive Weeds Control Program
http://tahoercd.org/aquatic-invasive-species-control-projects/

Beginning in 2005, the Tahoe RCD has been directly involved with over 30 non-chemical, aquatic invasive weed control projects. These projects represent treatment of almost 30 acres of invasive weeds. After several years of manual treatments, in 2013, weeds were completely eradicated from California State Parks' Emerald Bay.



A summary of the Lake Tahoe AIS Plant Projects is provided below:

2005-2014 Summary of Tahoe AIS Sites and Associated Treatment
(Source: *http://tahoercd.org/aquatic-invasive-species-control-projects*)

Year	Location	Biomass (gallons)	Biomass (Cubic Yards)	Suction Removal Area (sf)	Barrier Area (sf)	Total Treatment (sf)	Total Treatment (acres)	Treatment Density Class
2005	Emerald Bay - Avalanche Beach	238	1.18	2,000		2,000	0.05	high
2006	Emerald Bay - Avalanche Beach	1258	6.23	12,000		12,000	0.28	high
2007	No Weed Removal	0	0.00	0	0	0	0.00	very low
2008	Emerald Bay - Parson's Rock		0.00		500	500	0.01	high
2009	Emerald Bay - Avalanche Beach		0.00		400	400	0.01	high
2009	Emerald Bay - Parson's Rock		0.00		10,000	10,000	0.23	high
2009	Emerald Bay - Vikingsholm Swim Beach a	360	1.78	3,600	0	3,600	0.08	high
2010	Elk Point Marina	60	0.30	14,000	0	14,000	0.32	high
2010	Emerald Bay - Vikingsholm Swim Beach a	303	1.50	4,000	8,500	12,500	0.29	moderate
2010	Emerald Bay - Parson's Rock	101	0.50	2,000	0	2,000	0.05	high
2010	Lakeside Marina	2020	10.00	40,000	0	40,000	0.92	high
2011	Emerald Bay - Avalanche Beach	217.5	1.08	132,000	13,200	145,200	3.33	moderate
2011	Emerald Bay - Parson's Rock	262.5	1.30	34,000	7,000	41,000	0.94	high
2011	Emerald Bay - Vikingsholm Swim Beach a	150	0.74	96,250	1,200	97,450	2.24	low
2011	Tahoe Keys	0	0.00	0	17,200	17,200	0.39	high
2012	Emerald Bay - Avalanche Beach	560	2.77	82,000	44,000	126,000	2.89	moderate
2012	Emerald Bay - Parson's Rock	30	0.15	8,700	0	8,700	0.20	low
2012	Emerald Bay - Vikingsholm Swim Beach a	2	0.01	1,750	0	1,750	0.04	very low
2012	Tahoe Keys	0	0.00	0	14,075	14,075	0.32	high
2012	Lakeside Beach	277	1.37	12,200	68,400	80,600	1.85	high
2012	Lakeside Marina	2890	14.31	0	35,720	35,720	0.82	high
2012	Ski Run Channel	11527	57.07	71,840	65,360	137,200	3.15	high
2013	Emerald Bay - Avalanche Beach	146.25	0.72	20,075	28,800	48,875	1.12	moderate
2013	Emerald Bay - Mouth of Eagle Creek	26.25	0.13	14,000	0	14,000	0.32	moderate
2013	Emerald Bay - Parson's Rock	5	0.02	36,750	0	36,750	0.84	very low
2013	Emerald Bay - Parson's Rock North	7	0.03	1,000	0	1,000	0.02	moderate
2013	Emerald Bay - Vikingsholm Swim Beach a	2.5	0.01	31,500	0	31,500	0.72	very low
2013	Lakeside Beach		0.00	29,550	43,200	72,750	1.67	moderate
2013	Ski Run Channel	6831	33.82	115,956	19,080	135,036	3.10	high
2013	Tahoe City Dam	0	0.00	0	0	0	0.00	high
2013	Truckee River	0	0.00	0	0	0	0.00	high
2013	Mouth of Taylor Creek	200	0.99	0	0	90,000	2.07	moderate
2013	Mouth of Tallac Creek	990	4.90	0	0	26,000	0.60	moderate
2014	Emerald Bay	15	0.07	450	0	450	0.01	low
2014	Truckee River	3200	15.84	6,425	0	6,425	0.15	high
2014	Dam- Truckee River	0	0.00	0	18,400	18,400	0.42	high
2014	Crystal Shores East	0	0.00	0	10,400	10,400	0.24	moderate
	Totals	**31679.00**	**156.85**	**772,046**	**405,435**	**1,293,481**	**29.69**	

Native Aquatic Plants of Lake Tahoe

Andean Milfoil (*Myriophyllum quintense*)
Characteristics: feather-like submersed leaves in whorls of two to four, blue-green emergent leaves, tiny flowers (0.7mm-1.2mm long) with four petals located at base of emergent leaves, may form multiple flower stalks, often flowers in August or September (later than most other milfoils)
Importance: provides habitat of aquatic animals and stabilizes sediment

Photo credit: Jennifer Parsons, Washington State Department of Ecology

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Canadian Waterweed commonly known as Elodea (*Elodea canadensis*)
Characteristics: submersed leaves are bright green, translucent, oblong, 6-17 mm long and 1-4 mm broad; small white or pale purple flowers float at the surface
Importance: provides good habitat for many aquatic invertebrates and cover for young fish and amphibians

Photo credit: Christian Fischer

Coontail (*Ceratophyllum demersum*)
Characteristics: floats freely below the surface, no roots, 0.5-4 cm long leaves are forked into 2 flattened segments, leaves often somewhat stiff, leaves arranged in whorls of 5 to 12, tiny submersed green flowers present from June through September
Importance: provides habitat plant for young fish, small aquatic animals, and aquatic insects

Photo credit: Clayton Antieau, Washington State Department of Ecology

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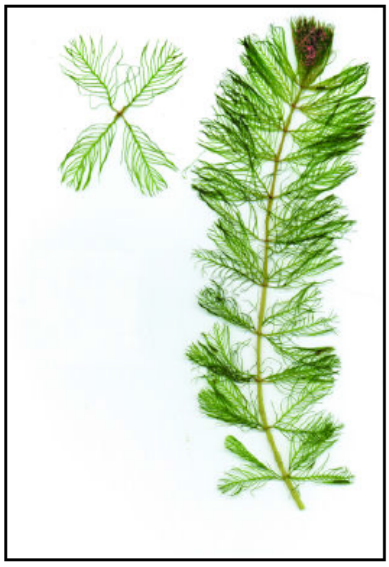
Leafy Pondweed (*Potamogeton foliosus*)
Characteristics: linear leaves that are 2-10 cm long and 1-2.5 mm wide, fibrous roots emerging from threadlike rhizomes, flowers have 2-4 whorls on an initially crowded spike (1 cm)
Importance: seeds and vegetation provide cover and food for aquatic animals

Photo credit: Clayton Antieau, Washington State Department of Ecology

Invasive Aquatic Plants of Lake Tahoe



Eurasian Water-milfoil (*Myriophyllum spicatum L.*)
Characteristics: long underwater stems, feathery foliage, tolerant to shallow and deep waters, distinguished from native milfoil by threadlike leaflets usually found in pairs of more than 14
Primary Means of Introduction: native to Europe and Asia, present in much of the United States and Canada, spread from lake to lake by boat trailers and aquarium dumping, has been spreading around Lake Tahoe for 15-20 years
Problems: impedes water flow, disrupts navigation, inhibits recreational activities, decreases water quality, reduces plant diversity
Management: physical (hand pulling, harvesting, cutting) and mechanical control
Prevention: clean all vegetation off boats and equipment

Established communities present in Lake Tahoe. Current management techniques controlling populations; eradication is not achievable.

Photo credit: Robert Johnson, Cornell University. Ruthanna Hawkins, Cayuga Lake Watershed Network

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Curly Leaf Pondweed (*Pontamogeton crispus L.*)
Characteristics: submersed aquatic plant with oblong blue-green leaves that have very wavy margin, reproduces by turions (see inset)
Primary Means of Introduction: native to Eurasia, Africa, and Australia; has begun to expand rapidly in Lake Tahoe over the past three years; primarily has spread in warm, shallow waters (such as marinas)
Problems: impedes water flow, disrupts navigation, inhibits recreational activities, decreases water quality, reduces plant diversity
Management: physical (hand pulling, harvesting, cutting) and mechanical control
Prevention: clean all vegetation off boats and equipment

Established communities present in Lake Tahoe. Current management techniques controlling populations; eradication is not achievable.

Photo credit: Three Lakes Council, South Salem, New York
Photo credit (inset): Leslie J. Mehrhoff, University of Connecticut

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Eurasian water milfoil and curly leaf pondweed populations are highly concentrated in the South basin, near the Tahoe Keys area, with smaller populations throughout the lake. Both plants currently dominate the submersed aquatic plant community, causing increased nutrient pumping from sediment (a cause of decreased water clarity).

The Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG) is currently working to prevent the spread of invasive species in Lake Tahoe. The public is invited to attend LTAISWG meetings and is encouraged to volunteer!

For more information about aquatic invasive species, please go to http://www.tahoercd.org/index.php/ISP/aquatic

2015 Truckee River Aquatic Plant Control Project
http://tahoeboatinspections.com/wp content/uploads/2015/08/2015_08_14_TruckeeRiverAISControl.pdf

FOR IMMEDIATE RELEASE: August 14, 2015

Innovation Applied to Tackle Invasive Plants in Truckee River

Truckee River, Tahoe City, CA – The Tahoe Resource Conservation District (Tahoe RCD) has piloted a project on the Truckee River to control the aquatic invasive plant, Eurasian watermilfoil (*Myriophyllum spicatum*), which has been growing in Lake Tahoe since the late 1980s, and likely entered the Truckee River following the overflow of the dam in 1997.

Tahoe RCD is a leader in developing highly-effective control strategies for open-water aquatic plant removal in collaboration with the Lake Tahoe Aquatic Invasive Species Program. In 2010, approximately 6 acres of aquatic invasive plants covered the nearshore near Vikingsholm in the iconic Emerald Bay. Control strategies used in Emerald Bay included laying down bottom barriers to kill the plants by eliminating light, and using diver-assisted suction removal to physically remove plants and roots. After four years of comprehensive treatment, Emerald Bay is free of aquatic invasive plants.

Tahoe RCD is now taking this strategic deployment of both methods to the Truckee River, from the lakeside of the Tahoe City Dam downstream to Alpine Meadows Road. Eurasian watermilfoil is growing in large dense patches along this stretch of the river. These patches of vegetation can alter water quality by raising pH, decreasing oxygen, and increasing water temperature, as well as causing a decrease in water clarity, all of which ultimately alters the ecosystem and causes negative impacts to recreation and public safety.

In 2014, 10,000 square feet of benthic bottom barriers were laid lake-ward of the Tahoe City Dam. In 2015, fewer than twenty plants have been detected at this site and subsequently removed. Also in 2014, 427 cubic feet of invasive plants were removed downstream from the dam using diver-assisted suction removal. In August of 2015, Tahoe RCD is working with A.C.E. Diving to install bottom barriers in the river system below the dam the same team successfully treated the Eurasian watermilfoil infestation at Emerald Bay. While bottom barriers have been successful in open water lake environments, using them within a river system will be a new application of this method.

"With the drought conditions, many people have asked how the lack of water at the Dam and down the Truckee River will impact efforts to remove invasive plants," said Kim Boyd, District Manager at Tahoe RCD. "With the low waters this creates a unique opportunity to use bottom barriers which provides a cost-effective technique for plant removal."

Tahoe RCD anticipates the need to continue efforts to control aquatic plants in the Truckee River for several years to come as the population is dense in some locations and environmental conditions such as water levels will continue to fluctuate.

“From our efforts in Emerald Bay, we know that invasive plant populations can be reduced and with continued treatments we will be able to better manage the populations in the future.” Boyd continues.

Funding for this project has been provided by the Community Foundation of Western Nevada/Truckee River Fund, California Department of Parks and Recreation, the Tahoe Fund, and the Rotary Club of Tahoe City.

Crystal Shores East Milfoil Barrier Project 2014-2017
2017 update: all weeds have been eradicated using bottom barriers and hand removal.

The homeowners association of Crystal Shores East in Incline Village stepped up in 2014, to remove invasive weeds from their marina by partnering with local experts. An infestation of approximately 10,000 square feet of Eurasian watermilfoil (Myriophyllum spicatum) was crowding out their marina. Eurasian watermilfoil is a submerged aquatic plant that grows in still or slow-moving water and reproduces mainly by fragmentation. It was first discovered in Lake Tahoe in the late 1990's on the South shore of Lake Tahoe. Over the years, small fragments of this plant have made their way across the 22 miles of famous blue waters and established new colonies.

The Tahoe RCD and Crystal Shores East Homeowners Association are combining public and private dollars to treat this satellite population of aquatic invasive weeds, with financial support from the Nevada Division of State Lands. This new partnership is providing Crystal Shores access to weed-removal materials and technical expertise of the Tahoe RCD and members of the Lake Tahoe Aquatic Invasive Species Program.

Treatment for this location includes a combination of bottom barriers and diver assisted hand removal. "Bottom barriers," sheets of synthetic material used to block sunlight and inhibit the plants from photosynthesis, were placed on the infestation early in September and removed in October. Divers will follow up with hand pulling to treat outlier plants. There have been some challenges with low water levels, but we are making adjustments as conditions change. Follow up surveys and treatment was conducted in the spring of 2015. Later in 2015, bottom barriers were placed again to be removed in 2016.

The Tahoe RCD hopes to continue the partnership with Crystal Shores East homeowners and use it as a model for other invasive species removal projects on private property. "It was eye-opening to see how involved it was to deploy the barriers," said Ann Schofield, representative from Crystal Shores East homeowners, "The Tahoe RCD has been great to work with." Lake Tahoe's clarity will benefit from the combination of private industry combining forces with public organizations to tackle invasive species.

Tahoe RCD Truckee Regional Aquatic Invasive Species Prevention Program 2012 Final Report
http://tahoercd.org/wp-content/uploads/2013/06/TRAISPP_Annual_Report_2012.pdf

Since 2010, the Tahoe Resource Conservation District (TAHOE RCD) has coordinated with local partners in the Middle Truckee River Watershed (outlet of Lake Tahoe to the California state line) to implement the Truckee Regional Aquatic Invasive Species Prevention Program (TRAISPP).

The principle objectives of this pilot program were to better understand invasive species issues in the region, provide outreach and education on invasive species, organize regional resource managers, evaluate usage patterns, and evaluate the feasibility of watercraft inspections and decontaminations. Since the program began in 2010, it has benefited from broad support amongst resource managers, county representatives, utility managers and boaters as well as funding from the Truckee River Fund. In 2011, federal, state and local agencies and stakeholders completed a risk analysis for the program area, which showed moderate to high risk of introduction, establishment and transport of Truckee AIS. As a result, project partners began working toward the creation of mandatory inspection programs within each of the jurisdictions in the program area – Placer County, Nevada County, Sierra County and the Town of Truckee. Coordination efforts have resulted in a formal Memorandum of Understanding and letters of support, as well as, funding and in-kind contributions from partner agencies. The geographical scope of coordination has extended through the entire Truckee River watershed, from Lake Tahoe to Pyramid

Lake. The degree of coordination and cooperation among partner agencies underscores the importance and need for regional management efforts.

Program waterbodies: Donner Lake / Stampede Reservoir /Independence Lake / Boca Reservoir / Webber Lake Prosser Reservoir / Martis Creek Lake /Lake of the Woods.

Inventory of AIS and Water Quality in lakes in the Lower Truckee River Region: 2012
http://tahoercd.org/wp-content/uploads/2013/03/Inventory-of_2012.pdf
The introduction and establishment of aquatic invasive species throughout the Truckee River region of California and Nevada is of growing concern to resource managers. Recent research from the region, conducted largely within Lake Tahoe, suggests that invasives cause both ecological and economic impacts (Kamerath et al. 2008; Vander Zanden et al. 2003).

For example, the recent introduction of Asian clam (Corbicula fluminea) is thought to facilitate increases in algal blooms in the southeastern part of the lake and have a variety of negative effects (Sousa et al., 2008). While, invasive plants such as water milfoil (Myriophyllum spicatum) can alter nearshore habitats and facilitate the invasion of other species such as warm water fishes which have drastic impacts on lake ecology (Kamerath et al. 2008). The invasion of species which is facilitated by previous non-natives has been described as "invasional meltdown" and can cause catastrophic shifts in ecosystems (O.Dowd et al. 2003)

The majority of the lakes in the Truckee River Watershed have resisted invasion by many of the exotic species (Rammer and Chandra 2010). However, as aquatic nuisances continue to spread to the western United States (e.g. dreissenid mussels in Lake Mead; Stockstad 2007) they are a risk to lakes and a concern to resource managers in the Truckee River watershed. Dreissenids have been known to significantly impact water quality, resulting in large scale economic damage by clogging water intake pipes and reducing recreational activity when they establish. Given the ability of dreissenids to spread between systems and the extensive boat traffic(a common vector for aquatic invasions)in the Truckee River watershed, the potential for the establishment of invasive mussels could be significant (Wittmann et al. 2009; Umek et al. 2009).

Adult invasive invertebrate and plant surveys
Invasive species were detected in 3 of the 8 lakes which were surveyed. Eurasian water milfoil was noticed at high densities in Martis Creek Lake and Spooner Lake. Asian clams were detected in several parts of Donner Lake and may have spread from the initial clam patch described in 2010 (Rammer and Chandra 2010). Dense patches of clams were detected along the state park beach, and near the outlet at the east end of the lake. Zebra mussels (*Dreissena polymorpha*), quagga mussels (*Dreissena rostriformis*), New Zealand mudsnail snails (*Potamopyrgus antipodarum*) and hydrilla (*Hydrilla verticillata*) were not detected in any of the study lakes. Shoreline invasive species survey data can be found in Appendix A. A variety of substrates and high use areas were surveyed over the course of the year.

Quagga and zebra mussel veliger detection
Veliger DNA or veligers (via microscopy) were not detected in any of the lakes sampled (Donner, Stampede, Boca, Prosser, Marlette, Martis Creek Lake, Spooner, and Independence) during since this monitoring program began in 2010.

2013 Truckee River_ Lakes Report UNR
http://tahoercd.org/tahoe-aquatic-invasive-species-resources/
The objective of this project was to identify water bodies within the Truckee River region (Donner Lake, Stampede Reservoir, Boca Reservoir, Prosser Reservoir) that have already established invasive invertebrate and plant communities, and to identify and document recent or new invasions. This is year three of the project and builds upon data collected in 2010 (Rammer and Chandra 2010), 2011 (Caldwell and Chandra 2011) and 2012 (Caldwell and Chandra 2012).

Specifically, our goals were to:

1. Use the method developed by Rammer and Chandra (2010) to continue shoreline surveys for invasive invertebrates (Dreissenid mussels, New Zealand mudsnail, Asian clam, and crayfish) and invasive plant (Hydrilla, Curly leaf pondweed and Eurasian water milfoil) species.

2. Sample lakes for the DNA of dreissenid mussel veligers to document invasions using zooplankton net hauls.

3. Quantify the concentration of calcium in the eplimentic waters of each lakes.

Adult invasive invertebrate and plant surveys:
Invasive species were detected in 1 of the 4 lakes which were surveyed during 2013 (Table 2). Asian clams were detected in several parts of Donner Lake and appeared to have spread from the initial clam patch described in 2010 (Rammer and Chandra 2010). This has been confirmed by other surveys done by other agencies (Dan Shaw, personal correspondence, California State Parks). Patches of clams were detected along the state park beach, and near the outlet at the east end of the lake. Zebra mussels (*Dreissena polymorpha*), quagga mussels (*Dreissena rostriformis*), New Zealand mudsnails (*Potamopyrgus antipodarum*) and hydrilla (*Hydrilla verticillata*) were not detected in any of the study lakes (Table 3). However, New Zealand mudsnails were detected in the lower Truckee River (Chris Crookshanks, personal correspondence, Nevada Department of Wildlife) during Summer of 2013.

Quagga and Zebra mussel veliger detection: Veliger DNA or veligers (via microscopy) were not detected in any of the lakes sampled (Donner, Stampede, Boca, Prosser, Marlette, Martis Creek Lake, Spooner, and Independence Lake.

Tahoe Keepers
http://tahoekeepers.org
http://tahoeboatinspections.com/tahoe-keepers/

In 2011, this online, non-motorized boat education/inspection program was launched. Tahoe Keepers, the outreach initiative targeted at paddlers, has been able to raise awareness to approximately 1500 people annually.

The League to Save Lake Tahoe helped to plan and implement the outreach and education portions of the Tahoe Keepers stewardship program. Funds came from the Lake Tahoe Quagga Mussel Prevention Fund, which the League formed in conjunction with the Tahoe Lakefront Owners Association.

TahoeKeepers.org provides video training on how to properly clean, drain and dry watercraft and gear after each use, and dispose of any plants or debris away from lakes and streams. Preventing invasive species is an important part of protecting Lake Tahoe's shoreline beauty.

Eyes on the Lake (EOL)
http://keeptahoeblue.org/our-work/eyes/

In 2015, TWSA sponsored a training session for 15 new EOL volunteers. Eyes on the Lake is the League to Save Lake Tahoe's newest volunteer program helping to prevent the spread of aquatic invasive plants in Tahoe's waters. If you are a water lover at Tahoe (SCUBA diver, paddler, swimmer, beachgoer, or boater) and want to help ensure Tahoe's waters stay clear and pristine, then Eyes on the Lake is for you. Volunteers will learn how to identify plants in the classroom and in the field.

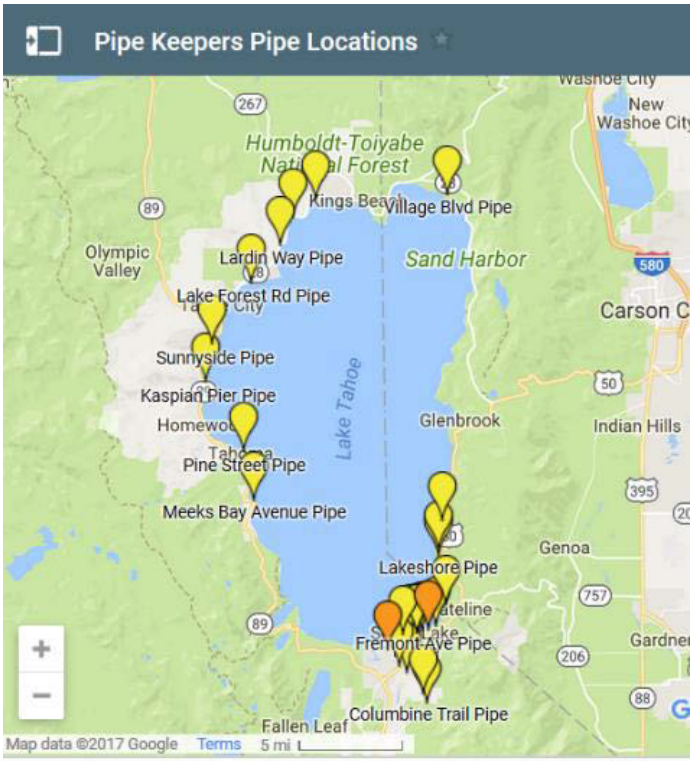
The two main targets of our Eyes on the Lake program are curlyleaf pondweed and Eurasian watermilfoil, which are already established in several locations throughout the lake and are difficult and expensive to control. These weeds clog recreation equipment, degrade shoreline beauty, and impede views of the lake's bottom. Milfoil is a common aquarium plant that was first introduced to the Tahoe Keys decades ago. It has now spread to dozens of locations throughout Tahoe by hitching a ride on boats.

A certified Eyes on the Lake volunteer receives training to:

- Identify aquatic invasive plants;
- Complete simple surveys while you are enjoying Tahoe's waters, and report what you find;
- Provide information to the Lake Tahoe Aquatic Invasive Species Program that can result in early detection of new infestations and more effective treatment.
- If you see something suspicious while out on the water report what you find to the Aquatic Invasive Species Hotline at (888) 824-6267.

Tahoe Pipe Keepers
http://keeptahoeblue.org/our-work/Pipekeepers

Tahoe Pipe Keepers is a volunteer based water quality monitoring program that examines the turbidity (clarity) of the water being released from storm drains into Lake Tahoe and tributaries. Since the program's launch in October 2012, a dedicated group of volunteers have braved the elements, during and after storm events to collect water samples, take photos and raise awareness about the impact of storm drains on lake and river waters. 2016/17 saw a large push in program expansion. To date, Pipe Keepers volunteers have collected over 2,000 water samples from 33 pipes around Lake Tahoe.



What is fine sediment and why is it a problem?

Fine sediment particles are smaller than the width of a human hair and can remain suspended in Lake Tahoe for years, even decades, degrading its deepwater clarity. Sources of fine sediment include road traction abrasives (road sands) that are applied to our streets and highways in the winter; dirt and pollutants from streets, parking lots and neighborhoods; and even degradation of roads and other surfaces. All this material washes into storm drains during rain storms and snowmelt and pollutes the Lake.

Lake Tahoe Algae Outbreaks
2018: (August 14, 2018) The TKPOA Water Quality Committee and the Water Quality Staff have been proactive in the planning and preparation of our waterways since last year's Harmful Algae Bloom (HAB). Water quality sampling and monitoring has been ongoing for the duration of the season. Unfortunately, the TKPOA is at the infancy stages of experiencing another algae bloom for this season in the West Channel, East Channel and Lake Tallac. Our sampling results show that the bloom is a type of cyanobacteria that is primarily composed of Dolichospermum. This cyanobacterium is capable of producing toxins, but only low levels of Anotoxin-A have been detected. TKPOA has contacted the appropriate authorities, including Lahontan Regional Water Quality Control Board (LRWQCB). LRWQCB has recommended the placement of caution signs around the Tahoe Keys (attached) and regular monitoring.

Key precautions:

- Avoid contact with algae or scum in the water
- Keep children away from algae or scum
- Fish caught in these waters should be cleaned with tap or bottled water. Guts should be thrown away.
- Do not let pets come into contact with algae / scum, drink the water or eat the scum on the shore
- Do not drink lagoon water or use for cooking
- Do not eat shellfish from the lagoons

Toxic algae detected in some Tahoe Keys waterways
https://www.tahoedailytribune.com/news/toxic-algae-detected-in-some-tahoe-keys-waterways
August 26, 2017

Ryan Hoffman / Tahoe Daily Tribune|

Signs warning of potentially harmful algae blooms were posted in certain areas within the Tahoe Keys earlier this week. Residents and visitors in certain areas of the Tahoe Keys are being warned of the presence of potentially poisonous algae.

Warnings were posted earlier this week along specific waterways, including off Aloha Drive. The signs say harmful algae may be present in the water. As of Friday, all the samplings tested so far indicated the lowest possible level of toxins, Greg Hoover, water quality manager and aquatic invasive species management coordinator for the Tahoe Keys Property Owners Association (TKPOA), told the Tribune Friday.

However, toxin levels can fluctuate up and down for many reasons, some unknown to water managers.

"The toxin level can go up and down based on all sorts of factors, a lot based on factors we don't even understand," Doug Smith, supervising engineering geologist with the Lahontan Water Board, told the Tribune Friday.

The caution signs posted in areas of the Keys recommend staying away from algae and scum if swimming in the water and keeping children away from the algae altogether. The water should not be used for cooking or drinking, and pets should be kept away from the water and any algae that may wash onto land.

Blue-green algae is naturally occurring and its presence has been increasingly noticed in bodies of water throughout California. Back in July water officials issued a warning telling people in Los Angeles County to avoid contact with water in Pyramid Lake due to a bloom of toxic blue-green algae.

Only certain forms of the algae produce toxins, Smith said. As far as the level of risk posed to people in the Keys, Smith added, "They should be aware of this because it's happening all across the state, and they should exercise caution … and try not to drink gobs [of the water]."

Reports of potentially harmful blue-green algae first came in on Aug. 19, according to Lahontan.

In the normal process, the water board would act as the first responders and take water tests and send them to a lab. However, Smith said TKPOA expressed a desire to fast-track the process.

Staff from the TKPOA collected three water samples from the main lagoon on Monday, Aug. 21, and paid to have those samples sent to the lab faster than would normally be the case, Smith said.

Those lab results, which were received Thursday, Aug. 24, showed low levels of Anatoxin-A and microcystins were present in some of the water samples.

Lahontan Water Board staff conducted a site visit throughout the main channel and collected water samples from lagoon waters adjacent to properties on Aloha, Lido and Morro drives on Tuesday, Aug. 22. Those sample results are expected sometime this coming week.

From there, water board staff and other officials will work together to monitor the situation. Representatives from other agencies, including El Dorado County Public Health, the Tahoe Regional Planning Agency (TRPA) and others, have been alerted of the situation.

"TRPA is aware of this concerning development and working closely with the Lahontan Water Board, who has jurisdiction on this matter, to monitor the situation and make sure that appropriate steps are taken to protect public health, safety, and the environment," Tom Lotshaw, public information officer for TRPA, said in an emailed statement.

Continued assessment of the situation will likely involve daily visual monitoring and sampling once per week, especially if favorable conditions continue, according to Lahontan.

2017: *http://www.laketahoenews.net/2017/08/toxic-algae-bloom-tahoe-keys-lagoons*

Toxic algae bloom in Tahoe Keys lagoons

laketahoenews.net/2017/08/toxic-algae-bloom-tahoe-keys-lagoons/

Published: August 24, 2017

Canals in the Tahoe Keys are plagued by blue-green algae. Photo/Kathryn Reed

By Kathryn Reed

A toxic algae bloom is covering a large swath of the Tahoe Keys, prompting a warning to people to be wary of the water.

Officials with the Tahoe Keys have known about the blue-green algae since Aug. 11. Warnings, though, did not start until Aug. 23.

For such a big problem, the caution signs are very tiny.

"It's in different locations in the west lagoons," Kirk Wooldridge, general manager for the Tahoe Keys Property Management Association, told *Lake Tahoe News.* "It's in various degrees in different areas. It depends on sunlight, current and depth."

On Wednesday the Lahontan Regional Water Quality Control Board encouraged signs be posted alerting people to the danger. Driving by it is near impossible to see them, but out with a dog is a different story.

“The level tested at Tahoe Keys did not show a high danger level. It was at the much lower caution level,” Doug Smith with Lahontan told *Lake Tahoe News.*

There are three levels of danger for cyanobacteria, which is better known as blue-green algae. The toxicity in the canals of this South Lake Tahoe neighborhood are at the lowest level.

Still, the “caution warning” includes: humans and dogs should not come in contact with the algae or scum on the shoreline, neither people nor pets should drink the water, fish caught in the area should be cleaned with tap/bottle water before cooking, no shellfish should be eaten from these waters, and the water should not be used for cooking.

More dangerous toxic levels can cause eye irritation, skin rashes, mouth ulcers, vomiting, diarrhea, and flu-like symptoms. Two dogs in Napa County died this summer after drinking water from a pond with the algae.

“Blue-green algae naturally occur everywhere in the environment. We don’t know the exact reason why certain areas have blooms,” Smith said.

Outbreaks have been occurring throughout California this year.

Why it goes away also isn’t known.

The plan is to continue field tests. If those have indicators that the level of toxicity is rising, it will be sent to the lab for definitive proof.

This is not something the Tahoe Regional Planning Agency or El Dorado County Environmental Health regulate.

“TRPA is aware of this concerning development and working closely with the Lahontan Water Board, who has jurisdiction on this matter, to monitor the situation and make sure that appropriate steps are taken to protect public health, safety, and the environment,” Tom Lotshaw with TRPA told *Lake Tahoe News.*

Copper sulfate is a proven herbicide that kills the algae. Applications have worked in other jurisdictions under Lahontan’s oversight. An emergency provision in Lahontan’s Lake Tahoe Basin Plan would allow the use, but the danger level would have to increase substantially for that option to be on the table.

It is not known if the algae can be spread by watercraft, but boat travel has not been halted. It could be that if it were

to get into Lake Tahoe, it would die because of the colder water temperature.

The Keys put up a boom on a canal linking the regular homeowners with the Lighthouse Shores gated community. According to Wooldridge, it didn’t do any good. The algae went under the boom.

He did not know how deep the muck goes.

The waterway at Venice and Alpine drives looks like a holding pond for a toxic chemical plant with the eerie green color and swirls along the shore.

Lake Tahoe Water Quality Investigations
http://terc.ucdavis.edu/publications/2013_LakeTahoeWaterQualityInvestigations.pdf

Algal Bioassay • Phytoplankton • Atmospheric Nutrient Deposition • Periphyton •
Final Report: July 1, 2010– June 30, 2013 Agreement No. 10-031-160
Submitted to: State Water Resources Control Board Lahontan Regional Water Quality Control Board
Submitted by: Tahoe Environmental Research Center University of California

The primary research and monitoring tasks addressed in this project include:

- Algal growth bioassay tests to assess nutrient limitation.
- Enumeration and identification of phytoplankton and collection of zooplankton samples.
- Atmospheric deposition of nitrogen and phosphorus
- Monitoring of attached algae or periphyton along the shoreline.

Lake Tahoe Aquatic Invasive Species Working Group
The Lake Tahoe Aquatic Invasive Species Working Group (LTAISWG) is a diverse group of agencies, community members and scientists dedicated to early detection and rapid response, prevention and control of aquatic invasive species in the Tahoe Basin. TWSA staff became actively involved in working with TRPA and Tahoe RCD as a member of the working group, focusing on the AIS inspection program protocols, public education and outreach.

Asian Clams

- **If any single factor had to be identified as the most important change in the state of Lake Tahoe since 2008 it would be the dramatic increase of Asian clams and other Aquatic Invasive Species.**

In spring 2008, UC Davis researchers discovered extensive beds of an invasive bivalve, the Asian clam (*Corbicula fluminea*), in the nearshore of Lake Tahoe along the southeastern edge of Lake Tahoe. Clam densities reach over 6,000 per square meter and are among the highest anywhere in the world. In Lake Tahoe Asian clams can affect plankton levels and food webs, out-compete native species, and cause attached algae to form nuisance blooms. More information on TERC Asian Clam research is presented later in this chapter.

Studying Circulation Patterns / Water Current Drifters
http://terc.ucdavis.edu/research/lake-tahoe/drifters.html

Measuring the water current at a single point provides valuable data – but only at that point. What is often important to know is how water moves all around the lake, and where it would carry pollutants or invasive species once they were in the lake. Water current drifters do that. TERC has used surface drifters attached to underwater sails (or drogues) to measure the paths that they take when carried solely by currents. A GPS unit in the drifter keeps track of the ever changing position, and in recent versions that data is sent to us in real-time via satellite.

The drifter studies to date have revealed a lot of new information about Lake Tahoe. We know that the circulation is dominated by two main eddies or gyres. The one in north travels counterclockwise, while the one in the south moves clockwise. Smaller gyres occur at the edges of these major gyres, and they disappear and reappear depending on the winds. The first hint that Asian clams could travel across the lake from east to west in less than a day was revealed by a drogue study. Our interest is now on understanding the small gyres that run along the nearshore regions of the lake.

Funding for this research has spanned many years, with numerous sources. Funders include the US EPA, East Bay Municipal Utility District (EBMUD), SNPLMA, the UC CITRIS Program and private donors. Our newest collaboration is with the students of the Tahoe Expedition Academy in King's Beach. Together we will be monitoring the currents off the north shore of Lake Tahoe and developing a web application to show the current movements.

2012 Current Studies Using Drifters
http://johnmuir.ucdavis.edu/news/announcements/385/floating-robots-track-surface-currents-of-lake-tahoe
Researchers at the UC Davis Tahoe Environmental Research Center (TERC), in collaboration with UC Berkeley, will undertake the first of a series of "drifter" experiments to better understand the surface currents of Lake Tahoe during the week of November 12 - 15, 2012.
A fleet of 64 floating drifters, each about the size of a 2-liter bottle soda, will track the water motion at 1-minute intervals by recording and transmitting their changing GPS location. They are submerged at the water level (to the approximate level of the orange tape visible in the photo) so that their motion is driven by lake currents.

Understanding surface currents of Lake Tahoe is important because currents are responsible for the transport of contaminants, invasive species, urban storm water and floating debris.
UC Davis research engineer Alexander Forrest programmed the 64 'drifters' used in an experiment to track Lake Tahoe surface currents. The drifters are plastic with a bright orange lid, and it definitely looks like it shouldn't be floating around Lake Tahoe. They are "floating robots," and if one rides the wind to your stretch of the lake, please return it to the UC Davis Tahoe Environmental Research Center (TERC).

On Nov. 12, 32 drifters were deployed in Lake Tahoe on a north-south and east-west line. They were to be tracked and replaced for two days with 32 fresh drifters. The positions of the drifters were mapped over the entire four-day period, offering scientists some insight into how surface currents move invasive species, urban storm water, and floating debris around the lake. Units that weren't retrieved by the end of day on Nov. 15 would lose battery power and therefore can't be tracked.

Quagga and Zebra Mussel Veliger Monitoring
In 2010, a veliger monitoring program was initiated by the Tahoe Regional Planning Agency, with assistance from TahoeRCD. Veligers are the larval stage of bivalve mollusks which includes Quagga and Zebra mussels, two potential invaders of Lake Tahoe. Monitoring is an essential element to ensure that the Watercraft Inspection Program has been effective in preventing Quagga and Zebra mussels from establishing populations in Lake Tahoe.

Eight Tahoe locations were surveyed bi-weekly from late June until the end of September; the eight locations included Elks Point, the Tahoe Keys, Emerald Bay, Meeks Bay, North Tahoe Marina, Sand Harbor, Obexers Marina, and Cave Rock. Sampling consisted of eight vertical plankton tows at each site, and the samples were sent to a laboratory to be analyzed.

- **As of Nov. 1, 2018, no veligers were detected.**

Early detection monitoring was conducted at 12 waterbodies within the Tahoe -Truckee watershed. Sampling consisted of vertical plankton tows at each site, and the samples were sent to a laboratory to be analyzed. All of the samples returned with no Zebra or Quagga mussel veligers present.

Aquatic Weed Removal Projects 2011-13
An Emerald Bay Aquatic Invasive Species Management Plan has been developed. The Plan identifies the long-term goal of Eurasian Water milfoil (EWM) eradication, where feasible, and the near-term goal of reducing all infested areas in Emerald Bay to levels that can be controlled through regular maintenance. Annual maintenance would be conducted by State Park employees or cooperators to remove remaining and newly established EWM plants until the risk of re-introduction into Emerald Bay is removed.

Achieving this near-term goal would be accomplished by a continuation of annual control efforts commensurate with the successful effort of 2010. The removal effort is a collaborative effort between the Tahoe RCD, TRPA, and the California State Parks. Work has been conducted near the Vikingsholm swim beach and pier, the Parsons Rock area, and near Avalanche Beach. In the summer of 2011, 7,700 square feet of bottom barriers was deployed at Parsons Rock and 2,400 square feet of barriers at Avalanche Beach. Significant diver-assisted suction removal of invasive weeds was performed and nearly 100% of the invasive weeds at Parsons Rock have been either covered with barriers or removed by hand. Previous work has shown near-eradication of weeds (particularly Eurasian water milfoil) in the Vikingsholm swim beach area. Prior to work, researchers were optimistic that similar results could be achieved at Parsons Rock and Avalanche Beach. In 2014, full eradication was verified.

Aquatic weed removal efforts also took place at Elks Point Marina in April and September 2010. The treatment included diver-assisted suction removal to remove large infestations of Curlyleaf pondweed and Eurasian water milfoil in the marina. Continued removal efforts will need to occur to eradicate the localized invasive weed populations in the marina.

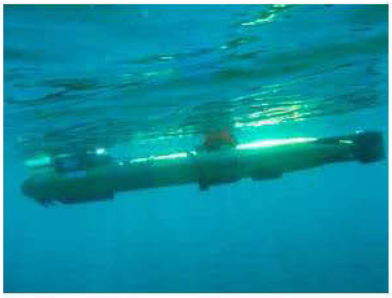
Crystal Shores East Milfoil Barrier Project 2014-17
Full eradication was accomplished in 2017. The homeowners association of Crystal Shores East in Incline Village stepped up in 2014, to remove invasive weeds from their marina by partnering with local experts. Rubber bottom barriers were placed in 2014-2017. An infestation of approximately 10,000 square feet of Eurasian watermilfoil (Myriophyllum spicatum) was crowding out their marina.

Asian Clam Removal Projects 2011-14
In 2011-13 the majority of work on AIS was located much farther away from TWSA member intakes; focused on the Emerald Bay, Tahoe Keys and Ski Run areas in South Lake Tahoe.
In 2011, the project expanded to Emerald Bay where a small population of Asian clams has colonized at the mouth of the bay. Tahoe RCD continued to manage and coordinate these efforts in collaboration with our partners and funders: UNR, UC Davis, U.S. Fish and Wildlife, Tahoe Regional Planning Agency, CA State Parks, Nevada Department of Environmental Protection, Lahontan WQCB, and Lake Tahoe Water Purveyors.

Asian Clam Population in Lake Tahoe – Experimental Controls 2009-2013

10-foot by 10-foot rubber bottom barriers were tested as a strategy for managing Asian clam populations

Researchers sampled Asian clam densities before and after rubber bottom barrier experiment



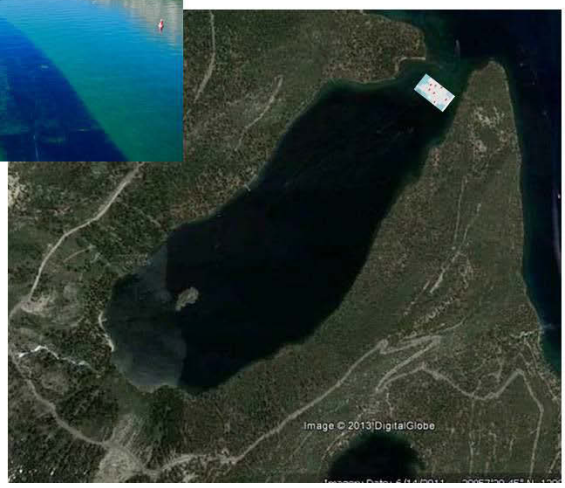
Autonomous Underwater Vehicle (AUV) is used to map clam beds around Lake Tahoe

In 2012, the AIS group began a larger scale Asian clam control project in the mouth of Emerald Bay. TWSA involvement in these projects was reduces since the barrier projects were not in proximity to drinking water intakes.

2012: UC Davis scientists assemble 5 acres of mats for Tahoe Asian Clam Project
http://www.news.ucdavis.edu/search/news_detail.lasso?id=10368
Oct. 16, 2012

Rubber barriers bound for the lakebed of Lake Tahoe's Emerald Bay were assembled at the University of California, Davis as part of the biggest Asian clam control project in the lake's history.

←View from mouth of Emerald Bay



Google Earth view, 2011 with mat plan approximately superimposed

The invasive clams threaten the lake's health and famed clarity. UC Davis scientists, staff and students are unfolding the long, black mats and enhancing them with rebar, brass grommets and valves that will hold the barriers in place underwater and enable scientific analysis of the project. The barriers were trucked to Lake Tahoe and beginning Monday, Oct. 22 (weather permitting) placed by divers onto a 5-acre area on the floor of Emerald Bay.

"This is the engineering that happens behind the scenes, before the barriers are deployed," said Geoffrey Schladow, director of the UC Davis Tahoe Environmental Research Center. "The purpose is to make the barriers physically sound, but also to minimize the amount of time divers have to spend underwater."

The valves being built into the material will serve as a port, allowing divers to insert a syringe and collect water samples from under the mat without disturbing the project.

Assembling the barrier material involves:

- 238 rolls of rubber barrier, each 100 feet long and weighing 300 pounds
- 10 miles of rebar
- 16,000 grommets

Scientists from UC Davis and the University of Nevada, Reno first devised and tested the concept of using rubber barriers to smother Asian clams in 2010, when they placed an acre of the barriers on the lake bottom. This first-of-its-kind method killed 100 percent of the clams. The success of those efforts and additional research led to this bigger project, which involves a team of interagency partners. The goal of the Emerald Bay Asian clam control project was to treat a relatively small, isolated population of Asian clams before they spread to an unmanageable level. Currently, the clams live on a shallow, gravel sill roughly 15 feet below the surface that partially separates Emerald Bay from Lake Tahoe. Treatment will be accomplished by covering the infested lake bottom with the thin rubber barriers, augmented with organic material, that reduce the available oxygen and smother the clams.

The UC Davis Tahoe Environmental Research Center will provide scientific oversight as the barriers are being deployed and when the barriers are removed in the fall of 2013. TERC and collaborators from the University of Nevada, Reno, will also analyze the project over the next 12 months, taking sediment samples, measuring nutrients and oxygen levels under the mats, and monitoring the project's overall effect on the Asian clams.

Controlling the Asian clam population in Lake Tahoe is critical as the clams have a variety of negative impacts. The clams could increase the potential for other species, such as Quagga mussels, to establish in Lake Tahoe. They also promote the growth of algae by releasing highly concentrated nutrients. Increases in algae impact the scenic beauty of the shoreline by changing the water color, reducing water quality, and washing rotting materials onto the beaches. Perhaps most significant, Asian clams compete with native animals for habitat and food, which causes a disruption in the food web.

By treating the Emerald Bay infestation in the early stage, impacts can be minimized or avoided. The treatment will also help prevent the spread of these invasive clams to other areas of Lake Tahoe. The project cost is about $810,000 and is funded by the Lahontan Regional Water Quality Control Board, U.S. Fish and Wildlife Service, and U.S. Forest Service Pacific Southwest Research Station.

Marla Bay Asian Clam Removal Asian Clams: 2010 experiment
In the summer of 2010, two sets of half-acre barriers were installed to test whether large-scale application of this experimental method is a feasible option. The bottom barriers were installed in Marla Bay, NV, and Lakeside, CA, and consisted of 20 rolls of 10 foot wide and 100 foot long high density polyethylene. Both of these larger scale project areas were again located within proximity to TWSA member agency water intakes. The project team worked closely with the water providers to plan the project to avoid potential impacts to drinking water quality. TWSA staff Rebecca Williams served as a member of the project team, conducting the water quality monitoring sampling and consulting with the team on mitigation requirements for the permits.

The Control of Asian clam (*Corbicula fluminea*) in Lake Tahoe with Benthic Barriers: The Influence of Water Temperature on Mortality
http://terc.ucdavis.edu/publications/documents/marlabayfinalreport.pdf
Final report for the Marla Bay Asian Clam Project published 2011.

Final Report for the Lake Tahoe Asian Clam Pilot Project
A final report for multiple Lake Tahoe Asian Clam projects 2009-2011 was submitted for permit requirements in March 2011. This document is available at:
http://lands.nv.gov/docs/LTLPreports/Invasive%20Species/Lake%20Tahoe%20Asian%20Clam%20Pilot%20Project%202009%20-%202011.pdf

Water Supplier Needs - Asian Clam Project Mitigation Measures
The Tahoe Water Suppliers Association (TWSA) has been in attendance for the Asian Clam Working Group meetings since 2009 and was part of the development of this project and the monitoring plan and mitigations. TWSA staff have been actively conducting water quality sampling during experiments as needed. Mitigation measures applied to all aspects of the project except the initial pre-installation background monitoring. The water purveyors were to be contacted within 72 hours of any work commencing. Bacteria results were to be obtained within 24 hours of time sampled, reviewed and methodology will be amended accordingly. If E. coli counts were detected or at the request of any TWSA member, a raw water sample can be taken at all the 5 TWSA intakes in the vicinity to insure no migration of microbial waste associated with barrier removal. The ultimate mitigation for the water supplier is to rely on storage and turn off pumpage for some period of time. In addition, if at any time during project activities, a spill or release of fuel from boats or operations occurred spill procedures were to be instituted and a sample for total petroleum hydrocarbons taken and sent to the lab. Spill information, emergency contact list, procedures, and forms were on hand for any project activity.

Asian clams: 2009 small-scale experiment
In 2009, a small-scale experiment to manage Asian clams showed that laying rubber bottom barriers on the lake sediment resulted in a dramatic reduction in clam density within a month after its installation. This is a new method that was developed in Lake Tahoe by UC Davis and University of Nevada Reno scientists in close collaboration with resource managers including the Tahoe Regional Planning Agency, the Tahoe Resource Conservation District and the US Fish and Wildlife Service and others. Both of these project areas were located within proximity to TWSA member agency water intakes. The project team worked closely with the water providers to plan the project to avoid potential impacts to drinking water quality. Water quality testing for turbidity and bacterial indicators remained low, well below action thresholds established in the project permits.

Lake Tahoe Region Aquatic Invasive Species Management Plan for California and Nevada - Sept. 2009
http://www.anstaskforce.gov/State%20Plans/Lake_Tahoe_Region_AIS_Management_Plan.pdf
http://www.trpa.org/default.aspx?tabindex=0&tabid=378

2014 UPDATE
Lake Tahoe Region Aquatic Invasive Species Management Plan CALIFORNIA – NEVADA
http://www.trpa.org/wp-content/uploads/01_Updated_Lake-Tahoe-AIS-Management-Plan_Final_July-2014.pdf

The Lake Tahoe Aquatic Invasive Species Management Plan (LTAISMP) is part of a multi-stakeholder collaborative effort to minimize the deleterious effects of nuisance and invasive aquatic species in the Lake Tahoe Region. This specific product is authorized pursuant to Section 108 of Division C of the Consolidated Appropriations Act of 2005, Public Law 108-447 and an interagency agreement between the U.S. Army Corps of Engineers and the California Tahoe Conservancy; report was prepared by Tetratech.

The focus of the 2014 Plan revision was to revise and update the content of the Plan taking into account changes in the implementation of AIS efforts in the Tahoe Region that have occurred in the previous four years, and the accomplishments during that time. In addition to the content update, there was also a focus

on changes that were needed to make the Plan as useful as possible to inform management, policy, and funding decisions related to AIS issues in the Region. This was accomplished by changing the format of the Plan to make the body robust enough to guide the program, while the appendices were expanded and intended to be "living" documents. With the format changes, future revisions to the body of the document will require major technical rewriting; the more frequent changes to appendices will require a simpler process of minor technical revisions.

Excerpts follow:

Executive Summary

Lake Tahoe is designated an Outstanding National Resource Water (ONRW) under the Clean Water Act (CWA Section 106) due to its extraordinary clarity. Substantial changes to the Lake Tahoe Region's economy, pristine water quality, aesthetic value, and recreational pursuits are occurring, partly due to the harmful impacts of non-native aquatic plants, fish, invertebrates, and other invaders. These non-native aquatic organisms are considered 'invasive' (or aquatic invasive species [AIS] in water) when they threaten the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural or recreational activities dependent upon such waters (NANPCA 1990). AIS are commonly spread by activities such as boating, fishing, hatchery releases, and aquarium dumping.

Table 6. Lake Tahoe Region AIS Management Plan Objectives

Objective	Title	Description
A	Oversight and Internal Coordination	Continue plan oversight and coordination within the Region, and coordinate with other AIS plans and programs outside of the Region.
B	Prevention	Prevent the spread of existing AIS and the introduction of new AIS to the Tahoe Region
C	Monitoring, Detection, and Response	Develop and maintain programs that: • Ensure the early detection of new AIS introductions • Monitor existing AIS populations • Establish and manage systems to rapidly respond to new AIS introductions
D	Long-Term Control	Establish and maintain funding sources to support activities that minimize impacts of AIS to native species and protect water quality and environmental health

The Lake Tahoe Region is not only threatened by new introductions of AIS to Lake Tahoe from other waterbodies, but also the expansion of existing populations within the lake and even as a source of AIS to nearby waterbodies.

Nearly 30 non-native species are established in the Lake Tahoe Region, including aquatic plants, fishes, invertebrates, and an amphibian. As examples, Eurasian watermilfoil (Myriophyllum spicatum; an aquatic plant) has been spreading around Lake Tahoe over the last 15-20 years, and curlyleaf pondweed (Potamogeton crispus; another aquatic plant) has begun to expand dramatically over the last seven years. Beds of Asian clams (Corbicula fluminea) are larger andmore common than previously known, and populations of warm water fishes such as largemouth bass (Micropterus salmoides) and bluegill (Lepomis macrochirus) are expanding.

Moreover, global climate change has resulted in warmer water temperatures, likely facilitating the establishment of non-native plants in the nearshore environment and providing increased spawning areas for warm water fishes that compete with desirable species.

The potential economic impact to the Lake Tahoe Region caused by new AIS introductions, or expanding populations of existing AIS could be substantial. The combined economic impacts to recreation value, tourism spending, property values, and increased boat/pier maintenance, when evaluated over a 50-year period, is estimated at between $417.5 million and $3.9 billion, with an average annual equivalent value of between $22.4 and $78 million per year. The largest estimated impacts would be to property values and lost tourism spending. Spending on prevention and early eradication typically produces a higher benefit to cost ratio than post- infestation control programs such that maximum benefits are realized through early and preemptive action.

This is the first update of the original Lake Tahoe Region AIS Management Plan (the Plan) that was approved in 2009. This update to the Plan seeks to revise the Plan taking into account changes in the implementation of AIS efforts in the Tahoe Region that have occurred in the previous four years, and the accomplishments during that time. In addition to the content update, the primary focus of the update is on changes that were needed to make the Plan as useful as possible to inform management, policy and funding decisions related to AIS issues in the region.

This has been accomplished by changing the format of the Plan to make the body of the Plan robust enough to guide the program, while the appendices were expanded and intended to be "living" documents. The format changes were intended to lead to future revisions where changes to the body of the document would require major technical revisions, and the more frequent changes to appendices would require the simpler process of minor technical revisions.

These changes seek to enhance coordination of regional, bi-state, state, and federal programs and to guide implementation of AIS prevention, monitoring, control, education, and research in the Lake Tahoe region.

The goals of the Plan are to:
- Prevent new introductions of AIS to the Lake Tahoe Region
- Limit the spread of existing AIS populations in the Lake Tahoe Region, by employing strategies that minimize threats to native species, and extirpate existing AIS populations when possible
- Abate harmful ecological, economic, social and public health impacts resulting from AIS

To achieve these goals, the Plan is structured around four objectives associated with:
- Oversight and internal coordination
- Prevention
- Monitoring, detection and response
- Long-term control

To meet these objectives, strategies are identified with respective action items detailing how that objective will be met. These strategies and actions will be frequently updated to illustrate program changes, accomplishments, and any emerging threats. The intent of the Plan is to provide more localized guidance for prevention and long term control of AIS in the Lake Tahoe Region and will not be in conflict with the California AIS Management Plan (CAISMP), administered by the California Department and Fish and Wildlife (CDFW) or the anticipated plan from the State of Nevada. Review of the Plan will be directed by the LTAISCC. The breadth of experience and representation on the LTAISCC allows for comprehensive guidance for subsequent Plan review.

From the 2009 Plan:
The 2007 discovery of Quagga mussels in Lake Havasu, Lake Mead, and the Colorado River Basin have prompted rapid cooperation and action by regional, bi-state, and federal agencies and non-governmental organizations in the Lake Tahoe Region. These new threats, coupled with recent studies showing high incidence of boat traffic to Lake Tahoe from these areas, have prompted a tremendous ramping up of education and outreach campaigns, new regulations to prevent accidental introduction, and increased control efforts and research on the biology and distribution of existing AIS populations.

Examples of these activities include:

- Formation of the Lake Tahoe AIS Working Group (LTAISWG).
- Formation of the Lake Tahoe AIS Coordination Committee (LTAISCC).
- Yearly workshops organized by the LTAISWG to prioritize AIS prevention, monitoring, control, education, and research efforts.
- Development and implementation of a Vessel Inspection Program at Lake Tahoe.
- Deployment of portable boat washing stations.
- Full-time AIS Coordinator hired by U.S. Fish and Wildlife Service (USFWS).
- Increased monitoring for invasive aquatic plants, invertebrates, warm water fishes.
- Use of diver-operated suction and benthic barriers to control invasive aquatic plants
- Evaluation of diver-operated suction and bottom barriers to control Asian clams
- Measurement of warm water fish behavior and diets in and around the Tahoe Keys
- Increased education and outreach activities.
- Quagga mussel survivability studies.

The purpose of the *Lake Tahoe Region AIS Management Plan* (the Plan) is to facilitate coordination of regional, bi-state, state, and federal programs and to guide implementation of AIS prevention, monitoring, control, education, and research in the Lake Tahoe Region.

Summarized in the Plan is the background of non-native species introductions to the Lake Tahoe Region, the pathways for existing and potential AIS introductions, the types of existing and potential AIS in the Lake Tahoe Region, and short- and long-term priorities for action. Also included (as appendices) is an overview of regulations and programs, the Vessel Inspection Plan, the Small Watercraft Screening Process, an estimate of potential economic impacts from a mussel infestation at Lake Tahoe, and an overview of existing and potential AIS life histories, environmental requirements, distributions, and control methods.

Table 2. Federal, State, and Regional Agencies, Regulations and Programs in the Lake Tahoe Region and Associated AIS Activities

	Control	Coordination	Environmental Documentation	Education/ Outreach	Eradication	Exportation	Financial Assistance	Importation	Possession	Prevention	Quarantine	Research	Technical Assistance
Federal													
Endangered Species Act of 1973	x				x								
Executive Order 13057		x											
Executive Order 13112		x		x			x			x			x
Lacey Act of 1990 (amended 1998)								x	x				
Nonindigenous Aquatic Nuisance Prevention and Control Act (1990) and National Invasive Species Act (1996)	x	x		x			x			x		x	x
National Environmental Policy Act of 1970			x										
U.S. Army Corps of Engineers		x					x					x	x
U.S. Department of Agriculture	x	x		x	x		x			x		x	x
U.S. Department of Interior	x	x		x	x		x			x		x	x
State and Regional													
California Department of Parks and Recreation	x	x		x	x					x	x	x	x
California Department of Food and Agriculture	x	x	x	x	x	x		x	x	x			x
California Department of Fish and Wildlife	x	x		x	x	x		x	x	x	x	x	x
California Environmental Quality Act	x		x		x					x			
California State Lands Commission	x	x					x						
California Tahoe Conservancy				x			x			x			
Environmental Improvement Program		x					x					x	

Table 1. cont.

	Control	Coordination	Documentation	Education/ outreach	Eradication	Exportation	Financial Assistance	Importation	Possession	Prevention	Quarantine	Research	Technical Assistance
State and Regional cont.													
Lahontan Regional Water Quality Control Board	x	x		x			x			x			
Lake Tahoe Aquatic Invasive Species Coordination Committee	x	x	x	x	x					x		x	x
League to Save Lake Tahoe				x			x			x			
Nevada Department of Wildlife	x			x	x	x		x	x	x	x		x
Nevada Division of State Lands		x					x						
Nevada Division of State Parks		x		x						x			
Tahoe Area Sierra Club Group				x						x			
Tahoe Science Advisory Group		x											
Tahoe Keys Property Owners Association	x												
Tahoe Resource Conservation District	x	x		x	x		x			x			x
Tahoe Regional Planning Agency	x	x	x	x	x		x	x	x	x		x	x
Tahoe Science Consortium		x		x								x	x
University of California, Davis - Tahoe Environmental Research Center	x			x	x					x		x	x
University of Nevada, Reno	x				x					x		x	x

Potential Effects of AIS on the Regional Economy
As the regional economy of Lake Tahoe developed, local concerns grew that the Tahoe Region could become overcrowded and lose its scenic appeal. In 1968, the Tahoe Regional Planning Agency was formed to achieve and maintain defined environmental threshold carrying capacities (thresholds). Significant resources have been channeled into the simultaneous regulation of development while moving toward achievement of thresholds (LTVA 2008). A challenge lies in minimizing adverse impacts of the recreation industry, including introduction of AIS, on the lake's natural environment, which in turn is the major draw for the recreational visitation. Sustainable recreation is vital to the local economy.

In 2011, the Lake Tahoe Region's natural and recreational amenities were estimated to draw between 3 and 5 million visitors annually. The 1999 Lake Tahoe Watershed Assessment reported that visitors spend an average of around $114 dollars per visitor day (Nechodom *et al.* 1999). This spending translates to local employment and income. In addition to supporting local jobs and generating income, the natural beauty and recreational utility at Lake Tahoe is reflected in property values within the region. Shoreline properties, in particular, are especially valuable and sensitive to AIS impacts. The lake also provides drinking water for the residents and thousands of visitors in the region.

Potential Impacts to Water Supply
Some Nevada water suppliers have been granted filtration avoidance status from the NDEP Bureau of Safe Drinking Water (NDEP-BSDW); based on ongoing compliance: source water quality remains within specified required limits for turbidity and coliform and an annual Watershed Control program update (TWSA Annual Report) indicates the watershed is at low risk for pathogens.

Recent efforts to use aquatic herbicides for aquatic weed control are of concern to the water suppliers due to the filtration exemption status of six of the water purveyors in the TWSA. Tahoe's status as an ONRW Tier 3 waterbody warrants special consideration in regulatory review of a potential herbicide application.

The main concern that with regard to water supply is the tendency of Quagga and Zebra mussels (if introduced) is that the mussels biofoul freshwater intake pipes. This invasion not only requires costly maintenance or periodic replacement of pipes, but it can result in the loss of filtration exemption due to the presence of mussels and plants in the water intake systems that raise human health concerns. Plants and invertebrates may colonize in large numbers near intakes, depositing organic contaminants into the water. If water suppliers cannot rely on the water drawn from the lake to be free of microbial contaminants, then further purification infrastructure might be necessary, raising unit costs for suppliers, and ultimately consumers.

The table below provides estimates of the necessary infrastructure spending to maintain current production levels without sacrificing drinking water quality in the event of a serious mussel and plant infestation near, on, or in the intake system. The redundant intake system would allow suppliers to take intakes offline in rotation for cleaning and maintenance without interrupting service. The presence of organic material in supply water can result in taste and odor problems that require another level of purification.

In 1990, $1 million, per million gallons per day (MGD) was estimated in capital costs for design and construction of tertiary treatment. The estimate includes a chlorine injection system to prevent mussels from colonizing the inside of intake pipes. (Source: Pers. Comm. Perri Standish Lee/Black and Veatch)

In total, a conservative infrastructure cost of approximately $25 million could be borne by the region's water suppliers if invasive mussels infest the lake. The low and median estimates are presented in the table below. Operation and maintenance costs will contribute to this total. For example, according to the recommended chlorine levels for injection systems by the U.S. Army Corps of Engineer's Zebra Mussel Chemical Control Guide, Lake Tahoe Region suppliers as a whole will need to use about 147 pounds of liquid chlorine per day, or 27 tons per year (Sprecher and Getsinger 2000). At a price of around $500 per ton (City of Lewisville 2008), water suppliers would need to spend more than $250,000 per year on chlorine alone.

Estimated Water Supply Infrastructure Costs (source: LTAISMP)

Cost Category	$ 2008 Low	$ 2008 Median	Justification
Redundant Intake System	3,100,685	4,429,549	Continued operation while performing maintenance
Taste & Odor Control System	20,326,710	29,038,157	Maintains clean taste and odor
Chlorine Intake Injection System	252,000	360,000	Prevents mussel colonization on inside of intakes
Annual Cleaning & Maintenance	1,219,603	1,742,289	Defoul intake on rotation; regular O&M
Annual Liquid Chlorine Supply	175,000	250,000	One year supply chemical cost
Total	$ 24,898,997	$ 35,819,996	

Lake Tahoe Basin Interagency Dreissenid Mussel Rapid Response Plan
http://tahoercd.org/wp-content/uploads/2014/11/01_Updated_Lake-Tahoe-AIS-Management-Plan_Final_July-2014.pdf
Updated 2014. Interagency Response Plan Practice Exercise conducted Sept. 12 & 13, 2012.

Prepared for the Lake Tahoe Aquatic Invasive Species Coordination Committee by:
U.S. Fish and Wildlife Service. For further information about this Interagency Dreissenid Mussel Rapid Response Plan for the Lake Tahoe Basin, please contact Steve Chilton, U.S. Fish and Wildlife Service (775-589-5265; steve_chilton@fws.gov).

The purpose of this plan is to provide a framework for an effective rapid response to the discovery of any Dreissenid mussel (mussel) aquatic invasive species (AIS) in Lake Tahoe. In this document, "rapid response" means that soon after a detection of a Dreissenid mussel (veliger or adult) in Lake Tahoe is discovered, 1) the responsible agency will make a determination of whether it is potentially significant and/or detrimental and 2) if that is the case, the responsible agency will develop and implement a course of action. This also would apply to mussels that are discovered in an adjacent waterway or lake that ultimately enters Lake Tahoe.

Possible courses of action for newly discovered mussels may include an effort to eradicate the species, control its spread, prevent future introductions, minimize or mitigate the damage it causes or study it further before any other action is taken. Rapid response is the second line of defense after prevention to minimize the negative impacts of AIS on the environment and economy of Lake Tahoe. Once non-native invasive species become widespread, efforts to control them are typically more expensive and less successful than rapid response measures. The damage caused by an AIS that becomes widespread, and

the actions that are taken to control it, may be more harmful to the environment than a successful rapid response.

Rapid Response Procedure

The initial steps in this procedure result in the determination of whether an active response is immediately necessary after a potential mussel detection is reported. If immediate action is necessary, and requires more than simple, highly localized measures, resource management staff may decide to implement an incident command system (ICS) response. A set of criteria will be developed to help in this decision making process. Many of the steps listed below are likely to take place simultaneously or overlap to some degree. Examples of these include outreach, rapid assessment, and containment activities.

In an ICS response, participants are assigned specific roles in a well-defined hierarchical system that can be expanded or collapsed based on the size and complexity of the incident. The ICS was developed to allow staff from different government agencies and organizations to work effectively and efficiently together to respond to a natural disaster. Participants essentially check their individual agency identities at the door and participate as members of the ICS organization, dedicated to responding to a particular incident. The system's success relies on participants understanding their role, a clear chain of command and communication, managers having an appropriate span of control, and a standardized process for identifying and communicating objectives, strategies, tasks and deadlines. Because of its proven effectiveness, the ICS has recently been integrated into the National Incident Management System (NIMS).

CHANGES IN LANDOWNERSHIP, ZONING, OR LAND ACTIVITIES

Commercial Crawfish Harvesting Approved in Nevada and California Tahoe Waters
In December 2011, the Nevada Department of Wildlife and the Nevada Division of State Lands approved for the first time, a commercial fishing operation at Lake Tahoe. This project did not focus on fish extraction, rather it allowed for the first time commercial crawfish harvesting. The project received approval based on support from TERC researchers that it may serve well as a control method on the naturalized invasive species (Signal Crawfish). Harvest operations began in the summer 2012, with the launch of the Tahoe Lobster Company.

In 2013, California removed a prohibition on commercial harvesting.
http://www.tahoedailytribune.com/news/8110033-113/lake-tahoe-crawfish-commercial

Gov. Jerry Brown signed Assembly Bill 165 in 2013, which repealed an existing law that banned the sale or purchase of crawfish taken from Lake Tahoe. Similar to a Nevada law adopted last year, the California law also states that any commercial take of crawfish is for the primary purpose of reducing the population. Before anglers can start trolling the California side of the lake, the Department of Fish and Wildlife regulations that govern the commercial take of crayfish must be re-written. Fred Jackson, owner of Tahoe Lobster Company, the area's most prominent commercial crayfish operation, expects the green light around the spring of 2014. "There's a time lag where they're going to have to re-write all the regulations," Jackson said. "It's the same situation we had with Nevada."

Scientists estimate there are more than 240 million signal crawfish in Lake Tahoe. University of Nevada, Reno (UNR) researcher Sudeep Chandra believes the species is contributing to algae blooms and declining clarity in the lake's near-shore waters. "With the millions and millions of crayfish in Lake Tahoe, a mechanism that increases the demand for anglers and harvesters to take them out is going to benefit the lake," Tahoe Regional Planning Agency (TRPA) spokeswoman Kristi Boosman said.

The California ban dates back to the late 1960s when a Swedish researcher was rumored to have sold nearly 100,000 Lake Tahoe crawfish to his country under the premise of research and re-population. At that time, Sweden's highly prized crawfish population had been decimated by a fungal outbreak. The Lake Tahoe breed was found to be immune to the fungus. In 1970, assembly member Eugene Chappie introduced a bill that would ban the commercial sale of crawfish. Thought to benefit Lake Tahoe, the tiny lobster-like crustaceans were on their way to being protected.

"They're especially valuable in the shallows of Lake Tahoe because they act as a clean-up crew," famed limnologist Charles R. Goldman was quoted saying in a 1978 National Geographic article. "They'll eat harmful algae, dead fish and debris. "I've even seen them dining on a water-logged edition of the San Francisco Chronicle." Chappie's bill passed and the sale of crawfish from the Lake Tahoe Basin was banned, until now.

Since, scientists have changed their view of the invasive species. They have been found to excrete nitrogen and phosphorous and provide invasive warm water fish like the small-mouth bass a food source. Assembly member Beth Gaines, R-Rocklin, introduced AB 165. "There will be many benefits to allowing for commercial fishing of crayfish in the Lake Tahoe region," Gaines said in a statement released at that time. "First, reducing the number of invasive crayfish will help the purity of the lake. Secondly, businesses can benefit by the sale of the crayfish, having a positive impact on the local economy while supporting local products."

Revised Land Management Plan for the Lake Tahoe Basin Management Unit
Forest Plan & Final Environmental Impact Statement (FEIS) - Revised Land and Resource Management Plan, August 2015 for Alpine, El Dorado, and Placer Counties, California and Douglas and Washoe Counties, and Carson City, Nevada
https://fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3844951.pdf
http://www.fs.usda.gov/detail/ltbmu/landmanagement/projects/?cid=fsm9_046482

Introduction to the Land Management Plan - Purpose
The purpose of this Land Management Plan (also known as the Forest Plan) is to provide strategic guidance to the Lake Tahoe Basin Management Unit (LTBMU) for forest management over approximately the next 15 years. This plan guides the restoration or maintenance of the health of the land, to promote a sustainable flow of uses, benefits, products, services, and visitor opportunities. The plan provides a framework for informed decision making, while guiding resource management programs, practices, uses, and projects. It does not include specific project and activity decisions. Those decisions are made separately, after more detailed analysis and public involvement. The Forest Plan is adaptive in that it can be amended when appropriate, to update the management direction based on new knowledge and information. The Forest Plan is strategic in nature and does not attempt to prescribe detailed management direction to cover every possible situation. While all components necessary for resource protection and restoration are included, the plan also provides flexibility needed for the responsible official to respond to uncertain or unknown future events and conditions such as fires, floods, climate change, changing economies, and social changes that may be important to consider at the time decisions are made for projects or activities.

The Lake Tahoe Basin is situated on the eastern side of the Sierra Crest and extends across the state line between California and Nevada. Lake Tahoe is 12 miles wide and 22 miles long, with a maximum depth of 1,645 feet. The lake is fed by 63 streams, but only one stream, the Truckee River, flows out. Elevation ranges from approximately 6,225 feet at lake level to 10,881 feetat Freel Peak. The basin topography is dominated by steep mountainsides with smaller areas of relatively flat land near the lake. The LTBMU was established in 1973, to facilitate consistent management of National Forest System (NFS) lands within the Lake Tahoe Basin watershed. These lands were previously managed by three separate national forests: Tahoe, Eldorado, and Toiyabe.

While the LTBMU is small in comparison to most National Forests, as the Tahoe Basin's largest land manager, its issues, resources and values are (in comparison) very large. The Forest Service manages 78% of all lands in the Lake Tahoe Basin; National Forest ownership in the Lake Tahoe Basin has grown from 35,000 acres in the 1950s to 154,850 acres. NFS lands include 3,366 urban forest parcels on sensitive lands acquired through the Santini-Burton Act.

The Lake Tahoe Basin is a mix of forested landscapes and urban communities surrounding the deep clear waters of Lake Tahoe. The work of the Forest Service is accomplished in conjunction with many partners. Other federal, state, and local agencies, and members of the public, work together with the LTBMU to conserve and restore natural and cultural resources, and enhance the recreational values of Lake Tahoe.

Lake Tahoe is a destination of regional, national and international significance, with over 5.7 million annual visits. Visitors are primarily from California and Nevada (76%), with the remaining 24% from other parts of the United States and abroad. Recreation and sightseeing opportunities are available in a wide range of alpine settings, from highly urbanized to remote Wilderness environments. But while it is possible to find solitude, the LTBMU as a whole is far from isolated –approximately 5 million people live within a 4-hour drive, 25 million live within a 1-day drive, and public air and ground transportation is also available.

The recreation-based economy of the Tahoe Basin relies on the setting of snow-covered mountains, forests, streams, lakes, meadows, wetlands, and beaches managed by the LTBMU. Approximately 56,000 permanent residents choose to live at Tahoe because of the breathtaking scenery and wealth of outdoor recreation opportunities. The LTBMU contributes to the tourist-based economy through provision of recreation opportunities including downhill skiing, cross-country/backcountry skiing, snowshoeing, hiking, beach access, camping, and sightseeing. Ongoing conservation education programs inform residents and visitors of all ages about the natural environment in which they live, work, and play. Partnerships continue to be important. Numerous groups provide their assistance in such activities as trail maintenance and construction, historic building maintenance, and interpretive programs. Many of the resorts, campgrounds, and the Tallac Historic Site are operated by private enterprises under special use permits –these partnerships support the local economy by providing jobs.

Natural values and benefits provided by the lands and waters under LTBMU management include clean water that flows to Lake Tahoe, clean fresh air, and habitat for a multitude of plant and animal species. Although extensive timber harvest, stream channel alteration, and other land uses in the late 19thand early 20thcenturies disturbed the natural balance of the Tahoe Basin, much restoration work has already been accomplished. Nonetheless, most of our natural resource management activities focus on restoring and enhancing forest health, watershed processes and water quality, and a diversity of wildlife habitats, as well as providing community wildfire protection. Restoring the balance of natural systems will help them adjust more easily to a changing climate. Management activities are undertaken to benefit both humans and the many other species that share these mountains. Many common forest activities such as mining, grazing, and timber harvesting are either not a part of LTBMU management or play a small role.

Over 75% of the area around Lake Tahoe is public land managed by the United States Department of Agriculture (USDA) Forest Service. Totaling over 150,000 acres, this land includes beaches, hiking and biking trails, wilderness areas, historic estates and developed recreation areas such as campgrounds and day use areas. The forest is managed to provide access for the public and to protect the natural resources of the area. The Forest Service manages the land in the Lake Tahoe Basin as a unique kind of National Forest, called the Lake Tahoe Basin Management Unit, or LTBMU for short.

The LTBMU is managed in many ways like other National Forests, but because of the needs of the lake and the relationship it has with the forests that surround it, the LTBMU has special focus areas, including:

- Erosion Control Management
- Watershed Restoration
- Fire and Fuels Management
- Forest Management
- Recreation Management

In many ways, the LTBMU can be described as a Restoration Forest, because of the strong ecosystem restoration roles.

National Forest Lands at Lake Tahoe
Through acquisition and land exchanges since the 1950s, National Forest land ownership has grown from 35,000 acres to 154,830 acres, including 3,366 Santini-Burton parcels.

Approximate land ownership in the Lake Tahoe Basin is:

- **National Forest 75%**
- **States and Local Government 10%**
- **Private 15%**

Since 1997, more than 3,064 acres have been acquired by state and federal agencies. Significant acquisitions during this period include more than 300 acres and 2,600 feet of lakefront at the Upper Truckee Marsh, nearly 1,800 acres associated with High Meadows and recently the additional 777 acreage surrounding Incline Lake in Nevada.The majority of National Forest lands encompass most of the non-urban wetlands, meadows and Stream Environment Zones (SEZ); important fish and wildlife habitat; and the available open space for recreation and environmental interpretation opportunities.

2018 Johnson Meadow Acquisition

Partner: Tahoe Resource Conservation District; California Tahoe Conservancy, California Department of Fish & Wildlife, Barton Health, Heavenly Resort
Total Project Cost: $8,315,000
Tahoe Fund Contribution: $100,000

Johnson Meadow, 206 acres of beautiful meadow in South Lake Tahoe and the largest privately-owned section of the Upper Truckee River, is now publicly owned. This is a major milestone for the health of Lake Tahoe. The Upper Truckee River has been identified as the most impaired watershed in the Tahoe Basin and the highest contributor of fine sediment impacting the clarity of the Lake.

The river discharges about 2,200 metric tons of fine sediment per year and delivers approximately 60 percent of the fine sediment that enters Lake Tahoe annually from stream erosion.

Acquisition of this property will allow for future restoration of the river that will have a dramatic impact on the Lake's famed clarity. The acquisition will also improve wildlife habitat, climate change resiliency and recreation connectivity. The purchase of the 206-acre property was made possible through a collaboration between Tahoe Resource Conservation District, the California Tahoe Conservancy, California Department of Fish & Wildlife, Tahoe Fund, and the former property owners, who owned Johnson Meadow for almost a century.

Over the next several years, the Tahoe RCD and their partners will need to identify $10-15 million in funding to begin restoration efforts for Johnson Meadow and $60 million for the entire Upper Truckee River Watershed. The campaign to acquire Johnson Meadow was made possible by the generous support of Barton Health and the dollar donations collected at Heavenly Ski Resort. These private donations of $50,000 each were used to secure more than $8 million in public funds through Prop 1 funding.

(Editor Note: TWSA sponsored 8 dog waste bag stations for this property, in partnership with Tahoe RCD.)

2008 Purchase of Incline Lake, Nevada

In July 2008, 777 acres around Incline Lake was removed from private land holding and seasonal occupancy, by purchase through the National Forest Service with funds from the Southern Nevada Public Lands Management Act (SNPLMA). The property is a significant watershed resource, a prime recreational resource for the surrounding communities and visitors to the Lake Tahoe region, and host to a variety of plants and wildlife. The property represents approximately 25% of the watershed for Third Creek, a significant source of water for Lake Tahoe, and is located within IVGID's boundaries. The land is adjacent to the Tahoe Meadows and the Mt. Rose Wilderness on Highway 431 outside Reno, NV. Purchase of this area provides significant watershed protection for the Incline Village GID. Incline Lake was drained in 2008 with the removal of the man-made earthen dam which created the lake, from safety concerns.

2018 Update: The USDA Forest Service Lake Tahoe Basin Management Unit (LTBMU) has issued a draft decision for management of 1,083 acres of National Forest System lands off the Mt. Rose Highway (SR 431) above Incline Village, Nev. The draft decision incorporates Alternative 2 - "The Incline Plan is a huge step toward improving National Forest recreation opportunities and public access on the North Shore of Lake Tahoe," said Jeff Marsolais, LTBMU Forest Supervisor, in a press release. "I am confident this plan provides for restoration of this important ecosystem as well as sustainable recreational benefits for current and futures generations in the Incline area."

Project-specific activities in the draft decision includes a series of management actions related to roads and trails projects, hydrology and habitat restoration and vegetation management activities. The project also proposes a Forest Plan amendment to modify a portion of the project area from a general conservation management area to a back-country management area.

Project-specific roads and trails proposals include adopting and rerouting of existing trails; replacing and/or upgrading road and trail stream crossings; installing Best Management Practices (BMPs), interpretive and wayfinding signs; creating a new trail near the former Incline Lake bed and resource protection barriers.

Restoration activities would include: removing the dam diversion ditch that connects Third Creek to the former Incline Lake bed; restoring stream channels and aquatic species habitat throughout the area; revegetating degraded areas with native vegetation species; restoring damaged wetlands, which resulted from previous water diversion activities; repairing erosion along the Franktown Ditch; developing a plan for future white bark pine management; and reducing tree density in meadow and wetland areas through forest thinning and restoration of aspen communities.

The purpose of the Forest Plan amendment is to change the management area designation of approximately 400 acres of the project area (west of Third Creek) from general conservation (general forest) to back country.

The draft Decision Notice/Finding of No Significant Impact is available at *fs.usda.gov/goto/ltbmu/InclineMgmt*.

Historical Activity
Public acquisition and restoration of sensitive lands directly support achievement of all nine environmental thresholds. Since 1982, USFS, California Tahoe Conservancy, and Nevada Division of State Lands acquisition programs have acquired and protected more than 20,000 acres of sensitive lands, comprised of more than 10,000 subdivided lots.

Program Highlights:
• Reduced the development potential within the Lake Tahoe Basin by approximately 20 percent.
• Protected thousands of acres of wetlands, meadows, and steep slopes prone to erosion.
• Protected miles of rivers and streams.
• Provided a land base for stormwater quality projects to achieve further water quality improvement.
• Protected valuable soil, vegetation, wildlife, and fisheries resources from further degradation.
• Enhanced public ownership and access to Lake shoreline.
• Protected and enhanced scenic resources.
• Improved air quality by retaining vegetation.
• Reduced vehicle miles traveled associated with residential and commercial development.

By acquiring many of the sensitive lands adjacent to rivers, creeks, meadows, and the lake, public agencies have protected and preserved the integrity of cultural and historic resources of the indigenous people who occupied the Tahoe Basin in years past.

BASIN MONITORING PROGRAMS
More information also available in the "Controls" section of this report.

The Tahoe Science Consortium (TSC)
http://tahoescience.org

Lake Tahoe is a renowned area for scientific study. In 1999, three Tahoe research groups, the University of California-Davis, University of Nevada Reno, and the Desert Research Institute, signed the Tahoe Environmental Science System (TESS), a plan for scientific cooperation in the Basin. During the same year the Lake Tahoe Science Advisory Group was established. Other local projects include volunteer-based monitoring programs and studies on the affects of recreation on water quality.

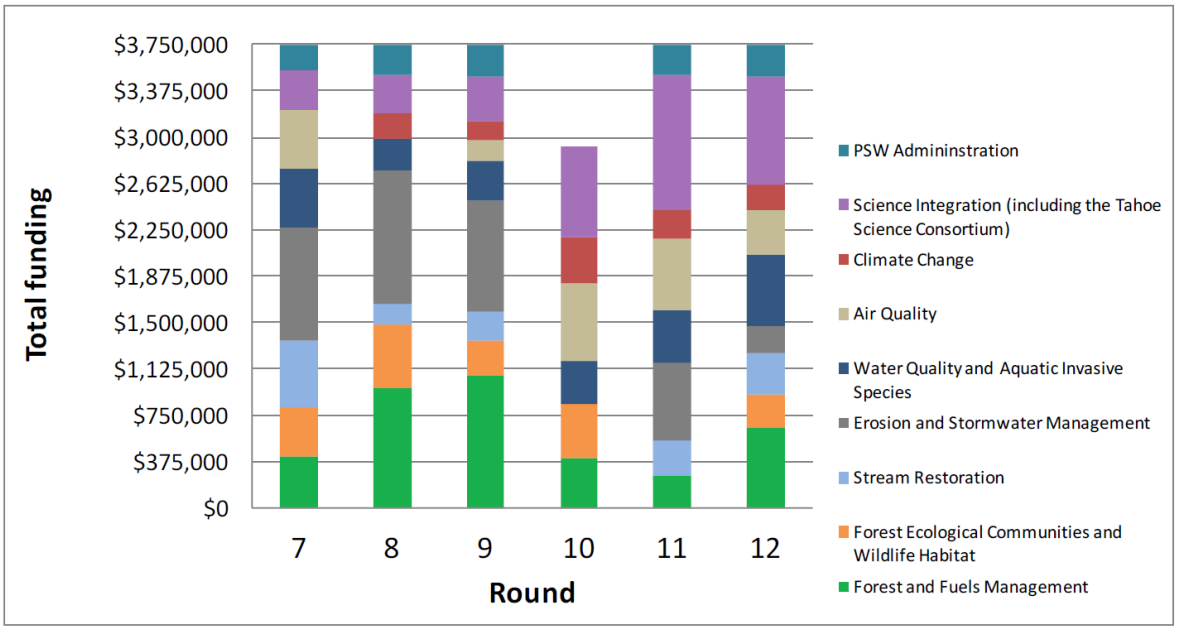
The Tahoe Science Consortium (TSC) includes representatives from the Desert Research Institute, University of Nevada Reno, University of California, Davis, Tahoe Regional Planning Agency, the U.S. Geological Survey, and the U.S. Forest Service. In 2001, the Lake Tahoe Science Advisory Group identified key research and monitoring needs for the Lake Tahoe Basin. In coordination with local non-profits, the Tahoe Regional Planning Agency and Lahontan Regional Water Quality Board host collaborative monthly meetings and an annual forum to disseminate scientific information. The Tahoe Regional Planning Agency has completing an online database, the Tahoe Integrated Information Management System (TIIMS), to organize basin research projects.

The most recent report of research, the "*2015 Tahoe Summit Report"* is available for download at the TSC website.

The TSC provides recommendations for the funding of public projects funded by the Southern Nevada Public lands Management Act (SNPLMA). A searchable database of the many projects funded at Tahoe is available at: *http://www.blm.gov/nv/st/en/snplma/snplma_prephase_1.html*

SNPLMA SCIENCE INVESTMENTS (2007- 2012)
http://tahoescience.org/wp-content/uploads/2016/07/TSC-Exec-Summary-Web.pdf

The portfolio of projects supported through the SNPLMA Science Program are illustrated below in the Tables below. A total of 100 projects (95 research and 5 TSC operations) projects were funded in SNPLMA Rounds 7-12. The TSC SNPLMA Science Program was as an integral part of the basin-wide Environmental Improvement Program (EIP), led by management Agency executives from federal, state, and bi-state agencies.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Round
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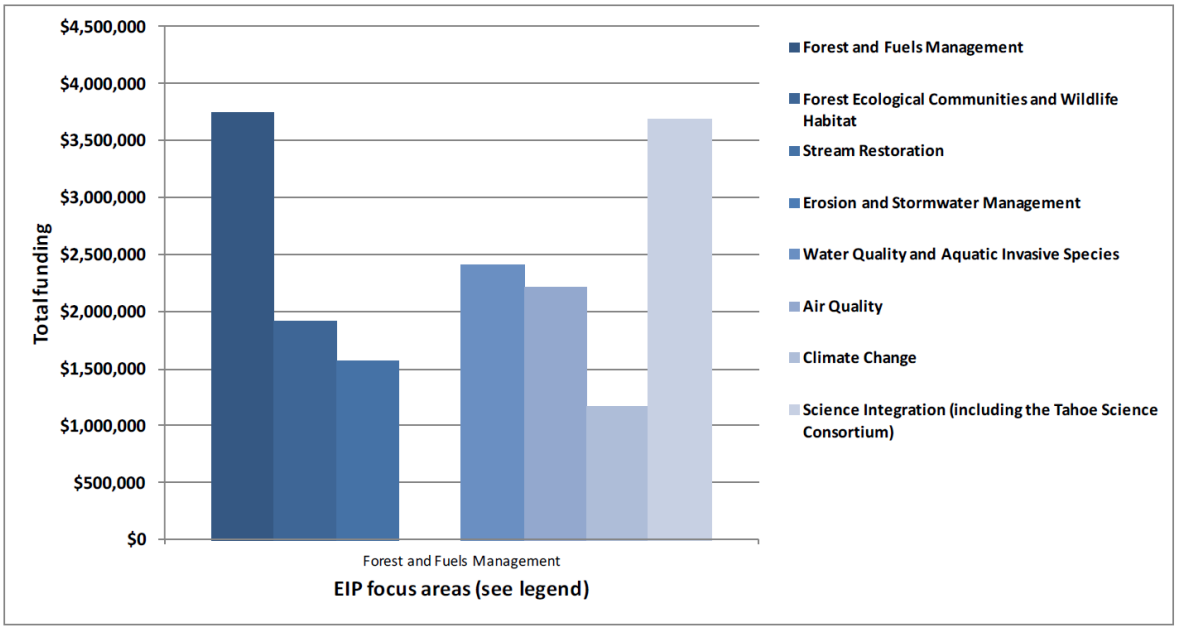
Science Integration (including the Tahoe Science Consortium)
Climate Change
Air Quality
Water Quality and Aquatic Invasive Species
Erosion and Stormwater Management
Stream Restoration
Forest Ecological Communities and Wildlife Habitat
Forest and Fuels Management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Total funding
Forest and Fuels Management
EIP focus areas (see legend)
Forest and Fuels Management
Forest Ecological Communities and Wildlife Habitat
Stream Restoration
Erosion and Stormwater Management
Water Quality and Aquatic Invasive Species
Air Quality
Climate Change
Science Integration (including the Tahoe Science Consortium)

Tahoe Science Conferences
http://tahoescience.org/events/conferences
September 21-23, 2015 - "Tahoe Science in a Changing Climate"

SESSION DESCRIPTIONS:

Real-world Applications of Remote Sensing, Data Visualization and GIS – a Workshop on Data, Platforms, and Analysis Techniques for Natural Resource Management Professionals
Remote sensing, from satellite, aircraft and unmanned aircraft systems (drones), provides a wealth of information from which to monitor and assess features on the Earth's surface. However, use of remote sensing data can be challenging for most natural resource managers. The objective of the Real-world Applications of Remote Sensing, Data Visualization and GIS Workshop is to provide a forum for natural resources professionals looking to enhance their understanding of remote sensing data, data collection platforms and data analysis techniques. The workshop will include lecture formatted presentations of current research that utilizes remote sensing data and technologies, along with helpful information on accessing remote sensing data, using analysis software tools and an overview of different platforms used to collect remote sensing data.

Air Quality in the Tahoe Basin and Sierra Nevada: Implications for People and Ecosystems
At this session the following issues will be discussed: spatial and temporal trends of air pollution distribution; pollution exposure regimes; long-range transport of pollutants; air pollution modeling in complex terrain; impacts of wildland fires on air quality; compliance with the National and California Ambient Air Quality Standards (NAAQS); atmospheric deposition and impacts on terrestrial ecosystems; suggestions for air quality control measures at the local scale of the Lake Tahoe Basin and regional scale of the Sierra Nevada Mountains. Focus of this session will be on the recent Tahoe Basin research findings in the context of the larger Sierra Nevada range. After a brief introduction by the Session co-chairs, an overview of key air quality issues in the western United States will be presented by our invited speaker (Prof. Dan Jaffe). It will be followed by 4 talks on distribution and formation of ozone and secondary organic aerosols in the Lake Tahoe Basin (Burley et al., Rayne et al., Preisler et al., Zielinska et al.). Information on background levels of health and ecologically important inorganic air pollutants collected at high elevation transects across the Sierra Nevada and White Mountains will be presented (Bytnerowicz et al.). It will be followed by discussion of impacts of the 2013 Rim Fire on ambient particulate matter air quality in Sierra Nevada and the state of Nevada (Cisneros et al.). The last talk will present models diagnosing and predicting impacts of the 2013 California wildfires on air quality in the Lake Tahoe Basin and Reno (Mejia and McCord).

Lessons in Paleoclimates from Sierra Nevada to the Great Basin
Understanding historical climate trends, spatial patterns and variability can provide information on the range of potential changes that may occur in the future. This session presents studies from the Sierra Nevada and the Great Basin that examine conditions and responses to past climate regimes ranging over time scales from the Pleistocene to the recent Holocene.

Extreme Tahoe—Droughts, Floods and other Natural Experiments
This session will address climatic forces that bring major droughts, storms and floods to the Tahoe basin and Sierra Nevada more generally, along with landscape and societal responses, historically and in the projected climates of the future. We will present recent research about the mechanisms of drought and storm, about meadow and forest responses to droughts, and about societal vulnerabilities in the region to epic winter storms. We will also present some new data systems and sources, specifically tuned to analysis, preparations, and planning for extreme weather and climate events in the Tahoe area.

New Goals, New Science: The Future of Environmental Restoration in the Lake Tahoe Basin
Over the last twenty years of the Environmental Improvement Program, a tremendous amount of work has been done to restore and protect the natural environment. As we move into the future, new priorities and concepts in environmental improvement are beginning to emerge. This interactive session will include a panel of both scientists and managers that will touch on how science has informed management thus far and what new science managers may need going forward. How will new concepts and trends such as the valuation of ecosystem services, the changing economic landscape, and the new direction of the Regional Plan affect our science and management needs? The panel will be looking for feedback from and interaction with the audience on these important questions.

Monitoring for Extremes
Americans are more at risk from natural hazards now than at any other time in our Nation's history. In the United States each year, natural hazards are the cause of hundreds of deaths and cost tens of billions of dollars in disaster aid, disruption of commerce, and destruction of homes, critical infrastructure and the environment. The stresses of climate change are projected to exacerbate these threats. To improve resilience, actions must be guided by the best information about hazards, risk, and the cost-effectiveness of monitoring and mitigation technologies. The session will focus on four efforts to provide such information.

Forest Ecology and the Role of Fire
This session will report on new research findings, management applications, and future challenges in managing forest ecosystems in the Lake Tahoe basin for long-term resilience. The session is organized into two segments: 1) how fire has shaped forests and how to shape forests to be resilient to future change and disturbance; and 2) how to manage forests to maintain native species and communities and the vital role that biodiversity plays in forest resilience.

A Tahoe Without Snow? Predicting and Adapting to Less Snow in the Tahoe Basin
Snow is an important resource for the Lake Tahoe Basin. It supports streamflow and groundwater, is critical to forest health, and provides significant economic benefit through recreation. However, meteorological drought and regional warming threaten the area with earlier and smaller snow melts. This session will explore both the snowpack observations and the consequences of changing precipitation and snowmelt patterns. In particular, we are interested in better understanding how water availability for people and ecosystems has responded to the recent drought and identify ways to build resiliency into these systems under expected changes in snowpack regimes over the 21st century.

Protecting Lake Tahoe: Aquatic Ecosystem Science Informing Management Decisions
Lake Tahoe is renowned for its pristine cobalt waters and impressive clarity. Protecting this outstanding national resource has been the focus of federal, state and local entities for over half a century. To effectively manage natural and anthropogenic influences, it is imperative that there is a current understanding of the interaction between chemical, physical and ecological processes. Management decisions must be adaptable and updated to include best available science and knowledge. In this session, we will hear some of the latest science on Tahoe's nearshore, water clarity, and nutrient and sediment conditions. We will then hear how agencies are incorporating new science into management decisions.

Partners

- Desert Research Institute (DRI)
- Tahoe Environmental Research Center-UCDavis
- University of Nevada, Reno

- USDA Pacific Southwest Research Station
- USGS

May 2012 Conference
http://tahoescience.org/events/conferences
The Tahoe Science Consortium and Sierra Nevada College hosted over 250 attendees for 3 days at the 2012 Tahoe Science Conference. The theme of the 2012 Tahoe Science Conference was "Environmental Restoration in a Changing Climate." Lake Tahoe and many other high alpine lakes around the world are being increasingly stressed by climatic changes and urban development. Compounding these factors are economic stresses on government agencies, local communities, the environmental community and the public. The 2012 Tahoe Science Conference provided a forum for creative dialogue among scientists, artists, environmental managers, public officials, and the general public about how to protect high alpine ecosystems under changing environmental and social climates. The conference was organized on three Tracks: Science, Management, & Visualization.

Tahoe Environmental Research Center (TERC) Deploys Autonomous Underwater Vehicle
TERC began a lake-wide experiment in August, 2009. In collaboration with the University of British Columbia and the University of Nevada Reno, TERC researchers deployed an autonomous underwater vehicle (AUV) in Lake Tahoe. This project was funded by the Lahontan Regional Water Quality Control Board and the Nevada Division of State Lands License Plate Funds. The AUV, known as Gavia, resembles a torpedo but is equipped with a broad suite of scientific instruments. These include high resolution cameras, side scan sonar, fluorometers for detecting algal chlorophyll and colored dissolved organic material (CDOM), water temperature and conductivity, and water current velocity. The Gavia is programmed ahead of time to tell it what course to follow, what depth to dive to and how far off the bottom to cruise.

In 2009-2010 the Gavia performed a complete circumnavigation of the lake at a depth of about 18 feet. This is the depth at which the heaviest concentrations of Asian clams have been found to date. There were also lateral transects conducted to depths of 300 feet at various locations where the clams were observed. Along the way the Gavia took high resolution images of the lake bottom four times every second, as well as measured other water quality parameters such as temperature, conductivity, turbidity, chlorophyll and CDOM. These data help rapidly guide researchers to find new areas of the lake that are impacted by invasive clams.

Researchers from TERC and UNR will test the Gavia observations using SCUBA survey and benthic sediment grab collections during the fall 2009 and winter 2010. The many thousands of high resolution images taken by Gavia require extensive, post-processing before the data can be evaluated.

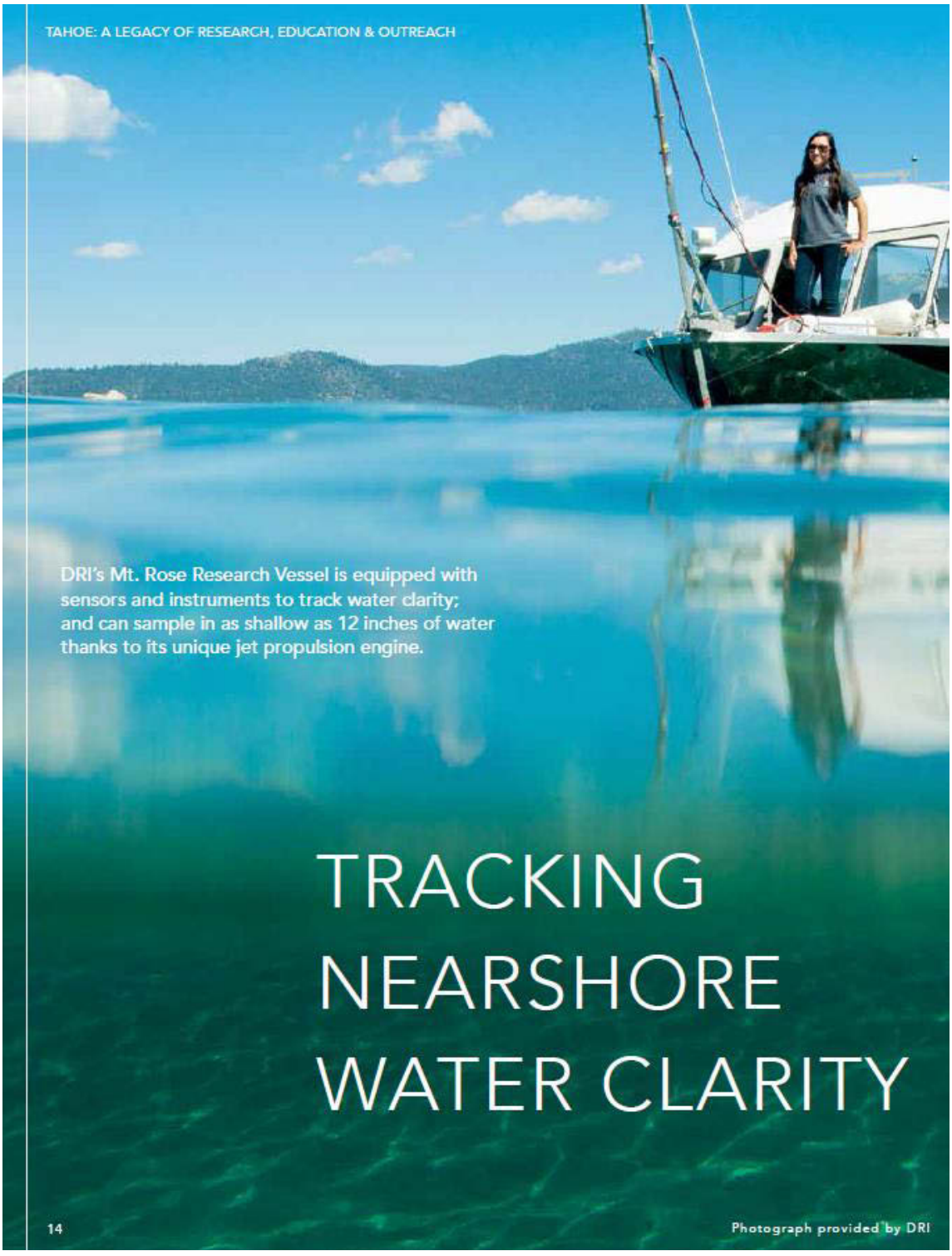
Nevada Researchers Collaborate to Preserve Lake Tahoe
http://newsroom.unr.edu/2013/08/14/nevada-researchers-collaborate-to-preserve-lake-tahoe/

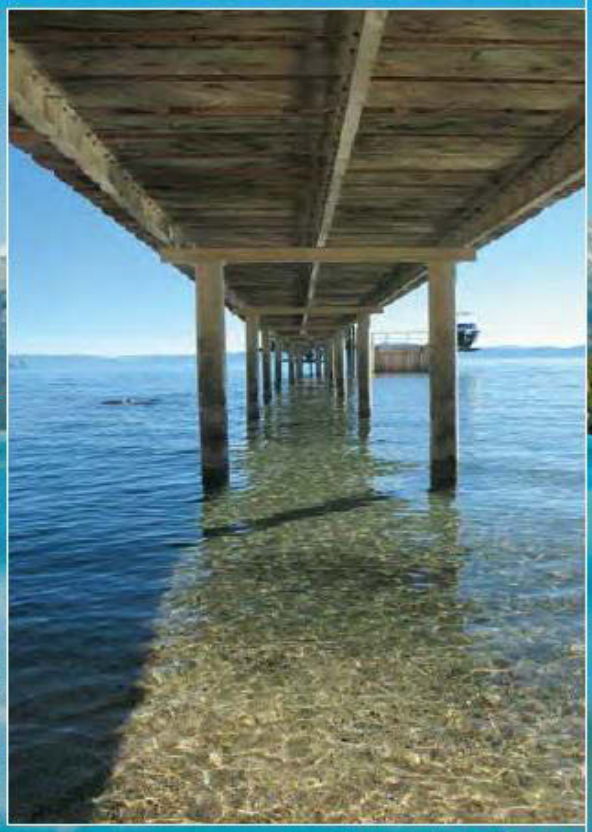
From Tahoe's mountaintops to the lake's sandy bottom, scientists from the University of Nevada, Reno continue to study and find solutions to the breadth of issues that face the entire Lake Tahoe Basin. Their research is making a tangible contribution to the decisions, policies and practices that guide the basin's environmental health.

University of Nevada, Reno researcher, center, scoops invasive fish from the Lake Tahoe Keys in a pilot project to determine the effectiveness of mechanical removal methods for management of non-native fish and the restoration of native fish in Lake Tahoe. Her project, based in the University's Aquatic Ecosystems Analysis Laboratory, received international attention when her team, including personnel from the California Department of Fish and Wildlife, found a monster goldfish in the Tahoe Keys while electrofishing. Photo by Mike Wolterbeek.

From the first rustic snow survey by a University professor in 1906 – an advancement still in use today – to the latest technology using sonar and rocket guidance systems, University scientists continue to take the pulse of Tahoe's climate and environment. "While clarity is improving in the offshore this year, things are not as positive on the nearshore, which is where most of the public engages the lake," Sudeep Chandra, University of Nevada, Reno researcher and long-time limnologist at Lake Tahoe, said. Chandra, director of the University's Aquatic Ecosystems Analysis Laboratory, is collaborating with other scientists to study the nearshore – among other issues – and how ultraviolet light levels, which are affected by particulates, help invasive species to thrive and cause native species to decline. Working in collaboration with other research institutions and management agencies, the University's scientists have taken an expansive view of the lake and its environs. Their research on the lake is extensive; they have looked at the Basin as a whole to learn how its health relates to the clarity and health of the water.

Current Tahoe Research Projects (excerpts from the "2015 Tahoe Summit Report")
http://environment.unr.edu/academy/downloads/TahoeSummit15-web.pdf





Photographs by E.S. Levy

Efforts to implement new integrated monitoring program underway

by Justin Broglio

Nearshore conditions at Lake Tahoe have been changing over recent years, with the appearance of aquatic invasive species, increasing periphyton (attached algae) and decreasing water clarity becoming more evident to both visitors and residents of the Tahoe Basin.

Since the completion of the Lake Tahoe Nearshore Evaluation and Monitoring Framework—a project funded during Round 10 of the Southern Nevada Public Land Management Act in 2010 and presented to the USDA Forest Service in 2013—scientists and technical advisors from the Desert Research Institute, the University of Nevada, Reno and the University of California, Davis - Tahoe Environmental Research Center have been working together to develop and implement a finer scale of evaluation and monitoring necessary in this unique zone of Lake Tahoe.

As part of this integrated monitoring program, DRI researchers are now utilizing their unique, nearshore research vessel to track nearshore water clarity characteristics around Lake Tahoe through an initial nearshore monitoring and evaluation grant funded by the Nevada Division of State Lands, through their Lake Tahoe License Plate program.

DRI's 21-foot jet boat, the Research Vessel (R/V) Mt. Rose, operates without a propeller and can continuously sample important nearshore characteristics in the shallow areas of the lake. The R.V. Mt. Rose is an ideal platform for studying changes in water clarity in these highly

continued...

visible and trafficked areas of Lake Tahoe. The R/V Mt. Rose is equipped with sensors that assess water quality conditions, including turbidity, transmissivity, and chlorophyll. A customized system is used for navigation and the real-time display of sensor data.

Further, DRI scientists are also working with the Tahoe Resource Conservation District to quantify changing patterns of urban storm water runoff around Lake Tahoe.

"These are only the first steps of many needed to rehabilitate and sustain this complex area of the lake," said Alan Heyvaert, Ph.D., principal investigator on the multi-year project and acting senior director of the Center for Watersheds and Environmental Sustainability at DRI.

"Water clarity concern for deeper parts of the lake has driven a lot of the action and a lot of the success over the last several decades to preserve and restore Lake Tahoe," he added. "As mid-lake conditions begin to stabilize or improve, more of the focus and support will shift to a new monitoring strategy that is intended to help resource managers track the most meaningful physical, chemical, and biological indicators of healthy nearshore conditions."

The nearshore zone is where many visitors and local residents interact directly with the lake and is valued for its recreational and aesthetic qualities, as well as for the unique biological community it supports. It is also the zone where pollutants from the surrounding watershed are more concentrated and where people are most likely to notice such ecological changes as reduced water clarity and especially the nuisance blooms of attached algae found on rocks and other hard surfaces.

The nearshore environment is inherently more complex, since it is immediately adjacent to stormwater flows and runoff from the developed and undeveloped

Photographs provided by DRI

portions of the surrounding watershed.

While the Lake's mid-lake clarity is expected to continue to improve from implementation of watershed best management practices, environmental improvement projects, and other actions, the monitoring and evaluation of nearshore conditions will be needed to fully understand why this part of the lake has deteriorated and what strategies are the most effective to address the problem.

"The introduction of aquatic invasive species has already produced some profound changes in the nearshore," said Sudeep Chandra, limnologist and director of University of Nevada Reno's Aquatic Ecosystems Analysis Laboratory. "Further establishment of aquatic invasive species in the nearshore has the potential to unravel the tremendous progress made toward protecting Lake Tahoe's clarity."

Chandra added that very little data currently exist on the nearshore community structure.

"We do not know the composition, distribution or abundance of most macro-organisms that inhabit the nearshore," he said. "Base data are urgently needed to describe these conditions before they change any further."

"The introduction of aquatic invasive species has already produced some profound changes in the nearshore."

Photographs by Shelbi Whitehead

1916 Lake Tahoe

Shoreline Survey Rephotography

Photograph by Herford Tynes Cowling, Small bluff to the east of the Upper Truckee Marsh, 1916, Water Elevation 6229.80'

Photograph by Peter Goin, Small bluff to the east of the Upper Truckee Marsh, 2013, Water Elevation 6225.9'

by Kelsey Fitzgerald and Peter Goin

Of the dramatic mountain lake environments in the world, the Lake Tahoe basin—split between Nevada and California—has the greatest innate draw. A destination for excursion-goers and vacationers since the 1870s, Tahoe now is a mecca of sorts for retirement tax havens, second homes, skiing, summer visits, and spirited gambling. The Tahoe Basin's beauty rivals such glacial-origin waters as Lake Como or Canada's Lake Louise, but Tahoe is more than water, villas, ski runs, and tough forest management decisions; it's an ecosystem where the visual history precedes scientific study by more than 60 years.

In 1916, long before most scientific monitoring in the Tahoe Basin began, a photographer named H.T. Cowling

Photograph by Herford Tynes Cowling Small bluff to the east of the Upper Truckee Marsh, 1916, Water Elevation 6229.80'

Photograph by Peter Goin, Small bluff to the east of the Upper Truckee Marsh, 2013, Water Elevation 6225.9'

documented conditions along the Lake Tahoe's California shoreline in a set of 151 photographs. Almost a century later, Peter Goin and Scott Hinton from the University of Nevada, Reno, are working to locate and photograph Tahoe's shoreline from the same viewpoints.

Cowling's original photographs were taken a few years after the construction of the 1913 Lake Tahoe Dam, which added water storage capacity to Lake Tahoe by raising the maximum surface elevation from 6223 feet (the lake's natural rim) to 6229.1 feet. "Property owners around Lake Tahoe were concerned about losing property to the higher water," Hinton explained. "The Bureau of Reclamation put together a survey, and in 1916 they went around Lake Tahoe and made photographs from different property owners' shorelines."

Over time, the higher water level made possible by the Lake Tahoe Dam changed people's perceptions of what was "normal". Goin and Hinton's work documents landscape change, and helps put the change into context.

"It is important to note that the water level in the 1916 Shoreline Survey was at 6,229.98 feet, nearly a foot above the current legal limit of 6,229.1 feet," Hinton said. "Because of the drought, the lake level is now a little bit below the natural rim. It's fascinating seeing where the lake was, and how the varying lake level changes people's perception of what is the natural look of Lake Tahoe."

Photograph by Herford Tynes Cowling, Rubicon Bay, 1916, Water Elevation 6229.80'

Photograph by Scott Hinton, Rubicon Bay, 2015, Water Elevation 6,222.91'

Photograph by Herford Tynes Cowling, Emerald Bay, 1916, Water Elevation 6229.80'

Photograph by Peter Goin, Emerald Bay, 2014, Water Elevation 6223.98'

2014 Tahoe Research Projects (excerpts from the "2014 Tahoe Summit Report")
https://tahoe.blogs.unr.edu/publication

Sudeep Chandra

New technology that revolutionized boat inspections could reduce invasive species

By Guia Del Prado

Top photograph by Krissy Clark
Bottom photograph by Scott Hinton

Every boat entering Lake Tahoe risks bringing invasive species such as mollusks, mussels or algae from other lakes. University of Nevada, Reno researcher Sudeep Chandra has been developing private-public partnerships to create low-cost, innovative solutions to protect the lake from invasive species. In collaboration with the boating industry and government agencies, Chandra has now designed an affordable and simple ballast filtration device to prevent invasive species from attaching to boats and invading Lake Tahoe.

Invasive species of aquatic wildlife can remain in boats' water holding tanks called ballasts, taking a free ride to Lake Tahoe from other infected water bodies like Lake Mead or the Sacramento Delta.

"The major vectors bringing species to Lake Tahoe is through boating," Chandra said. "They attach to the boats, get transported within the boat ballast, and are introduced to the lake when the boat ballast is evacuated. Once established, invasive species can result in the decline of the lake's clarity or native biology."

Chandra is hoping the ballast filtration system his team developed with private entrepreneurs from WakeWorX and the Watersports Industry Association (WSIA) will prevent foreign species from entering the lake.

The device filters ballast water, which continually moves through the ballast tank at the bottom of the boat's hull to cool the motor and balance the boat. After a series of simulated experiments, Chandra and his colleagues realized they might have a hit on their hands. For between $50 to $100, the device could filter out both large and small invasive species with high success rates.

"By using the filtration system, we can prevent 97 to 99 percent of small species such as the quagga mussel," Chandra said. "For larger species of organisms, it can keep 92 to 95 percent out of the boat's ballast water using this filtration system."

The filtration system received a positive response at a February WSIA boating conference in Colorado. The WSIA includes boating industry representatives like Mastercraft, a major boating manufacturer. The Tahoe Regional Planning Agency is also looking into adopting the technology for widespread recreational use through collaborations with private industry.

The new technology would improve the mandatory decontamination process in place for keeping invasive aquatic species out of Lake Tahoe. Currently, inspectors search the boats' hulls for plant fragments or shells. Then the boats are cleaned. Previous research done in the midwest concluded that visual inspections and cleaning had a greater than 90 percent effectiveness in reducing invasive species. But some species, such as plankton and mussel larvae veligers, are microscopic.

"You can't see them so filtration is a better way to keep them out," Chandra said. "Inspections are only as good as the people driving them."

No new major invasive species have been spotted in Lake Tahoe in the last few years, Chandra said. But if invasive species like quagga or zebra mussels do arrive in Lake Tahoe, they have the potential to be very destructive. In the last 50 years, at least four species found only at the bottom of Lake Tahoe have declined dramatically because of invasive species. The filter would also work both ways, preventing invasive species already in Lake Tahoe such as the Eurasian water milfoil and Asian clams from moving to other lakes and waterways.

Tourism and recreation remain the mainstays of the Tahoe Basin's economy. Chandra, who has been doing research as a limnologist at Lake Tahoe since 1997, hopes the new ballast filter will help to minimize the recreational boater's impact on the lake.

"Humans continue to affect the ecosystem by moving species from lake to lake through boating," he said. "What this does is to allow recreational boating to continue and minimize the movement of invasive species between water bodies through boating. It also allows scientists, managers and private industry to work together to develop innovative, cost-effective solutions for protecting water bodies from invasive species introductions."

Kumud Acharya

Can quagga mussel populations establish in Lake Tahoe?

By Justin Broglio

Quagga mussel populations are establishing with alarming rates in Lake Mead and throughout the Colorado River Aqueduct, one of the primary sources of drinking water for Southern California. This invasion is already having profound ecological and economic impacts on the Lake Mead watershed and the surrounding communities, including Las Vegas.

Currently, the scientific community and local Tahoe Basin agency managers are working to fully understand habitat suitability of Lake Tahoe and its watershed to support the establishment of quagga mussels. When quagga mussels establish themselves, they can dominate and alter the ecology of lakes. Survival from the veliger (larval) stage to adult stage is key in the establishment of mussels in any water body.

"There is an urgent need to finalize answers to the question of whether quagga could be established with reproductively viable populations that increase over time," said Kumud Acharya, a Desert Research Institute (DRI) associate research professor who has worked in Southern Nevada for the last eight years studying the lifecycles and ecological impacts of the quagga mussel.

"This is a particularly critical question given the more strict control and management strategies that have been adopted by the Tahoe Regional Planning Agency," added Acharya. "This is important, particularly with respect to boat inspection and washing programs at the lake. Decisions related to future investments in costly inspection activities would clearly benefit from a better understanding as to whether quagga can survive and reproduce in Lake Tahoe."

Recent findings from other Western aquatic ecosystems indicate that the survival of the quagga mussel can occur under variable and lower calcium concentrations than previously reported. While Lake Tahoe has been categorized as "low risk" for quagga mussel establishment based solely on its low dissolved calcium, preliminary findings from a joint pilot study lead by Acharya and Sudeep Chandra from the University of Nevada, Reno indicate that short-term adult and juvenile quagga survival may be possible in Lake Tahoe where calcium concentration is higher due to the presence of Asian clams and other reasons.

There is an urgent need to develop a complete risk analysis based on early and late stage life histories of quagga and a basic predictive model for describing the locations of mussels in Lake Tahoe's nearshore region.

Lake managers are seeking information to determine just how strict boat inspections and policies need to be to prevent invasion of quagga mussel to the basin. Thus, additional research proposed by UNR and DRI could provide information that will help fill in critical knowledge gaps.

Top photograph by Courtney Spangler
Bottom photograph by Scott Hinton

Photographs by Audrey Dempsey

Nina Oakley

Assembling Tahoe's public climate and weather database

By Justin Broglio

Climate has a pervasive influence in the Lake Tahoe Basin. The fluctuations of weather and climate constitute a major environmental driver for the region that impacts not only the natural environment, but everything from local policy and management decisions to the success or decline of a more than $1 billion per year tourism industry.

Launched in 2011, the Tahoe Climate Information Management System (TahoeClim, www.tahoeclim.dri.edu/) compiles a vast amount of climate data from more than a dozen networks and over 300 individual stations scattered through the Lake Tahoe basin that record basic temperature and precipitation data and numerous another meteorological variables including solar radiation and wind direction.

Explore more at www.tahoeclim.dri.edu

The goal of TahoeClim is to provide convenient access to meteorological data relevant to the Lake Tahoe Basin that can be utilized by a variety of users for research, management, public health and safety, and educational purposes.

"We have data available for the Tahoe region as far back as the late 1800s and early 1900s when official weather observations began in the U.S.," said Nina Oakley, a research climatologist at the Western Regional Climate Center based in Reno at the Desert Research Institute (DRI), who helped assemble the complex collection of data and tools as her first graduate student project at DRI.

"And it's not just for scientists and researchers," she added. "There are a lot of things that are very useful for regular, day-to-day users who are recreating in the Tahoe basin. The links on the left-hand side of the page ... I use those all the time when I go paddling, skiing, or am planning a camping trip."

Users of the site can obtain data for any station in the TahoeClim region and produce detailed graphs for some stations by clicking on their markers on the website's homepage map.

When it went live, TahoeClim made climate data available to the public, from six shoreline stations and two buoys that are owned and operated by the University of California, Davis, Tahoe Environmental Research Center. The full climate records for these stations had not previously been available online, Oakley said.

Oakley encourages people to explore the site and contact her with any questions regarding stations or the data.

"We are encouraging groups who have any kind of data to contact us and let us know what data they are collecting so we can add it to the website," she said. "We want to make this the place to go for Tahoe climate data."

The TahoeClim project also seeks to highlight gaps in current Tahoe Basin meteorological monitoring activities and to augment and improve measurements at selected sites. The website is continuously updated as relevant data sets are acquired and incorporated in the database.

What's Next?

The longest running station on the TahoeClim Dashboard is a National Weather Service Station in Virginia City that dates back more than century. Oakley says although a lot of data exist from historic stations around the basin, finding funding to properly maintain stations or install new stations to address specific scientific concerns or specific issues is challenging.

"Everyone wants weather data, but it is difficult to get long-term funding to support weather stations," she said. "If there were sustainable station funding, we would also likely see more support for a website such as TahoeClim that is attempting to gather data in one place."

"It would also be nice to add an educational component in the future," Oakley said. "But for now we're just keeping it running and collecting input on what people might want to see or help with."

Data Sources

The Tahoe Climate Information Management System sources data and information from local airports, the California and Nevada Climate Trackers, California and Nevada Smoke and Air Committee (CANSAC), California Snow Survey, Climate Summary Maps (HPRCC/WRCC), National Weather Service and National Oceanic and Atmospheric Administration (NOAA), DRI, NASA-JPL Bouy Network, NDOT, North American Freezing Level Tracker, Remote Automated Weather Station (RAWS), Reno-Carson volunteer observer network, Natural Resource Conservation Service (NRCS) SNOTEL sites, Snow Course, UC Davis TERC REMOTE Network sites, US Geological Survey Waterwatch, and WestMap.

The Tahoe Climate Information Management System is a joint collaboration between University of California, Davis and the Desert Research Institute and funded through SNPLMA (Southern Nevada Land Planning and Management Agency).

Charles Morton

Modeling the effects of climate change on the Lake Tahoe Basin

By Justin Broglio

Photographs by Krissy Clark

Charles Morton spends a lot of time writing code.

A mechanical engineer with a master's degree in geography, Morton is one of the Desert Research Institute's leading staff research scientists in GIS and remote sensing applications.

"I really enjoy it," said the 32-year-old Reno resident who is part of a unique team of researchers leading DRI's remote sensing and mapping work utilizing imagery from the Landsat satellites and most recently the computing power of the Google Earth Engine platform.

Recently, Morton helped complete the application of an integrated surface water and groundwater model, "GSFLOW", to simulate climate change effects on the hydrology of the Truckee River system fed by the mountain watersheds around Lake Tahoe, and throughout the Martis Valley region.

GSFLOW can be used to evaluate the effects of land-use change, climate variability, and groundwater withdrawals on surface and subsurface water flows for watersheds that range from a few square kilometers to several thousand square kilometers, and for time periods that range from months to several decades.

In the case of the Truckee River, Morton and his colleagues used GSFLOW to model the effects of a changing climate on surface and groundwater resources by simultaneously simulating different extremes of snowmelt runoff across the varied landscape, within the subsurface environment, and in local streams and lakes.

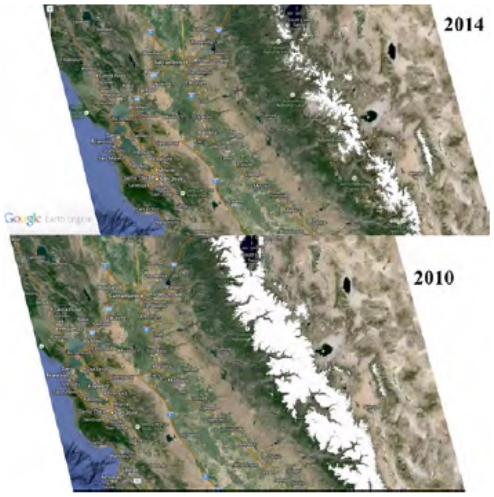
"A lot of models treat groundwater and surface water separately," Morton said. "For this application of GSFLOW we looked at the strong interaction between the two, specifically, in the Tahoe basin."

This unique application of the GSFLOW model is a big step forward in terms of simulation capabilities for assessing the effects of climate on water resources in and around the Lake Tahoe basin. Because Morton and his colleagues were able to model the interactions among all the major co-varying hydrologic processes – including snowmelt, runoff, evapotranspiration and surface water-groundwater interactions – local agencies, policy makers and water managers will be able to much more accurately model the available water in the Truckee River basin under any climate scenario.

And it's not just the flow models that interest Morton.

"We have also just recently started comparing the Landsat satellite images of snow cover in the Sierra to the model outputs," he explains. "By using the satellite data and the computing power of the Google Earth Engine we can get a much better idea of when snowmelt is occurring and if the models are capturing it correctly."

Morton's advanced mapping and modeling skills were also used to help create critical components of the Lake Tahoe Nearshore Evaluation and Monitoring Framework, presented in October 2013 to the TRPA Governing Board and to several other interested stakeholder groups more recently. (See pages 20-21 for more information on the report.)



The Lake Tahoe Nearshore Evaluation and Monitoring Framework
https://www.dri.edu/images/stories/centers/cwes/Lake_Tahoe_Nearshore_Evaluation_and_Monitoring_Framework.pdf

Lake Tahoe Nearshore Evaluation Report
October 24, 2013 – The Desert Research Institute of Nevada (DRI) released its Final Nearshore Evaluation Report (Report) as approved by the US Forest Service – Pacific Southwest Research Station (PSW). Executive Summary found as Enclosure 1. The full report can be found at *http://www.dri.edu/cwes*. Click on "Download the Full Report."

The Lake Tahoe Nearshore Evaluation and Monitoring Framework, a project funded during Round 10 of the Southern Nevada Public Land Management Act in 2010, was prepared for the USDA Forest Service by more than a dozen scientists and technical advisors from the Desert Research Institute, the University of Nevada, Reno and the University of California, Davis. In addition, a Nearshore Agency Working Group compiled of key staff from the California Regional Water Quality Control Board, Lahontan Region (Lahontan Water Board), the Nevada Division of Environmental Protection, the Tahoe Regional Planning Agency, and the U.S. Environmental Protection Agency participated throughout the process, communicating agency needs and supporting the scientists with relevant information.

"This represents the initial collaborative step between the science community and the resource management agencies to develop a comprehensive approach for assessing and managing the nearshore ecology and aesthetics of Lake Tahoe," said Alan Heyvaert, Ph.D., principal investigator on the multi-year project and acting senior director of the Center for Watersheds and Environmental Sustainability at DRI. The report does not recommend changes to existing state and TRPA legal or statutory definitions or standards affecting the Lake Tahoe nearshore. Rather, it explains, for the first time in one report, the unique aspects of this important zone; evaluates existing California, Nevada and TRPA standards and thresholds related to this region; presents a new conceptual model for evaluating nearshore environmental health; and proposes a monitoring strategy intended to help resource managers identify the most meaningful physical, chemical and biological indicators of healthy nearshore conditions.

"For monitoring and assessment purposes, the report defines "nearshore" as the zone from the low water elevation (6,223 feet), or the current shoreline, to the mid-summer thermocline, which has a depth of approximately 69 feet, and at minimum a distance of 350-feet from shore," Heyvaert explains. "It is in the nearshore region that most people experience the lake," said report co-author Geoffrey Schladow, director of the UC Davis Tahoe Environmental Research Center. "This report is an important step as it establishes the scientific underpinnings of a successful nearshore restoration program." Results from the report's widespread literature review and data summary indicate that conditions can differ widely around the lake's nearshore and create more localized effects as compared to the open-waters of Lake Tahoe, which tend to be more uniform.

The report also emphasizes that pollutants entering the lake from watershed or groundwater can be temporarily concentrated in the nearshore, before eventually being mixed and diluted in the open-water, resulting in biological responses not observed or recorded in Lake Tahoe's deep water.

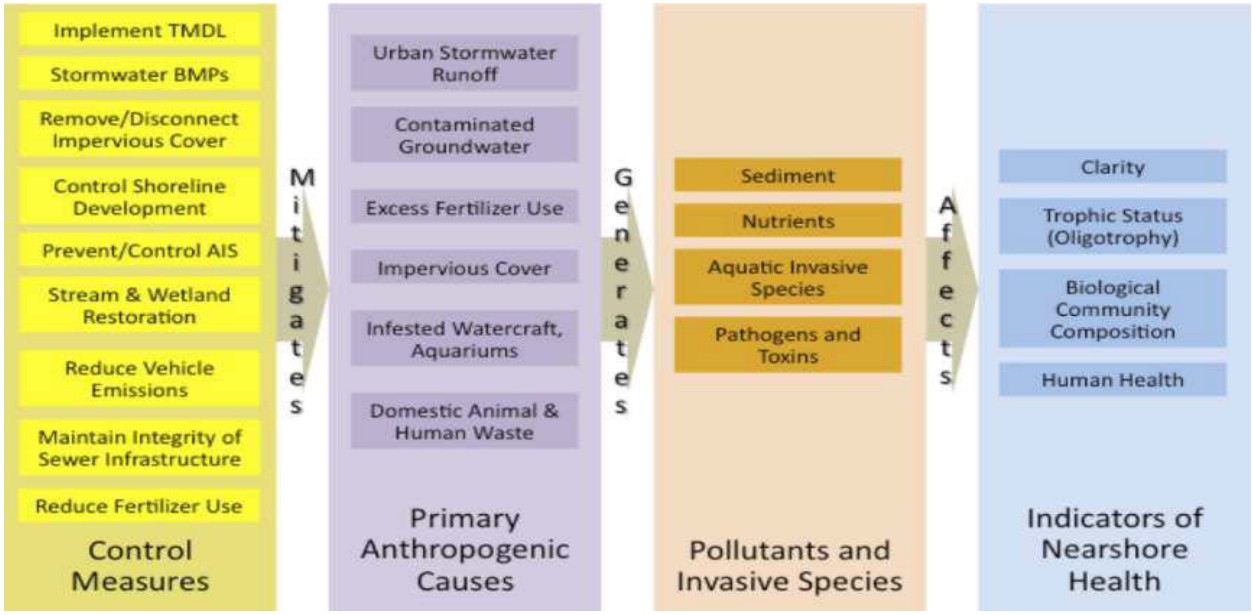
"The nearshore environment is inherently complex since it is immediately adjacent to stormwater flow and runoff from the developed and undeveloped portions of the surrounding watershed," said co-author John Reuter, research ecologist and associate director of the UC Davis Tahoe Environmental Research Center. "Therefore, it is recommended that a finer scale of evaluation and monitoring is necessary in this zone, especially for the nuisance blooms of attached algae found on rocks and other hard surfaces in the nearshore." Reuter added that in addition to pollutant factors, there are numerous other aspects unique to

the nearshore environment that can contribute to variation in conditions, such as greater vulnerability to increased temperature from climate change, effects of nearshore recreation, existing and future shorezone structures, and fluctuation in lake levels.

The report also summarizes the proposed and targeted research needs related to monitoring and management of the nearshore. "The introduction of aquatic invasive species has already produced some profound changes in the nearshore," said co-author Sudeep Chandra, limnologist and director of University of Nevada Reno's Aquatic Ecosystems Analysis Laboratory. "Further establishment of aquatic invasive species in the nearshore has the potential to unravel the tremendous progress made toward protecting Lake Tahoe's clarity." Chandra added that very little data exist on the nearshore community structure. "We do not know the composition, distribution or abundance of most macro-organisms that inhabit the nearshore," he said. "Base data are urgently needed to describe these conditions before they change any further."

The findings and recommendations of the report are expected to support several agency statutory and programmatic needs by:

1. Providing baseline information that could assist in developing data collection and analysis needed to inform any revisions or assessments of relevant state and TRPA standards;
2. Supporting the development of products for the Tahoe Monitoring and Evaluation Program;
3. Tracking the effectiveness of the Tahoe Total Maximum Daily Load Program and other Environmental Improvement Program efforts related to nearshore conditions and contributing to detection and management of aquatic invasive species in the nearshore.



Examples from the nearshore conceptual model of progression from relevant control measures to indicators of nearshore health.

Additional excerpts from the *"2014 Tahoe Summit Report"*:

An integrated approach

Developing the framework for monitoring Tahoe's nearshore environment

By Justin Broglio

A new report on the most commonly visited region of Lake Tahoe shows that changes in this highly visible area have become increasingly evident, with growing stakeholder interest in addressing the environmental, social and economic impacts.

This zone of the lake, commonly referred to as the "nearshore," is where many visitors and local residents interact directly with the lake and is valued for its recreational and aesthetic qualities, as well as for the unique biological community it supports. It is also the zone where pollutants from the surrounding watershed are often discharged and where people are most likely to notice such ecological changes as prolific algae on submerged rocks, invasive aquatic plants and animals, and reduced water clarity.

"This represents the initial collaborative step between the science community and the resource management agencies to develop a comprehensive approach for assessing and managing the nearshore ecology and aesthetics of Lake Tahoe," said Alan Heyvaert, principal investigator on the multi-year project and acting senior director of the Center for Watersheds and Environmental Sustainability at the Desert Research Institute (DRI).

"We know what's been happening in the deep part of the Lake," added Heyvaert. "That's what has driven a lot of the action and a lot of the success over the last several decades to preserve and restore the Lake. As conditions begin to stabilize or improve there, more of the focus now needs to shift toward the nearshore."

The report, developed by more than a dozen scientists and technical advisors from DRI, University of Nevada, Reno, and University of California, Davis, was prepared for the U.S. Forest Service and presented to the Tahoe Regional Planning Agency (TRPA) Governing Board and the Lahontan Regional Water Quality Control Board in the fall of 2013.

Key staff from the California Lahontan Regional Water Quality Control Board, the Nevada Division of Environmental Protection, the TRPA, and the U.S. Environmental Protection Agency also participated throughout the process, communicating agency needs and supporting the scientists with relevant information.

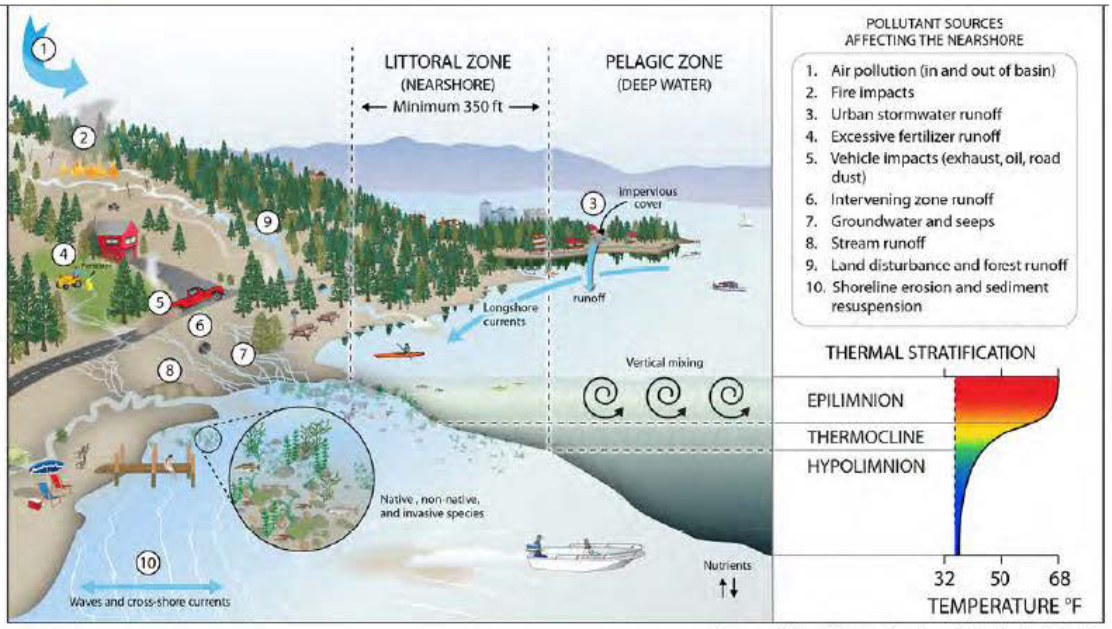
This report integrates for the first time an analysis of several unique aspects of Lake Tahoe's nearshore environment. It evaluates existing California, Nevada, and TRPA standards and thresholds related to this region and presents a conceptual model of interactions between important factors affecting nearshore environmental health, then proposes a monitoring strategy intended to help resource managers track the most meaningful physical, chemical, and biological indicators of healthy nearshore conditions.

Results from the report's in-depth literature review and data analysis summaries indicate that conditions can differ widely around the lake's nearshore and create very localized effects as compared to the open waters of Lake Tahoe, which tend to be more uniform.

"The nearshore environment is inherently more complex, since it is immediately adjacent adjacent to land use areas and receives runoff from both developed and undeveloped portions of the surrounding watershed," said report co-author John Reuter, research ecologist and former associate director of the UC Davis Tahoe Environmental Research Center.

Photographs by E.S. Levy
Full report available online at www.dri.edu/cwes

Photograph by E.S. Levy



Illustration, LJ Weible and A Heyvaert (Desert Research Institute), with additional clip art contributions courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/).

The report indicates that a finer scale of evaluation and monitoring is needed in the nearshore zone, especially, for the nuisance blooms of attached algae found on rocks and other hard surfaces in the nearshore.

The report also points out that the Lake Tahoe Total Maximum Daily Load (TMDL), a restoration plan for Tahoe's mid-lake clarity approved in 2011, will provide benefits for nearshore conditions as well. While the Tahoe's mid-lake clarity is expected to improve from implementation of watershed best management practices, environmental improvement projects, and other actions, the monitoring and evaluation of nearshore conditions will be needed to fully understand why some areas of the nearshore zone have deteriorated and what strategies are the most effective to address the problem.

"The introduction of aquatic invasive species has already produced some profound changes in the nearshore," said co-author Sudeep Chandra, limnologist and director of University of Nevada Reno's Aquatic Ecosystems Analysis Laboratory. "Further establishment of aquatic invasive species in the nearshore has the potential to unravel the tremendous progress made toward protecting Lake Tahoe's clarity."

Chandra added that very little data currently exist on the nearshore community structure.

"We do not know the composition, distribution or abundance of most macro-organisms that inhabit the nearshore," he said. "Baseline data are urgently needed to describe these conditions before they change any further."

Photograph by E.S. Levy

The Monitoring Framework

Researchers said they would like to see relevant nearshore assessments done in various areas around the Lake. In addition to existing sampling for attached and free-floating algae, new measurements would focus on nearshore water clarity, attached algae, and the status of insects, fish, and crayfish. Monitors also test for toxins and pathogens. The findings and recommendations of the report are expected to support several needs by:

- Providing baseline data and analysis to inform revisions or assessments of relevant state and TRPA standards;
- Supporting the development of products for the Tahoe Monitoring and Evaluation Program on status and trends in nearshore conditions; and
- Tracking the effectiveness of the Tahoe Total Maximum Daily Load Program and other Environmental Improvement Program efforts related to nearshore conditions, including the detection and management of aquatic invasive species in the nearshore.

Tahoe Environmental Research Center (TERC) launches Citizen Science App
To download (version 2) of the app for the iPhone or Android phones visit *www.citizensciencetahoe.org*.
http://www.sacbee.com/news/local/environment/article31589879.html

The UC Davis Tahoe Environmental Research Center has launched a student-programmed app that can turn Lake Tahoe beachgoers into researchers. Citizen Science Tahoe is a free smartphone app through which the public can log information about what they see on the 71-mile shore of Lake Tahoe. The app logs the date, time and location of every user's input and combines it with data acquired from real-time sensors put up in conjunction with lakefront property owners.

"It's pretty unique that the general public is teaming up to gather this information," said Geoff Schladow, director of the University of California, Davis, Tahoe Environmental Research Center.

Researchers are asking the public for input on four categories: algae, local species, water quality and beach conditions. For more keen observers, the "Pipe Keepers" and "Eyes on the Lake" categories examine water inflow to the lake and the spotting of invasive species, respectively. Once the data are gathered, the center will arrange an interactive exhibit. Displays with data will also be put up in Lake Tahoe and other select areas late this year, where they will remain for many years, Schladow said.

The project was funded with help from the North Lake Tahoe Resort Association and a $150,000 grant from the Institute of Museum and Library Services. The project's specific aim is to analyze the impact that the physical and chemical interactions that form Lake Tahoe have on its nearshore in order to help preserve it and other lakeshores. The nearshore is the area that Lake Tahoe visitors most often come in contact with, but it is also one that researchers know the least about. "The nearshore is an area that has undergone a lot of degradation in the last 10 or 20 years, but it hasn't been monitored thoroughly," Schladow said.

UC Davis researchers and students hope the crowdsourcing of nearshore observations will help change that. "There's a whole lot more (beachgoers) than there are of us. There are more people on the shore on any given day. But also, when people look at things critically, it makes them think of the degradation and of how to protect lakeshores," Schladow said.

Shahzeb Khan, 19, from Monterey, is a UC Davis freshman and computer science major who programmed the app. He won a competition to create and maintain Citizen Science Tahoe. Schladow said Khan was chosen because his proposal was thorough and his enthusiasm for the cause showed through his writing.

As he maintains Citizen Science Tahoe in the coming months, his duties will include tweaking the app, providing app updates and making sure the database runs smoothly, according to Khan.

"This connects with everything I want to do in the future. I've always been into apps and creating new apps. I think that's where the future of computer science is headed," Khan said.

TERC Launches real-time Nearshore Monitoring Network
http://www.turnerdesigns.com/submersible-instrumentation/item/the-nearshore-network-instrumenting-lake-tahoe

The UC Davis Tahoe Environmental Research Center (TERC) has been working to launch the world's first, real-time Nearshore Network comprised of approximately 20 sites around the Tahoe basin. The first six stations, spanning both California and Nevada, were installed in 2014.

As of June 2016, there are 7 stations installed around Lake Tahoe, and an additional station on Cascade Lake which feeds into Lake Tahoe. Each station consists of a Turner Designs C3 Submersible Fluorometer measuring turbidity, algal concentration, and dissolved organic material, along with a RBRmaestro CTD measuring water temperature, conductivity, lake level, and wave height. An underwater cable supplies power to each station and returns data, which are displayed as near real-time and can be accessed via the internet. TERC aims for a minimum of 12 other stations to be added in the future as additional funding is acquired.

Why are these nearshore data so important? Unlike the deep portion of the lake, the nearshore is subject to sudden erratic changes in water quality. These changes occur in response to storms, inflows from streams and storm drains, local erosion, or drift from other parts of the lake. Every part of the nearshore responds differently. The Nearshore Network will allow scientists and agencies to better understand the causes of degradation, to better implement projects to mitigate degradation, and to determine appropriate and meaningful threshold standards for nearshore conditions.

Data are directly comparable to identical measurements being taken at one of the mid-lake buoys, a collaboration with NASA-JPL. In this way, it will be possible to relate the evolving nearshore conditions with conditions at the center of the lake. Data will also be used to educate the public through online displays at TERC's Tahoe Science Center and other locations around the basin.

Funding for this project (along with access to docks) is being provided through a unique partnership between lakefront property owners, private donors in the Tahoe basin, instrument manufacturers, and TERC. Each donor is supporting the operation of one nearshore sensor for a minimum of four years. This unique partnership is enabling the collection of a consistent water quality data set for the area of the lake that most people come in contact with.

Researchers study Lake Tahoe water movements
http://www.recordcourier.com/news/13714581-113/lake-tahoe-schladow-wind
The Tahoe Environmental Research Center recently installed five stations like the one shown here as part of a nearshore network. The instrument measures things like water temperature, turbidity and algal concentration near the edges of Lake Tahoe.

It may look calm and peaceful to the human eye, but research shows Lake Tahoe is anything but placid underneath the surface. Its waters are constantly rocking up and down and shifting from side to side. Sometimes they're churning clockwise — in other areas, counter-clockwise.

The lake is an extremely variable and complex environment, and one of the few things scientists do know about it is that they know very little about water movements, said Dr. Geoff Schladow, director of the Tahoe Environmental Research Center.

That was one of the things discussed in a TERC presentation Thursday that shared new research on water circulation patterns in Lake Tahoe. "Lake motions are important," Schladow said to a group of about 30 people at Round Hill's Elks Point Fire Station. He added, "It's the currents, it's the motions, that transport everything in the water."

Understanding the movement of water in Lake Tahoe is important for a variety of reasons, Schladow pointed out. It helps researchers better identify the potential paths of harmful pathogens and substances in the lake, as well as the spread of invasive species.

He said there are several factors that effect the lake's movement, but wind is the main one.
"We all think, 'Oh, Tahoe, wind comes from the southwest,'" he said. "It does a lot of the time, but it comes from the southwest when you measure it at the airport."

Schladow presented several models of wind patterns showing pockets of swirling air currents around the lake. Some were traveling in different directions than others. Other data showed how wind pushes one side of the warmer, and lighter, surface water down deeper —the colder layers beneath it also get pushed down as a result — to begin a rocking motion throughout the lake.

"There are motions everywhere," he said, "not just next to where the wind is blowing."

Showing this a little more clearly, another model separated the lake into small grids — which were then separated into even finer grids in the nearshore — to get a better idea of water movement at the lake. The idea is that these models can be used as tools to help protect drinking water quality at Lake Tahoe by better recognizing the pathways of pathogens.

Additionally, TERC has launched a nearshore network of monitoring stations to further measure water quality at the edges of the lake — an area researchers no little about. "It's the idea that we can monitor the nearhore in real-time," Schladow said. "It's not that hard to do. It's the data we're interested in, and we think it's the data that's needed." The nearshore network instruments sit at the bottom of about 2 meters of water and measure things like water temperature, turbidity and algal concentration. Five stations are already installed in the lake. Schladow said a sixth is expected to go in at Sand Harbor in 2014.

Annual Lake Tahoe to Pyramid Lake Snapshot Day
http://tahoetruckeesnapshotday.org

Snapshot Day is an event which has grown over the past 18 years, between local partners within the Tahoe Basin, Truckee River and Pyramid Lake watersheds. The Snapshot Day event provides a picture of regional watershed water quality during a specific 3 hour time frame, on a single day during the month of May. Annually, over 300 volunteers collect water quality data from 90 to 100 locations within the watersheds. Snapshot Day is a collaborative effort from multiple agencies, covering the North Shore Lake Tahoe, South Shore Lake Tahoe, Middle Truckee River near the town of Truckee and Lower Truckee River from the Nevada Stateline to Pyramid Lake

In spring 2008, TWSA staff accepted a leadership role in this event, serving as the North Lake Tahoe Coordinator. TWSA staff provides staff support, some event funding, grant fund management and other leadership roles for this event.

Fecal coliform sampling on Snapshot Day attempts to locate 'hot spots' or areas of potential microbial sources. Over the years Snapshot Day leaders have changed the locations where fecal coliform sampling occurs, which has helped them determine which sites will continue to be monitored annually and which sites do not pose a microbial threat (Source: R. Whitney pers. comm. 2006).

Event Summary

In 2018, Snapshot Day reached its 18th anniversary. It remains one of the longest running citizen watershed monitoring events on the West Coast of the United States. Snapshot Day continues to highlight successful engagement with the public in active watershed stewardship, while providing valuable data to the responsible agencies.

As previous data sets are compiled and data storage is improved, this program can show long-term trends and better assist agencies in watershed conditions analysis. Snapshot Day 2017 was a collaborative effort between the North Shore Lake Tahoe, South Shore Lake Tahoe, Middle Truckee River near the town of Truckee and Lower Truckee River from the Nevada Stateline to Pyramid Lake.

This collaborative effort is sponsored by the Incline Village General Improvement District, the League to Save Lake Tahoe, the Truckee River Watershed Council and the Nevada Division of Environmental Protection.

Snapshot Day is a bi-state event and as such falls under two statewide citizen monitoring programs: the California State Regional Water Quality Control Board's (SWQCB) Clean Water Team and the Nevada Division of Environmental Protection water and education outreach activities. In 2017, volunteers gathered data at a total of 82 locations throughout the Truckee River watershed.

Incline Village Clean Water Team (Volunteer Monitoring)
The Incline Village Clean Water Team has been on hiatus due to low participation. It is under consideration for re-establishment as an 'Adopt-A-Stream program' in order to offer volunteers more participatory tracks such as photo documentation of stream conditions and litter removal, in addition to water sample grabs. In fall 2011, the Tahoe Expedition Academy (TEA) agreed to be a pilot group for the new program. They have adopted Griff Creek, in Kings Beach, CA. They are conducting regular stream flow, turbidity and dissolved oxygen monitoring, plus litter collection and streambank documentation.

Past history on the program:
The streams in Incline Village discharge directly into Lake Tahoe. To protect their drinking water source, the Incline Village Clean Water Team (IVCWT) monitoring helped identify existing problems and helps prevent future water quality issues. Bi-monthly, volunteers monitored 11 different sites in Incline Village, on Deer, Incline, Third, and Rosewood Creeks and on an unnamed tributary on Diamond Peak. Volunteers collect: habitat information, physical and chemical characteristics of the water quality, and water samples for lab analysis. The data collected is available to state and local agencies as well as anyone who may have an interest in a specific area.

IVGID/ TWSA Staff Beach Sampling Program
IVGID/TWSA staff has collected weekly or bi-weekly water samples from Incline beaches and stream mouths since 2003. The database is used to track potential contamination locations or trends. Long-term data sets are available upon request to wastenot@ivgid.org.

South Lake Tahoe Water Citizen Quality Monitoring
http://www.sierranevadaalliance.org
The South Lake Tahoe Monitoring Project (SLTMP) began in 2007 and was volunteer water quality monitoring project coordinated by the Sierra Nevada Alliance for the purposes of data collection and watershed education. The project area is the Upper Truckee River Watershed which contains the largest tributary to Lake Tahoe, the Upper Truckee River, as well as other major tributaries, including Trout Creek, Taylor Creek, Angora Creek, and Cascade Creek. The Upper Truckee marsh, which is at the mouth of the Upper Truckee River, is one of the largest meadows in the Sierra Nevada and is habitat for many bird, mammal, and aquatic species. During 2008, 25 volunteers monitored fifteen sites in the South Lake Tahoe region of the Upper Truckee River Watershed. Creeks were monitored in January, March, May, and July. The May monitoring day was coordinated with the annual Snapshot Day, a basin-wide volunteer water quality monitoring event.

The focus of the project was monitoring areas where past and current land use practices and issues are affecting water quality in the Upper Truckee River watershed. Monitoring includes water quality field readings and water quality sample collection for chemical parameters.

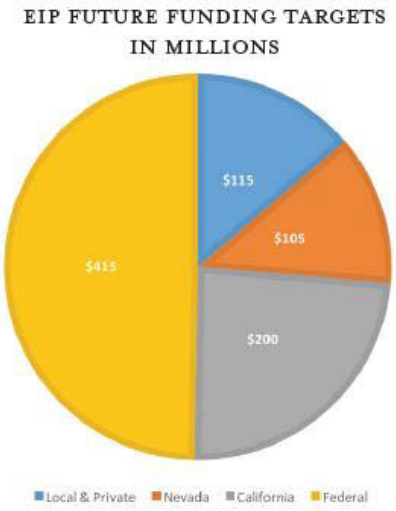
The Alliance worked with six watershed councils in the Sierra to establish citizen-volunteer water quality monitoring programs to assess the impacts of common land uses on Sierra watersheds. Some of the impacts that were assessed were connected to development in sensitive ecosystems, historic logging and mining, dams and impacts from historic stream channel alteration.

Tahoe Integrated Information Management System (TIIMS) becomes TRPA EIP Tracker Database

http://www.tiims.org *www.trpa.org*

Editor note: TIIMS website has been closed and a new website serves as the data portal for EIP projects. New EIP tracker database: *https://eip.laketahoeinfo.org*

TRPA launched the EIP in an effort to better implement the Regional Plan and highlighted it at the Presidential Forum at Lake Tahoe in 1997. Recognizing that capital investments, research, and monitoring were essential components of the Regional Plan, the EIP called for an initial investment of $908 million in capital projects and $58 million in research and monitoring over 10 years. The EIP also identified hundreds of specific projects and programs to be undertaken by more than 50 funding partners including federal, state, and local agencies, and the private sector. The projects were focused on improving air, water, and scenic quality, forest health, fish and wildlife, and public access to the Lake and other recreation areas. The prime directive of the EIP was to move the Tahoe Basin closer to environmental threshold attainment.



EIP INVESTMENT BY SECTOR: 1997–2016

- **Federal:** $655.2 million
- **State of California:** $813 million
- **State of Nevada:** $131 million
- **Local Government:** $108.5 million
- **Private:** $353.9 million

Today, over 400 EIP projects have been completed and hundreds more are in progress, with over $1.8 billion of investment in the highest priority environmental improvement projects.

THE TAHOE PARTNERSHIP

The EIP is an unparalleled partnership working to achieve the environmental goals for the Region. Local, state, and federal government agencies, private entities, scientists, and the Washoe Tribe are all collaborating to restore the clarity and environmental health of Lake Tahoe. The collective impact of 50-plus organizations this past year resulted in improved forest and ecosystem health, progress on lake clarity, restored fish and wildlife habitat, and better public access for recreation at Lake Tahoe. Emerging threats from climate change, invasive species, and wildfire risk are challenging this partnership in unprecedented ways.

2016 EIP ACCOMPLISHMENTS HIGHLIGHTS:

10,750 feet of **stream channel** restored

33 miles of **roadway upgraded** to reduce erosion and stormwater pollution

4,331 acres of treatment to clear **forests of hazardous fuels**

7,869 boats inspected for **aquatic invasive species**

39 boats containing AIS **intercepted** (4 with zebra/quagga mussels)

69.2 feet average annual **lake clarity**

4.9 acres treated for **aquatic invasive plants**

120 acres of **SEZ restored**

425 feet of **public shoreline** added

Photo by Rick Berg

3

The Tahoe Integrated Information Management System (TIIMS) was previously used to house and disseminate information about the Lake Tahoe Basin's planning and restoration efforts. TIIMS contains tools to meet the needs of all stakeholders within the Basin. Citizens, research scientists, and resource managers can use TIIMS as a one-stop site for information about Lake Tahoe. TIIMS represented a complete information management solution. TIIMS Partners include Federal, State, tribal, and local agencies within the Lake Tahoe Basin which are involved in a myriad of planning and restoration efforts throughout the watershed ranging from permitting to regulatory enforcement to maintaining and improving the quality of surface and groundwater resources.

Lake Tahoe Status and Trend Monitoring Evaluation Program
http://tahoemonitoring.org

Tahoemonitoring.org is the public reporting website for the Lake Tahoe Status and Trend Monitoring and Evaluation Program (M&E Program) in beta development. It is not fully live as of publication.

Water Category: The purpose of the Water Overarching Category is to provide a portal to information related to water quality and conditions of aquatic ecosystems in the Lake Tahoe region.

The following reporting categories are included in this overarching category:

- The *Lake Tahoe* reporting category is used to report on the status and trends of indicators that measure deep water and nearshore conditions of Lake Tahoe in terms of water quality, clarity and biological integrity.
- The *Small Lakes* reporting category is used to report on the status and trends of indicators associated with biological, physical and chemical integrity of small lakes in the Tahoe Region.
- The *Streams and Wetlands* reporting category is used to report on the status and trends of various indicators of biological, chemical and physical conditions of Lake Tahoe tributaries and riparian habitats.
- The *Stormwater Quality* reporting category is used to report on the status and trends of indicators the measure runoff water quality.
- The *Aquatic Invasive Species* reporting category is used to report on the status and trends of indicators that measure the extent and distribution of invasive plant and animal species associated with aquatic habitats.
- The *Aquatic Species and Communities* reporting category is used to report on the status and trends of indicators that measure special status wildlife, fish and rare plants as well as unique communities found in aquatic habitats.

Lahontan Water Board and the Nevada Division of Environmental Protection
Total Maximum Daily Load Study (TMDL)
http://ndep.nv.gov/bwqp/tahoe3.htm.

The United States Environmental Protection Agency (EPA) approved NDEP's Lake Tahoe Total Maximum Daily Load Report (TMDL) submittal at the 15th annual Lake Tahoe Summit on August 16, 2011. This Final EPA approved version has been revised from the California adopted version for which EPA approval was gained the same day. The revisions were necessary to correct errors, clarify Nevada's regulatory structure and approach to implementation and emphasize that the proposed implementation timelines may need to be adjusted for a variety of reasons, but particularly the availability of future funding. The errata sheet indicates all the differences between these versions. However, it is important to emphasize that despite the submittal and approval of distinct reports, the Lake Tahoe TMDL effort represents a common and consistent plan between the States of Nevada and California to address the clarity decline within Lake Tahoe.

Final TMDL
Under the Clean Water Act and California law, final TMDLs must contain all the elements addressed during Phase One and Two of the Lake Tahoe TMDL. The Lake Tahoe TMDL implementation plan presents a detailed process for achieving load reductions over a specified time frame. Several expectations have emerged among Lake Tahoe TMDL collaborating agencies. The Lake Tahoe TMDL will integrate with the Pathway efforts to update resource management plans by providing load reduction targets that can be incorporated into the TRPA Regional Plan, the Environmental Improvement Program, and Lake Tahoe Basin Management Unit Forest Plan. The Lahontan Water Board and NDEP will incorporate the Lake Tahoe TMDL implementation needs into the Lahontan Basin Plan and NDEP Continuous Planning Process documents.

The Lake Tahoe TMDL monitoring plan describes procedures for tracking load reductions and documenting progress toward achieving milestones. It also describes how project effectiveness measurements and ongoing research will refine the understanding of factors driving loading to the Lake. The monitoring plan will become the scientific basis for the formal cycles of continual improvement and adaptive management that will be initiated during Phase Three of the Lake Tahoe TMDL. All elements from Phases One and Two will be packaged in a Final TMDL document that will complete Phase Two. Note that the implementation and operation phase of the Lake Tahoe TMDL is expected to continue for a period of decades beyond 2009. Current discussions of likely time frames for achievement of the Lake Tahoe TMDL load reductions range from 30 to 100 years.

Charting the Course to Clarity
http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/lake_tahoe/docs/cac_208_09_final.pdf
This report presents highlights of the strategy for restoring Lake Tahoe's clarity. For the first time since researchers began continuously measuring Lake Tahoe's famed water clarity 40 years ago, UC Davis scientists reported today that the historical rate of decline in the lake's clarity has slowed considerably in recent years. Scientists at the UC Davis Tahoe Environmental Research Center say that by using new, more sophisticated models for detecting trends and, by factoring out the effects of annual precipitation, they have concluded that the historic rate of decline in the lake's clarity has slowed since 2001.

Climate Change
Global climate change is projected to have unprecedented impacts on the health of the environment and economy in the Lake Tahoe Basin. As temperatures rise and more precipitation falls as rain rather than snow, management efforts to protect the Basin's forests, fish and wildlife, and fabled water clarity will face unique challenges.

To address these impacts, the Environmental Improvement Program (EIP) partner agencies are formulating a Basin-wide strategy to address climate change. The strategy is intended to ensure that all major planning and regulatory programs at Lake Tahoe are designed to take into account the projected impacts of climate change.

For example, future EIP water quality and erosion control projects will need to be designed for larger peak flows in the winter, and habitat improvement projects will need to take into account potential changes in the type, location, and distribution of vegetation communities. The climate change strategy will provide a starting point for sustainable decision making in the Tahoe Basin. These actions will be addressed in a combination of plans and programs, including the EIP, the Lake Tahoe Regional Plan Update, the Regional Transportation Plan, Community Plans, and local actions.

As part of this comprehensive strategy, the EIP broadly focuses on maintaining healthy forest ecosystems and watersheds and on improving mobility and access with environmentally-friendly transit. Mandates and incentives to develop sustainably-designed communities, projects, and green infrastructure will be developed as part of the update of the TRPA Regional Plan.

The most significant impacts of a future, modeled climate change at Lake Tahoe are changes in hydrologic conditions and reduced frequency of complete vertical mixing of the lake. Hydrology output from the downscaled climate modeling suggests a significant reduction in the amount of precipitation falling as snow in the Tahoe basin. This could have consequences for water supply as well as winter recreational sports. Should the lake's deep mixing be restricted to the extent the models suggest, internal loading of nutrients from the sediments will be very significant and will drive a fundamental change in the biological productivity status of both the pelagic and littoral regions of the lake. These nutrients, particularly phosphorus, will be available to drive algal growth. Reducing the load of external nutrients entering the lake in the coming decades may be the only possible mitigation measure to reduce the impact of climate change on lake clarity and trophic status.

The meteorologic and geographic conditions in the Tahoe basin combine to create a vulnerable ecosystem. Temperatures in the Basin are increasing faster than in the surrounding region. This may be due to the influence of the lake and its heat (energy) budget on local air temperature, although a decrease in the reflectivity of the snowpack from deposition of soot (black carbon) may also play a role. Second, under historic and current conditions the lake mixes to the bottom on the average of only once every four years. Continued warming will increase the lake's thermal stability, and likely shut down its vertical mixing altogether. Third, on occasion, the lake historically has fallen below its natural outlet elevation during prolonged dry years. Lake level modeling in our study suggests that under some greenhouse gas emission scenarios, outflow from Lake Tahoe could cease by the end of the 21st Century.

Sierra Nevada Alliance (SNA) Community and Resource Protection Programs
www.sierrranevadaalliance.org

Sierra Water & Climate Change Program
http://sierranevadaalliance.com/programs/regional-climate-change/#Project
The Sierra Water & Climate Change Program alerts the public and decision makers to the impacts of climate change in the Sierra and ensure that smart local resource management plans (watershed plans, general plans, hydropower relicensing, integrated regional water management, forestry, etc.) are adopted that protect natural resources by reducing emissions and adapting to climate change. Climate change is presently impacting the Sierra and future impacts could be catastrophic.

The Sierra Nevada supplies 55% of California's developed water rights plus most of the water for Northwestern Nevada through a vast water delivery system that is highly dependent on the Sierra snowpack. Over the past 100 years, there has been a 25% reduction in runoff from April to July in the central Sierra –Sacramento region, and a 10% reduction in the southern Sierra. Leading scientists agree that temperatures will rise even under the best emission reduction scenarios. This increase in temperature results in a projected decline of 25 -40% of the snowpack between years 2025-2050; by 2100 losses could reach 75-90%. The Sierra Nevada Alliance is working with conservation representatives, resource managers, and community leaders to ensure they have cutting edge tools to adapt resource plans and projects that protect Sierra waters, wildlife, and rural communities.

Sustainable Sierra Communities program
http://sierranevadaalliance.com/wp-content/uploads/2014/02/CaseStudyTranstion.pdf
The Sustainable Sierra Communities program encourages actions and local planning processes to increase the sustainability of vibrant rural Sierra communities. Through on-the-ground projects, model programs, publications, events and workshops, the Sustainable Sierra Communities Program focuses on local actions toward a sustainable future.

Desert Research Institute (DRI) Center for Watersheds and Environmental Sustainability
The Desert Research Institute and the University of Nevada, Reno have worked together for decades to provide comprehensive studies that have led to a better understanding of threats to Lake Tahoe's air and water quality and the health of the forest. This report was jointly issued to highlight some of the collaborative scientific research that is conducted by both institutions at the Lake Tahoe Summit. The summary of most recent projects, including Aquatic Invasive species and nearshore water quality projects, is available at: *http://www.dri.edu*

Lake Tahoe Nearshore Evaluation Report
October 24, 2013 – The Desert Research Institute of Nevada (DRI) released its Final Nearshore Evaluation Report (Report) as approved by the US Forest Service – Pacific Southwest Research Station (PSW). The full report can be found at *http://www.dri.edu/cwes*.

Lake Tahoe's nearshore is the zone of relatively shallow water around the lake's perimeter that is valued for its recreational and aesthetic qualities, as well as for the biological community it supports. The nearshore is the part of the lake that visitors and residents interact with most. Changes in the nearshore over time have increased interest in managing the nearshore and the factors responsible for its progressively reduced condition. Lahontan and the other member agencies (TRPA, NDEP, US EPA) of the Nearshore Agency Working Group have received public criticism for focusing on Lake Tahoe's mid-lake water quality and transparency, as represented by the Lake Tahoe TMDL, to the perceived paucity of attention paid the nearshore. In 2010, with funding managed by the US Forest Service PSW, the Nearshore Science Team and the Nearshore Agency Working Group set out to comprehensively evaluate the Lake Tahoe nearshore. The purpose of the project was to summarize the results of past research and monitoring efforts to improve our understanding of factors and activities affecting nearshore conditions. The Nearshore Science Team was tasked with evaluating the applicability of existing water quality standards to the nearshore and its desired condition, identifying the most meaningful indicators of nearshore conditions, and proposing a strategy for monitoring these indicators.

DRI Lake Tahoe Watershed Projects
http://www.dri.edu/cwes/lake-tahoe-watershed

Some of the ongoing DRI projects that deal with nutrient and fine sediment loading to Lake Tahoe and the health of the watershed include:

- Identifying atmospheric sources of dust and nutrients in the Tahoe basin
- Determining atmospheric dust and nutrient deposition rates on the lake surface
- Measuring and modeling fugitive dust emissions from roads in the Basin
- Characterizing stormwater runoff fine sediment and nutrient loads
- Evaluating nutrient and fine sediment loading for different land uses
- Determining groundwater nutrient loading to the lake
- Conducting near-shore lake clarity surveys to identify areas of high nutrient and fine sediment loading from surface water, stormwater, and groundwater inflows

- Determining shoreline erosion contributions of fine sediment and nutrients to the lake
- Identifying and quantifying microbiological communities in the lake
- Evaluating restoration project effectiveness in removing fine sediment and nutrients from surface water runoff
- Evaluating BMP structures effectiveness in removing fine sediment and nutrients from surface water runoff
- Determining the amount of impervious cover, such as roads, parking lots, and roofs that produce increased stormwater runoff in the Lake Tahoe watershed
- Evaluating the effects of fire on atmospheric sources of nutrients entering the lake
- Identifying the sources of fine sediment that enter the lake
- Developing bio-engineer systems for removal for nutrients and fine sediment in stormwater runoff
- Evaluating the efficiency of highway runoff structures for removal of nutrients and fine sediment
- Evaluating the health of the American Martin population in the watershed
- Help structure adaptive management, so that as new information is gained in the Basin management practices can include this information
- Develop a stormwater monitoring program for the Lake Tahoe watershed

Impacts of Land Use on Water Quality in Lake Tahoe Watersheds
Prepared by Desert Research Institute for NDEP by Gayle L. Dana, Richard B. Susfalk, Paul Verburg
http://www.dri.edu

The goal of this study was to conduct a source assessment of nutrients and sediments in the Third and Incline Creek Watersheds in support of the Lake Tahoe TMDL. The primary objectives were to characterize sediment and nutrient loading from specific land uses and understand nitrogen (N) and phosphorus (P) transport pathways.

Suspended sediment loading was greatest from both watersheds during snowmelt events and was typically dominated by sediment originating from the undeveloped land use accounting for 41-45% of the total sediment exiting the Incline Creek watershed. The ski area and urbanized land uses each contributed between 25 to 32% of the whole watershed sediment load. The undeveloped land use also dominated Third Creek, contributing up to 72% of sediment load delivered directly to Third Creek. In addition to this 27,000 to 356,000 kg of suspended sediment delivered by Third Creek during yearly snowmelt, Rosewood Creek delivered another 45,000 to 109,000 kg to Third Creek just upstream of its discharge to Lake Tahoe. However, on a relative flux basis, suspended sediment delivery from the undeveloped land use was the lowest of all land uses studied. For example, suspended sediment fluxes from the undeveloped land use were between 38 to 73% lower than that from urban and ski area land uses within Incline Creek.

When normalized by the water flux, sediment mobilization from the urbanized land use during rain or snow events was typically five times greater than that from the undeveloped land use, compared to 15 times greater during rain events, on average. Nitrogen fluxes were decoupled from phosphorus fluxes in the Third Creek urbanized land use, as the highest total N fluxes occurred during the lower water year of 2005. This was in contrast to total P in both watersheds and total N in the Incline Creek urbanized area that had the greatest total nutrient fluxes in conjunction greater water fluxes.

Tahoe Stormwater Particle Assessment and Management for Urban and Roadway Runoff

Heyvaert, Alan C., DRI, Project period 09/02/2010 - 10/31/2012
Funded by USDA - Forest Service

Project Description

http://www.dri.edu/dhs-research-themes/3164-tahoe-stormwater-particle-assessment-and-management-for-urban-and-roadway-runoff

The urban portion of the watershed contributes about 70% of the fine sediment that is delivered to Lake Tahoe. These fine particles significantly affect water clarity in this otherwise pristine lake. Current pollutant reduction strategies are targeting their removal through erosion control and stormwater treatment projects. The investment of significant financial resources to improve the Lake's clarity require that our understanding of the sources, transport and potential for removal of these particles from urban stormwater be accelerated. The intent of this project is to add to our current, yet incomplete knowledge concerning fine particles. Specifically, this project will provide information to (1) help establish reliable, calibrated relationship(s) between turbidity, the mass of size fractionated suspended solids, and the number of <16 um micron particles in stormwater runoff, (2) provide details on mechanisms involved in the removal of fine particles in vegetated BMP treatment basins and (3) provide data on the efficiency of this type of commonly used BMP while giving recommendations for design characteristics to increase fine particle removal. The Lake Tahoe TMDL (Total Maximum Daily Load) program and associated efforts to improve lake clarity (e.g. EIP) will greatly benefit from increasing our understanding of fine sediment removal and how to measure success.

Lake Tahoe Divers Conservancy

http://www.alpengroup.org/tahoe-divers-conservancy

The Tahoe Divers' Conservancy (TDC) is a grassroots, community based, organization advocating for the protection of Lake Tahoe and other marine environments of the Sierra Nevada. The mission of the TDC is to document, study and conserve the complex marine environment that defines Lake Tahoe. Scientific research divers conduct on-going research and long term monitoring programs. TCD's advisory board is comprised of marine science experts who provide guidance and assistance on research projects. The TDC has been an active partner in the aquatic invasive species pilot removal projects. The group also conducts community underwater and beach cleanups, and maintains an active education and outreach events schedule.

Nevada 2012 Water Quality Integrated Report - published April 2014

http://ndep.nv.gov/bwqp/303dlist2012.htm

Every two years the Nevada Division of Environmental Protection is required by the Clean Water Act (CWA) to conduct a comprehensive analysis of water quality data associated with Nevada's surface waters to determine whether state surface water quality standards are being met and designated uses are being supported. Nevada's Integrated Report is prepared in accordance with the requirements of Sections 303(d)/305(b)/314 of the Clean Water Act and is intended for use by the public, other entities and NDEP for water quality management planning purposes. The Nevada 2012 Integrated Report (2012 IR) evaluates data collected over a 5 year period, between October 1, 2006 and September 30, 2011.

California 2012 Water Quality Integrated Report
http://www.swrcb.ca.gov/water_issues/programs/tmdl/integrated2012.shtml
Date: February 12, 2013
Subject: 2012 California Integrated Report [Clean Water Act Sections 303(d) and 305(b)] Update

The State Water Resources Control Board staff, in coordination with Regional Water Quality Control Board's staff and USEPA, has been working to assess the data submitted by all interested parties as part of the Notice of Solicitation dated August 30, 2010. Over 250 individual data sets, covering over 20,000 individual waterbody pollutant combinations and over 150,000 sample points, were received from sources including government agencies, municipalities, environmental groups, citizen groups, and National Pollutant Discharge Elimination System dischargers. Staff continues to work on the assessment of the data in order to create an accurate and scientifically defensible report. Due to the complex nature of this project, State Water Board staff anticipates that the data assessment work will be completed and available for Regional Board public review by the end of 2013 or early 2014. If you have any questions, please contact nmartorano@waterboards.ca.gov or 916-341-5290.

FIRES
Securing Funding for Fire Flow Needs
Since 2008, more than $3,000,000 in federal funds have been matched (50/50) by from partnership members. In 2016, Sustainable Community Advocates brought forth on behalf of TWSA and individual water suppliers, an initiative to Secure TRPA approval to add Specific Water Supply and Transmission Projects that Improve Firefighting Capability to the adopted list of Environmental Improvement Program (EIP) Projects (Expand Focus Area 02 – Forest Management).

The purpose of this request from the Tahoe Basin Fire Chiefs and members of the Tahoe Water Suppliers Association (TWSA) that TRPA formally add specific water supply and transmission projects that improve firefighting capability to the list of projects adopted in the Lake Tahoe EIP (Expand Focus Area 02 - Forest Management). Consistent with the provisions of TRPA Code Chapter 15, the TRPA Governing Board delegates to its Executive Director the authority to approve this request, so long as it meets the eligibility criteria set forth in Chapter 15. As of publication, this request is still pending.

As a result of the Angora Fire in 2007, emphasis was placed in the Tahoe Basin on developing adequate water supply and services to address fire flow needs. Public water systems in the Tahoe Basin were designed for daily, community water use needs; they were not designed to provide the continuous, high volume output of water needed for firefighting in the "wildland urban interface" which characterizes many Tahoe neighborhoods. TWSA members have been actively working to secure funding for infrastructure upgrades including: storage tank replacements, booster stations, interties between separate water systems, and emergency power systems to provide additional water supply in case of emergency.

Below is an example of recent projects and cost share on fire flow projects.
(Source: Lake Tahoe Fire Prevention Partnership: L. Nolan)

USFS Funding
Lake Tahoe Fire Prevention Partnership
NOTE: In some cases, actual project costs are estimates and rounded

2016 Funding (Local Match still pending but minimum of $800,000)

Agency	Total Budget Amount including 50% match	Actual Project Costs
STPUD - 2016/2017 Fire Hydrant Service Expansion Project	$ 636,734.00	
NTPUD -2016/2017 Dolly Varden Water Main Replacement Project	$ 175,742.00	
TCPUD - 2016/2017 The Bunker Tank Replacement Project	$ 215,786.00	
IVGID - 2017 Watermain Replacement & Fireflow Enhancement Project	$ 266,058.00	
IVGID - 2016 Watermain Replacement & Fireflow Enhancement PH II	$ 100,000.00	
KGID - 2016/2017 Standby Generator Installation Project	$ 114,136.00	
RHGID - 2016/2017 Fire Hydrant Replacement	$ 21,746.00	
Douglas -Cave Rock Lake Intake Improvements Project	$ 47,806.00	
Lakeside - Cedar/Park/Manzanita Water Line Extension	$ 5,992.00	
Admin	$ 16,000.00	
Totals	**$ 1,600,000.00**	**$ -**

2015 (some projects have not been implemented as yet) Local Cost Match $1,427,000

Agency/Project	Total Budget Amount including 50% match	Actual project costs
STPUD - Fire Hydrant Service Expansion Project	$ 797,048.00	$ 1,000,000
NTPUD - Dolly Varden Water Main Replacement Project	$ 222,280.00	$ 1,400,000
TCPUD - The Bunker Tank Replacement Project	$ 268,372.00	
IVGID - 2015 Watermain Replacement and Fireflow Enhancement Project	$ 457,744.00	
KGID - Waterline Replacements Project	$ 142,654.00	
RHGID - New Pump Soft Starts at Office Booster Station	$ 27,224.00	
Douglas - Lake Water System Improvements	$ 57,176.00	
Lakeside - Fire Hydrant Installation Project	$ 7,502.00	$ 27,000
Admin	$ 20,000.00	
Totals	**$ 2,000,000.00**	

2014 Local Cost Match $1,811,414

Agency/Project	Total Budget Amount including 50% match	Actual project costs
STPUD - Saddle/Keller Waterline Replacement	$ 526,556.00	$ 658,000.00
NTPUD - Cantebury Water Main Replacement Project	$ 146,134.00	$ 400,414.00
TCPUD - Upper Ellis Road Waterline Replacement Project	$ 158,224.00	$ 600,000.00
IVGID - 2014 Watermain Replacement & Fireflow Enhancement Project	$ 302,066.00	$ 600,000.00
KGID - Beverly Road & Virginia Drive Waterline Replacement Project	$ 94,244.00	$ 150,000.00
RHGID - New Upper Pressure Zone Water Storage Tank	$ 17,948.00	$ 35,000.00
Douglas - Cave Rock Water System-Upper Cave Rock Tank Rehab	$ 37,022.00	$ 65,000.00
Lakeside - Fire Hydrant Installation Project 2014	$ 4,806.00	$ 27,000.00
Admin	$ 13,000.00	$ 26,000.00
Totals	**$ 1,300,000.00**	**$ 2,561,414.00**

2013 Local Cost Match $3,878,351

Agency/Project	Total Budget Amount including 50% match	Actual project costs
STPUD (State Street Waterline Replacement)	$ 625,066.00	$ 2,000,000.00
NTPUD (Canterbury Water Main Replacement)	$ 172,578.00	$ 400,414.00
TCPUD (Tahoma Meadows Transmission Line Repl Ph2)	$ 174,272.00	$ 846,762.00
IVGID (2012 Watermain and Fireflow Enhancement Ph 2)	$ 358,038.00	$ 1,000,000.00
KGID (Beverly Rd & Virginia Dr Waterline Replacements)	$ 111,784.00	$ 224,175.87
RHGID (New Upper Pressure Zone Wtr Storage Tank Rplc)	$ 21,304.00	$ 50,000.00
Douglas (Upper Cave Rock Tank Rehab)	$ 45,952.00	$ 75,000.00
Lakeside (Fire Hydrant Installation Project 2013)	$ 5,706.00	$ 27,000.00
Admin	$ 15,300.00	$ 20,000.00
Totals	**$ 1,530,000.00**	**$ 4,643,351.87**

2012 Local Cost Match $3,671,208

Agency/Project	Total Budget Amount including 50% match	Actual project costs
STPUD (Wildwood Waterline)	$ 735,370.00	$ 1,500,000.00
NTPUD (Minnow Ave. Waterline Replacement)	$ 203,034.00	$ 326,409.00
TCPUD (Bunker Tank Replacement)	$ 102,513.00	$ 500,000.00
TCPUD (Grouse Waterline Replacement)	$ 102,513.00	$ 500,000.00
IVGID (2012 Watermain and Fireflow Enhancement Ph 1)	$ 421,222.00	$ 1,000,000.00
KGID (Jeff Lane and Linda Way Waterline Replacements)	$ 131,510.00	$ 341,799.78
RHGID (Zone 1 Water Storage Tank)	$ 25,064.00	$ 200,000.00
Douglas (Zephyr Knolls Waterline)	$ 54,062.00	$ 150,000.00
Lakeside (Sunrise & Hill Water Improvements Phase 2)	$ 6,712.00	$ 25,000.00
Admin	$ 18,000.00	$ 28,000.00
Totals	**$ 1,800,000.00**	**$ 4,571,208.78**

Fuels Plans for the Lake Tahoe Basin

Updated Lake Tahoe Basin Community Wildfire Protection Plan
http://www.nltfpd.net/whats-new/updated-lake-tahoe-basin-community-wilfire-protectin-plan/
Contact: John Pickett (775) 220-7675, Forester, Tahoe Douglas Fire Protection District

South Lake Tahoe, Calif. – An updated Lake Tahoe Basin Community Wildfire Protection Plan was presented to the public during the Lake Tahoe Environmental Summit on Monday, August 24, 2015. This new Community Wildfire Protection Plan was collaboratively developed by the 18 member organizations of the Tahoe Fire and Fuels Team (TFFT) and is the culmination of a three-year planning effort.

At last year's Lake Tahoe Summit, the TFFT presented the updated Lake Tahoe Basin Multi-jurisdictional Fuel Reduction and Wildfire Prevention Strategy, which provides a strategic framework for how land managers and the public work together to lessen the risk of loss from wildland fire. The strategy can be thought of as a business plan and agreement between the public and Tahoe agencies. The updated Community Wildfire Protection Plan is over 500 pages, including tables and maps, and is a comprehensive planning document, with specific prioritized projects and community actions that have been proven to effectively reduce wildland fire danger.

The Healthy Forest Restoration Act of 2003 created the concept of Community Wildfire Protection Plans. Prior to that time, fire planning was done by federal and state land managers, generally without a partner in the local community, because few community groups addressed fire hazard specifically. At that same time, federal and state agencies, such as the U.S. Forest Service and CAL FIRE, were under increasing budgetary pressures. Fire suppression costs began consuming increasingly large percentages of budgets, but home losses and acres burned continued to increase dramatically. The president and Congress worked together in a bipartisan manner to change course and give communities the tools and authority to take charge of their local risk and plan and implement projects to address that risk.

In 2004, the Nevada Fire Safe Council, Tahoe Regional Planning Agency, U.S. Forest Service, state agencies and local fire agencies produced Community Wildfire Protection Plans that served as the primary planning tool for fuels reduction projects around the Tahoe Basin. Projects implemented under the original plan have successfully kept fire starts small and enabled successful, and un-newsworthy, suppression. While there is clearly still great fire hazard in areas of the Tahoe Basin, much headway has been made.

Since the original Community Wildfire Protection Plans were written, wildland fires have resulted in catastrophic losses from South Lake Tahoe to Austin, Texas – but there were also successes. In fact, many communities that had taken steps to mitigate fire hazard have been entirely successful. The updated Community Wildfire Protection Plan incorporates the elements common to successful programs from across the country. Its goals are to:

- **Create fire-adapted communities:** The plan provides mitigation strategies and community-driven action plans to help create communities where citizens are engaged and active in preparing for wildfire. It facilitates interagency cooperation and strengthens communication and support between agencies and the public.
- **Restore and maintain fire-resilient landscapes:** The plan provides prioritized locations for fuel reduction treatments to enable land managers to effectively work across jurisdictions and address risks to ecosystems and communities at a landscape scale.

- **Provide effective and efficient wildfire response:** The plan provides strategic treatments on the landscape that will facilitate safer and more successful suppression. This plan provides for tracking, reporting, and sharing of both fuel reduction accomplishments and homeowner/community initiatives.

Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy 10-Year Plan
http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fsm9_046334.pdf
The USDA Forest Service Lake Tahoe Basin Management Unit (LTBMU) is lead agency for the *Lake Tahoe Basin Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy 10-Year Plan.*
This strategic Comprehensive Fuels Plan for the Lake Tahoe Basin incorporates approximately 208,800 acres. The plan was developed to comply with the White Pine County Conservation, Recreation and Development Act Of 2006; Public Law 109-432 (H.R. 6111).

The plan facilitates the strategic decisions that must be made by land management, fire and regulatory agencies to reduce the probability of a catastrophic fire in the Basin. It combines all existing fuel treatment plans that have been developed within the basin and provides a communication framework for participating agencies to identify priority areas and to work collaboratively on accomplishing those priorities. In addition, it builds upon current and past fuel reduction projects that have already occurred on nearly 13,000 acres and the efforts of community-based fire departments and fire safe councils that are actively treating fuels around residences.

Two fire councils, the Tahoe Basin Fire Safe Council and Nevada Fire Safe Council, provide resources to California and Nevada homeowners, respectively, to protect their property. Many of the participating local fire departments offer tree removal and thinning services to local residents. Education materials are also provided (TRPA 2005). The states, public land managers (excluding the US Forest Service) and local jurisdictions currently invest significant funding to the fuel reduction effort in the Lake Tahoe Basin.

During the term of the current situation, the communities of the Lake Tahoe Basin must undertake maximum efforts to secure long term funding to support ongoing maintenance. Until the current need for fuel reduction on state, municipal, and private lands is accomplished, the communities of the Lake Tahoe Basin, the environment, and lives of the Basin's residents and guests remain at risk. Significant and reliable funding is needed to complete fuel reduction projects on state, municipal and private property identified in the *Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy 10-Year Plan* for the Lake Tahoe Basin.

Lake Tahoe Basin Management Unit (LTBMU)
Most of the communities in the Lake Tahoe Basin are listed on the national federal registrar for communities at risk of catastrophic fire (LTEEC 2004). A majority of the land in the Tahoe Basin is owned by the US Forest Service, Lake Tahoe Basin Management Unit (LTBMU). LTBMU actively completes control burns annually to reduce the risk of a catastrophic fire in the Basin.
The Lake Tahoe Basin Management Unit prescribed burns are updated regularly at *http://www.fs.fed.us/r5/ltbmu/fire/current.shtml*.

Angora Fire 2007
The Angora Fire began on June 24, 2007 in the North Upper Truckee area in South Lake Tahoe, California and was fully contained on July 2, 2007. It burned in a particularly sensitive area: a watershed that provides a quarter of the water that runs into the lake. About 10 percent of the watershed was destroyed. The Angora Fire burned approximately 3,100 acres of land area in the southwest portion of the Lake Tahoe Basin, California. Undeveloped montane, mixed conifer forest habitat was the dominant land type within the burn area, but significant areas of urban development were also affected.

Angora Fire Effect on Water Supply
TWSA water purveyors have indicated no changes in raw water intake turbidity readings due to the Angora Fire. Unlike the east and north shores, the majority of South Lake Tahoe water supplies are fed from groundwater sources, which are less affected by erosion than the lake source intakes.

Lake Tahoe Basin Management Unit (LTBMU) Monitoring Strategy for the Angora Burn Area
http://www.fs.fed.us/r5/ltbmu/documents/angora-fire/angora_restoration/2009_Docs/Angora_Restoration_Prop_Action_02_11_2009_FINAL.pdf
In the immediate aftermath of the Angora Fire, the Lake Tahoe Basin Management Unit moved quickly to determine monitoring and assessment needs related to impacts on US Forest Service lands, as well as consequent effects to downslope and downstream resources. Monitoring questions and strategies were identified which would provide essential information to evaluate the impacts of the fire on forest resources and establish a baseline for evaluation of natural recovery and restoration efforts. These monitoring strategies are currently being evaluated as part of planning for the Angora Phase III Restoration Project. The current monitoring strategy is described in this document.
In addition to the studies undertaken by the Forest Service, a small number of studies by other organizations have been granted area access permits to allow researchers and other agencies' staffs to conduct their own research and monitoring efforts and/or to assist the USFS in its data collection efforts. The long term monitoring strategy will be defined as part of the environmental analysis conducted for the Angora Fire Restoration Project.

Formation of the California-Nevada Tahoe Basin Fire Commission
http://www.nltfpd.net/pdfs/TahoeBasinFireRpt_Findings.pdf
As a result of the Angora Fire, the California-Nevada Tahoe Basin Fire Commission was formed as a bi-state management planning committee, tasked with streamlining defensible space planning and fuels reduction projects, in the fall of 2007. The California-Nevada Tahoe Basin Fire Commission completed a comprehensive review of the laws, policies, and practices that affect the vulnerability of the Tahoe Basin to wildfires. The Commission also looked at the myriad of natural and human factors that make this Basin so unique, but also render it uniquely susceptible to the occurrence and deleterious impacts of wildfires.

Commission's findings relative to water quality
The unique water quality and clarity of Lake Tahoe is a natural resource of global significance and is dependent on protection from catastrophic wildfires in the Lake Tahoe Basin. Lake Tahoe is one of the three clearest lakes of its size in the world. The water quality of the Lake and its tributaries is fundamental to the scenic quality and global significance of the Lake Tahoe Basin, yet water quality depends on a fragile balance among soil, vegetation, and human impact. The focus of water quality protection in the Basin is to minimize human disturbance, and to reduce or eliminate the addition of pollutants that result from development or other disturbance. There is perhaps no single disturbance event with greater potential deleterious impact on the Lake than a catastrophic wildfire.

VIII. POLLUTION CONTROLS

General methods for controlling pollution in watersheds include: obtaining written agreements with public landowners; participation in regional planning efforts; public education; collaboration between watershed stakeholders and regulators, emergency response programs, and securing funding for watershed programs (EPA 2003).

The Tahoe Water Suppliers Association (TWSA) designs programs to meet EPA guidelines and local regulations.

This chapter is a summary of TWSA and Tahoe Basin regional agency control activities during the reporting year including: regulatory changes, environmental improvement projects, public education, mapping and spill reporting projects.

CA Drinking Water Program transferred from the Department of Public Health to State Water Board
http://www.waterboards.ca.gov/drinking_water/programs/index.shtml

Reorganization Summary
CA State policy declares that every human being has the right to clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes [AB 685 (Eng, Chapter 524, Statutes of 2012)].

The Administration had evaluated the current governance structure of the state's drinking water and water quality activities and concluded that aligning the state's drinking water and water quality programs in an integrated organizational structure would best position the state to both effectively protect water quality and the public health as it relates to water quality, while meeting current needs and future demands on water supplies.

With the Legislature's approval and appropriate legislation, this alignment was achieved by moving the Drinking Water Program from the Department of Public Health to the State Water Board on July 1, 2014.

The Administration's goal in transferring the Drinking Water Program is to align the state's water quality programs in an organizational structure that:

1) Consolidates all water quality regulation throughout the hydrologic cycle to protect public health and promote comprehensive water quality protection for drinking water, irrigation, industrial, and other beneficial uses;

DRINKING WATER PROGRAM / ADMINISTRATIVE STAFFING AT DEPARTMENT OF PUBLIC HEATH

Drinking Water Program Staffing	Number of Staff
Executive Division	15
Operator Certification	7
Drinking Water Technical (SRF)	40.5
Regulatory - Northern CA	77.5
Regulatory - Southern CA	104
ELAP	25
TOTAL Drinking Water Program	**269**

Administrative Staffing	Number of Staff
Administrative Staff	6
Legal Division	5
Legislation/Public Affairs	1
Information Technology	10
TOTAL Administrative Staff	**22**
TOTAL Permanent Staff	**291**

NOTE: The total number of Drinking Water Program staff includes 291 permanent staff positions as well as temporary help.

2) Maximizes the efficiency and effectiveness of drinking water, groundwater, and water quality programs by organizing them in a single agency whose primary mission is to protect water quality for beneficial uses including the protection and preservation of public and environmental health;

3) Continues focused attention on providing technical and financial assistance to small, disadvantaged communities to address their drinking water needs;

4) Consolidates financial assistance programs into a single state agency that is focused on protecting and restoring California water quality, protecting public health, and supporting communities in meeting their water infrastructure needs;

5) Establishes a one-stop agency for financing water quality and supply infrastructure projects;

6) Enhances water recycling, a state goal, through integrated water quality management; and

7) Promotes a comprehensive approach to communities' strategies for drinking water, wastewater, water recycling, pollution prevention, desalination, and storm water.

US EPA Regulatory Changes

Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule/ LT2ESWTR)
http://water.epa.gov/lawsregs/rulesregs/sdwa/lt2/index.cfm

The deadline for compliance was October 1, 2014. All TWSA members have achieved compliance, are in process towards compliance with regulatory extensions, or were exempted due to existing treatment processes. Information on TWSA member compliance is available in "Chapter V - Description of the Water Supply".

The USEPA developed the Long Term 2 Enhanced Surface Water Treatment Rule (LT2 rule/LT2ESWTR) to improve drinking water quality and provide additional protection from disease-causing microorganisms and contaminants that can form during drinking water treatment. Pathogens, such as *Giardia* and *Cryptosporidium*, are often found in water, and can cause gastrointestinal illness (e.g., diarrhea, vomiting and cramps) and other health risks. In many cases, water needs to be disinfected through the use of additives such as chlorine to inactivate (or kill) microbial pathogens.

Existing regulations did not require unfiltered systems to provide any treatment for Cryptosporidium. Although unfiltered systems maintain watershed control programs to protect water quality, recent national surveys have shown Cryptosporidium to be present in the sources of unfiltered systems. Without treatment, these Cryptosporidium will pass into the water distributed to consumers. Available data indicate that the average risk from Cryptosporidium in unfiltered systems is higher than in filtered systems, so that treatment by unfiltered systems is required to achieve comparable public health protection. Further, with available technologies like UV and ozone, treatment for Cryptosporidium is feasible for all unfiltered systems. Consequently, EPA is establishing requirements under the LT2ESWTR for all unfiltered systems to treat for Cryptosporidium, with the required degree of treatment depending on the source water contamination level.

Revised Total Coliform Rule (RTCR) – Final Rule
http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation_revisions.cfm

Public water systems (PWSs) and primacy agencies must comply with the revised requirements by April, 2016. Until then, PWSs and primacy agencies must continue complying with the 1989 TCR. On February 13, 2013, EPA published in the Federal Register the revisions to the 1989 TCR. EPA anticipates greater public health protection under the Revised Total Coliform Rule (RTCR). The RTCR:

- Requires public water systems that are vulnerable to microbial contamination to identify and fix problems; and
- Establishes criteria for systems to qualify for and stay on reduced monitoring, which could reduce water system burden and provide incentives for better system operation.

Revised Total Coliform Rule: A Quick Reference Guide (PDF)
EPA 815-B-13- 001, September 2013

The RTCR establishes a maximum contaminant level (MCL) for E. coli and uses E. coli and total coliforms to initiate a "find and fix" approach to address fecal contamination that could enter into the distribution system. It requires public water systems (PWSs) to perform assessments to identify sanitary defects and subsequently take action to correct them.

The Revised Total Coliform Rule
Date of Implementation: April 1, 2016 / Date of Regulation: February 13, 2013

EPA finalized the Revised Total Coliform Rule (RTCR). The RTCR maintains the purpose of the 1989 Total Coliform Rule (TCR) to protect public health by ensuring the integrity of the drinking water distribution system and monitoring for the presence of microbial contamination. EPA anticipates greater public health protection under the RTCR, as it requires public water systems (PWSs) that are vulnerable to microbial contamination to identify and fix problems, and it establishes criteria for systems to qualify for and stay on reduced monitoring, thereby providing incentives for improved water system operation.

The RTCR, as with the 1989 TCR, is the only microbial drinking water regulation that applies to all PWSs. Systems are required to meet a legal limit (i.e., maximum contaminant level (MCL)) for *E. coli,* as demonstrated by required monitoring. The RTCR specifies the frequency and timing of the microbial testing by water systems based on population served, system type, and source water type. The rule also requires public notification when there is a potential health threat as indicated by monitoring results, and when the system fails to identify and fix problems as required.

The entities potentially affected by the RTCR are PWSs that are classified as community water systems (CWSs) (e.g., systems that provide water to year round residents in places like homes or apartment buildings) or non-community water systems (NCWSs) (e.g., systems that provide water to people in locations such as schools, office buildings, restaurants, etc.); State primacy agencies; and local and tribal governments. The RTCR applies to approximately 155,000 PWSs that serve approximately 310 million (M) individuals.

The RTCR establishes a health goal (maximum contaminant level goal, or MCLG) and an MCL for *E. coli,* a more specific indicator of fecal contamination and potential harmful pathogens than total coliforms. EPA replaces the MCLG and MCL for total coliforms with a treatment technique for coliforms that requires assessment and corrective action. Many of the organisms detected by total coliform methods are not of fecal origin and do not have any direct public health implication.

Under the treatment technique for coliforms, total coliforms serve as an indicator of a potential pathway of contamination into the distribution system. A PWS that exceeds a specified frequency of total coliform occurrence must conduct an assessment to determine if any sanitary defects exist (a sanitary defect is defined by the RTCR as a "defect that could provide a pathway of entry for microbial contamination into the distribution system or that is indicative of a failure or imminent failure of a barrier that is already in place"); if any are found, the system must correct them.

What are the key provisions PWSs must comply with under the RTCR?

Provision Category	**Key Provisions**
Contaminant Level	• Addresses the presence of total coliforms and E. coli in drinking water. • For E. coli (EC), the Maximum Contaminant Level Goal (MCLG) is set at zero and the Maximum Contaminant Level (MCL) is based on the occurrence of a condition that includes routine and repeat samples. • For total coliforms (TC), PWSs must conduct a Level 1 or Level 2 assessment of their system when they exceed a specified frequency of total coliform occurrence. Other events such as an MCL violation or failure to take repeat samples following a routine total coliform-positive sample will also trigger an assessment. Any sanitary defects identified during an assessment must be corrected by the PWS. These are the treatment technique requirements of the RTCR.
Monitoring	• Develop and follow a sample siting plan that designates the PWS's collection schedule and location of routine and repeat water samples. • Collect routine water samples on a regular basis (monthly, quarterly, annually) and have them tested for the presence of total coliforms by a state certified laboratory. • Analyze all routine or repeat samples that are total coliform positive (TC+) for E. coli. • Collect repeat samples (at least 3) for each TC+ positive routine sample. • For PWSs on quarterly or annual routine sampling, collect additional routine samples (at least 3) in the month after a TC+ routine or repeat sample. • Seasonal systems must monitor and certify the completion of a state-approved start-up procedures.
Level 1 and Level 2 Assessments and Corrective Actions	• PWSs are required to conduct a Level 1 or Level 2 assessment if certain conditions indicate that they might be vulnerable to contamination, and fix any sanitary defects within a required timeframe.
Reporting and Recordkeeping	• PWSs are required to report certain items to their states. These reporting and recordkeeping requirements are essentially the same as under TCR with the addition of Level 1 and Level 2 requirements.
Violations, Public Notification (PN) and Consumer Confidence Report (CCR)	• PWSs incur violations if they do not comply with the requirements of the RTCR. The violation types are essentially the same as under the TCR with few changes. The biggest change is no acute or monthly MCL violation for total coliform positive samples only. • PN is required for violations incurred. Within required timeframes, the PWS must use the required health effects language and notify the public if they did not comply with certain requirements of the RTCR. The type of PN depends on the severity of the violation. • Community water systems (CWSs) must use specific language in their CCRs when they must conduct an assessment or if they incur an E. coli MCL violation.

Lead and Copper Rule
http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/index.cfm

Lead and copper enter drinking water primarily through plumbing materials. Exposure to lead and copper may cause health problems ranging from stomach distress to brain damage. On June 7, 1991, EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR or 1991 Rule).The treatment technique for the rule requires systems to monitor drinking water at customer taps. If lead concentrations exceed an action level of 15 ppb or copper concentrations exceed an action level of 1.3 ppm in more than 10% of customer taps sampled, the system must undertake a number of additional actions to control corrosion. If the action level for lead is exceeded, the system must also inform the public about steps they should take to protect their health and may have to replace lead service lines under their control.

Reduction of Lead in Drinking Water Act
Date of implementation: January 4, 2014 / Date of Regulation: January 4, 2011
Summary:
Amends Safe Drinking Water Act (SDWA) Section 1417 – Prohibition on Use and Introduction into Commerce of Lead Pipes, Solder and Flux.
• Modifies the applicability of the prohibitions by creating exemptions.
• Changes the definition of "lead free" by reducing lead content from 8% to a weighted average of not more than 0.25% in the wetted surface material (primarily affects brass/bronze).
• Eliminated provision that required certain products comply with "voluntary" standards for lead leaching.
• Establishes statutory requirement for calculating lead content.

Electronic Delivery of the CCR
http://water.epa.gov/lawsregs/rulesregs/sdwa/ccr/upload/ccrdeliveryoptionsmemo.pdf

EPA evaluated several electronic delivery methods to determine which forms meet existing CCR Rule requirements as a part of the CCR Rule Retrospective Review. The EPA interpretive memorandum SDWA – Consumer Confidence Report Rule Delivery Options, dated January 2013, clarifies the requirements of the CCR Rule associated with the delivery of the CCR. The memorandum's attachment, Consumer Confidence Report Electronic Delivery Options and Considerations, provides an overview of electronic delivery methods and describes approaches for community water systems that may want to implement electronic delivery.

Electronic Delivery
The EPA's CCR Rule Retrospective Review evaluated several electronic delivery methods and discusses in the attachment a framework for electronic delivery methods that meet existing CCR Rule requirements. The EPA has identified two different approaches allowable under the current rule that a CWS could use in providing electronic delivery of CCRs to its bill-paying customers: 1) paper CCR delivery with a customer option to request an electronic CCR, or 2) electronic CCR delivery with a customer option to request a paper CCR. CWSs should consider a combination of delivery methods (described in the memorandum's attachment) for their CCRs based on available technology and the preferences of their customer base. The attachment to this memorandum provides important considerations for CWSs that choose to implement CCR electronic delivery. The EPA recommends that CWSs provide options for their customers that are cost-effective and practicable for the CWS, as well as convenient and understandable for their customers. Because this is a new and rapidly changing environment, the EPA recommends that primacy agencies reach out to their CWSs and provide assistance to ensure that methods of electronic delivery being considered by CWSs meet CCR Rule requirements.

Shifting / Reduced Economic Funding for Restoration Projects
Projects and studies used to understand, analyze and mitigate environmental problems such as storm water runoff and aquatic invasive species requires large amounts of funding. Prior to 2011, Lake Tahoe had a significant influx of federal money (often matched with state and local government funds) coming in to support an array of research projects, environmental improvement and capital improvement projects. Although not immediately apparent, since several large projects are being completed from prior funding, loss of federal funding signals a drastic slow down in water quality improvements for the region.

This influx of funding had decreased drastically, with a major loss being Tahoe Restoration Act funding for multiple years. The U.S. federal government has not renewed the Act for 4 years. Funding from the Southern Nevada Public Lands Management Act (SNPLMA) has greatly reduced with the economic downturns of 2008-2011 and drop in real estate process and transactions. There is now an increased emphasis on private-public partnerships to accomplish restoration goals.

2016: Tahoe Restoration Act is Funded Again
http://www.keeptahoeblue.org/news/opinion-pieces/Congress-passes-the-Lake-Tahoe-Restoration-Act

In December of 2016, President Obama signed legislation that included the Lake Tahoe Restoration Act, authorizing $415 million for restoration, research and aquatic invasive species and wildfire prevention at Lake Tahoe. The Act has been a keystone of the effort to protect and restore Lake Tahoe's clarity.

The League to Save Lake Tahoe strongly supported this legislation, which follows action by California and Nevada to renew their commitment to cooperation on Lake Tahoe's environmental goals, without which continued public funding may have been impossible.

The U.S. Senate joined the U.S. House of Representatives in passing the Water Resources Development Act, which included the reauthorization of the Lake Tahoe Restoration Act. The following is a statement by Darcie Goodman Collins, PhD, the executive director of the League to Save Lake Tahoe: “This is a great day for Lake Tahoe. We are thrilled that Congress has passed the full Lake Tahoe Restoration Act, intact with the protections we supported. We are grateful for the hard work of our Senate delegation under the sponsorship of Nevada Senators Dean Heller and Harry Reid and California’s Senators Dianne Feinstein and Barbara Boxer. This landmark legislation will provide over $400 million in critical public funds for environmental restoration projects, the control of aquatic invasive species and to reduce the threat of catastrophic wildfire. Once signed by President Obama, this legislation will allow essential actions to protect Lake Tahoe to move ahead, increasing the likelihood that we’ll be able to Keep Tahoe Blue now and for future generations.”

The Tahoe Fund
www.tahoefund.org
The Tahoe Fund, established in 2010, has stepped up as a public-private partnership proponent; seeking to raise funds from private donations and investors, in order to keep to fund critical environmental, recreation and improvement projects going in the Tahoe Basin. The Tahoe-based organization’s goal is providing funding for conservation, recreation and stewardship education projects at Lake Tahoe. TWSA partnered with the Tahoe Fund on a Bottom Barrier Challenge to raise the funds to complete the Tahoe RCD bottom barrier inventory for 5 acres of lakewide treatment.

Tahoe Beach Apps
Looking for a public beach in Tahoe? Now there is an app for that! The Tahoe Fund, in partnership with the California Tahoe Conservancy’s Tahoe License Plate Program, funded the creation and development of the Tahoe Beaches App to help residents and visitors find their way to more than 50 public beaches around Lake Tahoe. The Lake Tahoe Beaches app uses GPS to help you find nearby beaches and driving

directions. You can search for beaches by beach features, including: Accessibility, Barbecues, Boat Rentals, Campfires, Campsites Nearby, Fishing Nearby, Food Concessions, Group Facilities, Overnight Parking, Paddleboard/Kayak, Jet Ski Rentals, Pets OK, Picnic Tables, Playground, Public Bathrooms, Public Transit Nearby, Shade Available, Showers and Volleyball Courts. Each beach has its own profile with helpful information such as: photos, hours of operation, parking info, contact info, nearby transit, directions, ways to help take care of the environment and a full description.

Tahoe Fund Project Portfolio
The Project Portfolio contains projects selected by the Tahoe Fund Board of Directors for funding. The Tahoe Fund is dedicated to educating the general public on the environmental issues facing restoration efforts at Lake Tahoe and to raising funds to support EIP (Environmental Improvement Program) projects that protect the natural environment. The Tahoe Fund provides support for projects in all EIP program areas, but generally focuses its efforts in three areas: Conservation, Recreation, and Education. A full inventory of projects has been developed and is available on the website: *http://www.tahoefund.org*

In 2016 The Tahoe Fund introduced the Tahoe Fund Environmental Venture Trust, a new approach to philanthropy in Tahoe. Like a traditional venture capital fund, the Tahoe Fund Environmental Venture Trust will provide seed funding for a variety of innovative early-stage environmental projects that will help solve the environmental challenges facing Lake Tahoe. The returns will be purely philanthropic. By providing early-stage funding we can help kick start innovative pilot projects and get new projects off the ground.

Risk is inherently involved in venture funding, but the rewards can be incredible. Through our Projects Committee, we will closely vet new project ideas utilizing the following principals:

- The greatest possibility to improve the Tahoe environment and to attract significantly more funds in the future.
- Projects deemed to have good potential that have no other source of funding for this early-stage.
- To avoid projects that could be perceived as controversial or that duplicate any other project resources in the Tahoe Basin.

The seed investments will be modest in size. We will look for projects with great capacity for leverage of the initial seed funds through future public funding sources. It is possible as the projects advance they could also be considered for greater fundraising efforts by the Tahoe Fund.

Aquatic Invasive Bottom Barrier Challenge
http://www.tahoefund.org/our-projects/active-projects .

Partner: Tahoe Resource Conservation District, Tahoe Water Suppliers Association
Total Project Cost: $52,500 / Tahoe Fund Goal: $26,250 / TWSA Match = 1/1 to Tahoe Fund

In 2017, the Tahoe Water Suppliers Association collaborated with the Tahoe Fund on a “Bottom Barrier Challenge”, offering up to $26,000 of matching funds to private donations. The joint fundraising project for bottom barrier mats was launched in June 2017 as a Tahoe Fund Project, closing on Dec. 31, 2017. http://www.tahoefund.org/our-projects/active-projects .

Aquatic invasive plants are affecting water quality around the shoreline of Lake Tahoe. Through a well-coordinated program, the Tahoe Resource Conservation District has been able to remove aquatic invasive weeds with the use of bottom barriers and diver-assisted hand pulling. The current inventory of bottom barriers is 1.6 acres short of the maximum 5 acres of coverage permitted for Tahoe. The Tahoe Water Suppliers Association has issued a matching challenge to purchase the remaining 175 barriers that would

bring the inventory to the full 5 acres. They will match every dollar that Tahoe Fund raises between now and the end of 2017. With the full inventory of mats, we can ensure more aquatic invasive weeds are removed from the Lake and water quality is improved."

Other Current Tahoe Fund Projects:

UV Light Pilot Project
http://www.tahoefund.org/our-projects/active-projects/uv-light-pilot-project/

Partners: Tahoe Resource Conservation District, Inventive Resources Inc., California Tahoe Conservancy
Total Project Cost: $270,000 / Tahoe Fund Grant: $10,000

In an effort to spur innovation in Tahoe, the Tahoe Fund provided the initial funds for a project that will evaluate UV light as a new method to remove aquatic invasive weeds. This innovative approach will be used in a pilot program at Lakeside Marina & Beach and could change the way aquatic invasive weeds are controlled in Tahoe's watershed and beyond if successful.

Aquatic invasive weeds are a serious threat to the crystal clear waters of Lake Tahoe. Aquatic invaders such as Eurasian watermilfoil and curly-leaf pondweed have already established in the Lake. These non-native species change the natural make-up of the waters and threaten to significantly reduce the recreational use of the Lake and surrounding rivers.

A $5,000 grant to the Tahoe Resource Conservation District from the Tahoe Fund's Environmental Venture Trust helped secure $260,000 in public funding from the California Tahoe Conservancy to get the project started this year. An additional $5,000 grant will provide underwater cameras to monitor the effectiveness of the UV light.

Tahoe Fund 2018 Signature Projects

July 6, 2018 by Rachel Horton

Projects include Desolation Wilderness Trail Restoration, Kings Beach Trail Transformation & Sugar Pine Plantings

INCLINE VILLAGE, Nev. And TAHOE CITY, Calif. – July 6, 2018 – The Tahoe Fund is kicking off its 2018 fundraising season with the announcement of three new Signature Projects that will help improve outdoor recreation in the Basin while restoring Tahoe's environment. The projects include Tahoe Rim Trail restoration in Desolation Wilderness that will improve usability and safety; transformation of the Kings Beach Trail into a multi-feature trail; and the planting of 10,000 sugar pine seedlings around Lake Tahoe.

"It's never been more critical to help fund key environmental projects that have a real impact on the Basin," said Tahoe Fund Board Chair Katy Simon Holland. "It's exciting to see these projects come to life through the passion and support of people who care deeply about this area."

Desolation Wilderness, one of the most scenic hiking and backpacking destinations on the Tahoe Rim Trail, has been severely impacted from increased use combined with extreme weather events. Donations to this Tahoe Fund project will benefit the Tahoe Rim Trail Association to rehabilitate a section of the trail, improve safety for trail users and reduce the flow of sediment into alpine lakes and streams. Every dollar given to this unique project will be matched up to $40,000 through the end of 2018.

The Tahoe Fund has a goal to raise $15,000 to benefit the Kings Beach Trail project, which aims to transform a current Off-Highway Vehicle trail with major erosion issues into a multi-feature trail for use by mountain bikes, motorbikes, hikers and equestrians. In partnership with the Tahoe Area Mountain Bike Association, the U.S. Forest Service, the Truckee Tahoe Airport and the North Tahoe Public Utility District, the newly designed trail will help prevent the flow of sediment from the eroding trail into Griff Creek and Lake Tahoe.

The Tahoe Fund's third Signature Project will help bring new life to the forest, with a goal of raising $15,000 for the Sugar Pine Foundation in an effort to plant 10,000 sugar pine seedlings around the Basin. Volunteer plantings are scheduled at the Emerald Fire and Angora Fire scars as well as Spooner Summit, Sand Harbor, Tahoe Vista and along the new Incline Village bike path.

To learn more about the Tahoe Fund and how you can get involved in their projects, please visit tahoefund.org.

Previous and Ongoing Tahoe Fund Projects:
"Tahoe In Depth"
Tahoe Fund is proud to sponsor "Tahoe In Depth", an award winning environmental newspaper that reports on environmental improvement projects around the Basin. Published twice a year, Tahoe In Depth reaches over 40,000 homeowners with information from some of the 50 partners working to restore the health of the Tahoe environment. (Editor Note: TWSA is also a sponsor.)

"Take Care" Campaign
Litter. Dog poop. Unsafe fires. Bear safety. These are just some of the issues impacting our region. The Tahoe Fund, in partnership with the Lake Tahoe Outreach Committee, developed the Take Care™ campaign to help reduce these impacts and promote a more responsible use of our great outdoors.

In 2015, TWSA commissioned "Drink Tahoe Tap" graphics for this campaign.

The campaign was designed for use in outreach efforts by public agencies, private businesses and nonprofit organizations in the Region. Aimed at residents and visitors. The initial launch includes messages for the 2015 summer season: general litter, cigarette butts and beer bottle litter, dog waste, fire safety, bear awareness, and aquatic invasive species prevention. A Take Care Toolkit featuring the digital files for all of the messages is now available to download for free at takecaretahoe.org.

"We held a workshop in September 2013 with more than 60 regional stakeholders to address these issues," said Amy Berry, Tahoe Fund CEO and member of the Lake Tahoe Outreach Committee. "We heard loud and clear that a unified stewardship brand was needed to bring the region together to elevate our messages and see the biggest impact. We are thrilled to finally make the materials available to our regional partners for use in their outreach efforts."

Incline to Sand Harbor Bike Path
Partners: Tahoe Transportation District, NV State Parks, Tahoe Regional Planning Agency, Nevada Division of State Lands, US Forest Service, Incline Village General Improvement District, Washoe County, Nevada Department of Transportation, Federal Highway Administration / **Goal:** $750,000
This three mile ADA accessible bike path from the edge of Incline Village to the entrance of Sand Harbor State Park will create an incredible recreational amenity for the Incline Village Community. The 10-foot wide paved trail will begin at the Tunnel Creek Café and travel for one mile on the mountain side to Tunnel Creek and Hidden Beach. The next phase of the path will then travel to Memorial Point and then onward to the entrance of the Park. It will provide unparalleled pedestrian and bike access to the east shore of the lake while significantly improving the safety of the Route 28 corridor.

Tahoe City Aquatic Invasive Weed Removal
Lead: Tahoe Resource Conservation District
Partners: Tahoe Regional Planning Agency, California Department of Parks and Recreation, Truckee River Watershed Council **Goal:** $50,000
This project includes control and removal efforts for aquatic invasive plants (Eurasian Watermilfoil) to restore the near shore environment back to its original pristine manner. Aquatic plant removal occurred on public lands along the north shore of Tahoe, specifically at the mouth of the Tahoe City Dam and down the Truckee River.

Ski Run Channel Invasive Weed Removal
Lead: Tahoe Resource Conservation District
Partners: Tahoe Regional Planning Agency, California Department of Parks and Recreation, California Tahoe Conservancy **Goal:** $15,000
The Ski Run Channel in South Lake Tahoe is infested with Eurasian watermilfoil and curly-leaf pondweed, aquatic invasive plants that threaten the clarity of the Lake. The high volume of traffic through the channel, notably commercial daily cruises to Emerald Bay, spread the invasive plants to other pristine areas of the Lake. This project will treat and remove these hazardous weeds to restore the near shore clarity around the Lake.

Tahoe Fund Environmental Education Fund
Partners: Environmental stewardship programs and organizations in the Tahoe Basin **Goal:** $25,000
The Tahoe Fund believes strongly in the need for environmental stewardship of the Lake Tahoe Region to help ensure the long-term preservation of the Lake among our current and next generations. The magnificent environment of Tahoe creates a wonderful opportunity to create lifelong environmental stewards in the Basin and beyond. Through the Environmental Education Fund, the Tahoe Fund will provide grants to projects and programs that educate and inspire both children and adults to take care of Tahoe's environment.

2013 Tahoe Fund Projects:
Emerald Bay Asian Clam Control Project
Tahoe Fund Goal: $30,000 / Total Project Cost: $75,000
Project Partners: California State Parks, UC Davis, Lahontan Water Quality Control Board, Tahoe Resource Conservation District
Lead Agency: Tahoe Regional Planning Agency
Within Emerald Bay, a small, fast-multiplying invader known as the Asian clam threated to overwhelm the near shore ecosystem of this world-famous inlet. In 2012, a team of scientists and divers covered approximately 5 acres of the lake bottom with black rubber matting to smother the clams by cutting off their oxygen supply. It was the largest Asian clam control project in the lake's history and the first time the technique, developed by UC Davis researchers, has ever been tried on this scale. Because the clam population was still small and isolated, the project could completely remove the remaining population from Emerald Bay and help control its spread to other areas of Lake Tahoe.

West Shore Bike Trail
Tahoe Fund Goal: $25,000 / Total Project Cost: $1,557,900
Project Partners: North Lake Tahoe Resort Association, Placer County Parks, California Tahoe Conservancy
Lead Agency: Tahoe City Public Utility District
The West Shore Bike Trail Project was the critical "missing link" in the popular west shore network of bike and pedestrian trails connecting Squaw Valley, Tahoe City, and Tahoma. The trail now ends in the Homewood area, where bikers and runners are forced onto the narrow shoulders of Highway 89. The Tahoe City Public Utility District and the California Tahoe Conservancy built this one mile segment in coordination with Caltrans' plans to install new stormwater improvements along the highway. Once this

segment is completed, visitors and residents will be able to enjoy a continuous 20-mile network on the west shore, linking parks, stores, restaurants, and neighborhoods along Lake Tahoe and the Truckee River.

Angora Creek Bridge Replacement
Tahoe Fund Goal: $15,000 / Total Project Cost: $30,000
Lead Agency: California Department of Parks and Recreation (CA State Parks)
Angora Creek, a tributary of the Upper Truckee River, flows through the high meadows and conifer forests of Washoe Meadows State Park near Meyers, CA. The creek has been the site of several recent projects to restore damage caused by historic grazing practices, road and sewer construction, and the 2007 Angora fire. A new meandering channel now supports thriving fish and plant communities. The new bridge protects the river and lake and serves as a hub for hikers, bikers, birders, and other visitors to this jewel of Tahoe's south shore.

Sand Harbor Beach Improvements
Tahoe Fund Goal: $35,000 / Total Project Cost: $207,507
Project Partners: Nevada Division of State Parks Recreation Trails Program, Nevada Div. of State Lands
Lead Agency: Nevada Tahoe Resource Team/Nevada State Parks
Situated within Lake Tahoe Nevada State Park, Sand Harbor is perennially the most popular summer recreation destination amongst all of Nevada's State Parks. Each year, nearly one million visitors will enjoy Sand Harbor and its spectacular surroundings. Some will use the Park as a launch spot for a day of boating or kayaking, while others may choose a family day at the beach or an evening of entertainment at the Lake Tahoe Shakespeare festival. The unique beauty of Sand Harbor – and its stunning views to the Lake – makes it one of the most photographed locations at Tahoe. Protecting the fragile beach environment, while providing a high quality recreational experience, is a constant priority and challenge for Nevada State Parks. The Sand Harbor Beach Improvements Project was designed to do both. The project replaced antiquated infrastructure and provides three new access points that will connect the parking area to the beach and eliminate erosion issues along the sand bluffs. Newly designed overlooks will provide ADA access to allow those with certain abilities to enjoy views of the beach and Lake Tahoe, and a new ADA accessible path approved access to the shores of Tahoe itself.

2012 Tahoe Fund Projects:
Blackwood Creek Restoration/Eagle Rock Trail, West Shore
Raised: $30,100
Lead Agency: California Tahoe Conservancy
The Lower Blackwood Creek and Eagle Rock Restoration Project restores one of Tahoe's most impaired watersheds and created a spectacular new trail on the lake's west shore, just five miles south of Tahoe City. The project is the final piece of a comprehensive interagency effort to restore the watershed. Blackwood Creek contributes over 1900 tons of fine sediment per year to Lake Tahoe, more per unit of area than any other watershed in the Tahoe Basin. Through a collaborative effort led by the California Tahoe Conservancy, the creek and its riparian areas was restored, fish and wildlife habitat improved, and an interpretive kiosk installed. A new trail was also built to the summit of Eagle Rock, providing a 20-minute walk to stunning views of nearly all of Lake Tahoe.

Lake Tahoe Summits 2009-2017
Nevada and California federal representatives gather at the shores of Lake Tahoe annually every August, to discuss ongoing progress in restoration efforts. The Lake Tahoe Summit is now in its 20th year The Lake Tahoe Summit is an occasion to reinvigorate problem solving efforts and to build pragmatic, strategic partnerships. TWSA is a sponsor of this event providing water stations and refillable bottles to all attendees.

2018 Lake Tahoe Summit: Recommitting to collaboration
https://carsonnow.org/story/07/19/2018/lake-tahoe-summit-2018-recommitting-collaboration
By Joanne S. Marchetta

Nearly 25 years ago, the Tahoe Regional Planning Agency and dozens of partners embarked on an unprecedented mission to conserve and restore the Lake Tahoe Basin's treasured natural resources through the Lake Tahoe Environmental Improvement Program.

That partnership has continued to grow. Today, the EIP is one of America's most ambitious and successful landscape-scale restoration programs, with more than 50 local, state, federal, nonprofit, and private sector partners completing projects that improve Lake Tahoe's forests, streams, wildlife habitat, water quality, and public recreation opportunities.

As the annual Lake Tahoe Summit approaches on Aug. 7, hosted this year by U.S. Sen. Dean Heller (R-NV), now is the time to reflect on the challenges and successes of this "epic" collaboration and recommit to working together to face the most difficult issues like climate change. This year's summit follows the news that Tahoe's famous water clarity in 2017 fell to the lowest levels ever recorded. The end of the most severe drought in a millennium followed by the wettest winter on record and record summer temperatures all combined to reduce the lake's average annual water clarity to 59.7 feet.

But one bad year does not make a trend. We continue to make major progress on restoring Tahoe's clarity to its historic level of nearly 100 feet by reducing stormwater pollution from roads and urban areas and restoring streams, meadows, and wetlands that play a critical role in the watershed's health.

There are many challenges in front of us. But heading into this year's summit the Lake Tahoe Region can take stock of what we have accomplished together.

This summer marks the 10th anniversary of Lake Tahoe's Aquatic Invasive Species Program. Over the last decade, watercraft inspections have successfully prevented the introduction of any new aquatic invasive species in the lake. With the inspection program keeping new invasive species out of the lake, collaborating partners are completing more projects to control populations of aquatic invasive species that found their way into the lake decades ago.

Last year, partners treated 14.5 acres of the lake for Asian clams and aquatic invasive plants — a new record for the number of treatments in one year at Lake Tahoe. And we are working with both the public and private sectors to expand Tahoe's aquatic invasive species control program, testing new treatment technologies like ultraviolet light and securing funding to make continued headway on this important issue.

Over the last two decades, basin fire agencies have treated more than 70,000 acres of forest to thin out brush and other hazardous fuels in the wildland urban interface areas that surround Lake Tahoe communities, with more than 50,000 acres of forest treated since the devastating Angora Fire in 2007.

Fire management partners are working to complete the first round of fuel reduction in all 117,000 acres of wildland urban interface at Tahoe within the next 10 years and working with communities to create defensible space and improve wildfire preparedness through the Tahoe Network of Fire Adapted Communities Program.

TRPA and partners on the Tahoe Fire and Fuels Team are also working to expand this forest health work into the broader landscape through the Lake Tahoe West Restoration Partnership. This groundbreaking project is focused on restoring forest resilience to drought, insect attacks, and climate change in 60,000 acres of Tahoe's West Shore, an area spanning from Emerald Bay to Squaw Valley. Last summer, project partners completed a resilience assessment of West Shore forests. We are now working on a restoration strategy to accelerate forest health and fuel reduction projects in this area and incorporate water quality and recreation improvements to restore one of Lake Tahoe's most iconic landscapes and create a model we can use for other parts of the basin.

Much more progress is on the horizon for the Lake Tahoe Region. TRPA and its transportation and recreation partners are working on a corridor management plan for state Route 89 to improve traffic congestion, parking, and public recreation access in the heavily visited Emerald Bay area and to develop a Tahoe Basin Sustainable Recreation Strategy.

Partners have brought new bike share and micro-transit services to Lake Tahoe and started construction on several major transportation projects, including the Fanny Bridge Community Revitalization Project in Tahoe City, the Incline to Sand Harbor Bike Path, and new bike paths at Dollar Point and Meeks Bay. With the recent public acquisition of Johnson Meadow, we are looking forward to vastly expanded restoration of Lake Tahoe's largest tributary, the Upper Truckee River.

With continued collaboration, Lake Tahoe can meet its major challenges head on in the next quarter century, from a changing climate to continued population growth in neighboring metropolitan areas and increased visitation from those areas.

2017 Tahoe Summit - Combatting the effects of climate change in the Lake Tahoe Basin
http://sanfrancisco.cbslocal.com/2017/08/22/tahoe-summit-points-up-new-environmental-challenges-at-lake/

LAKE TAHOE (KPIX 5) — 20 years after the first Tahoe Summit, a new meeting to evaluate the environmental state of the lake and region around it has resulted in a mixed report card. On one hand, visitors are doing a better job of keeping pollution and sediment out of the lake, finally halting that long-term decline in lake clarity. "So Tahoe today is healthier and more resilient because we never shied away from a challenge," said Joanne Marchetta of the Tahoe Regional Planning Agency. But now Lake Tahoe faces a new challenge staying blue.

"It is warming 10 times faster than it did in history. Global warming is affecting this lake," said Sen. Dianne Feinstein. That warmer water makes it easier for algae to grow. And with the warm summer season having increased by 26 days over the last 50 years, there is also evidence of greater threats on land. "The fill-in of our forest — and the fire potential — and the actual fires that take place," said Feinstein.

On that front, multiple agencies will start tackling the some 136,000 dead trees in the Tahoe Basin and get more aggressive with forest management. That is something Republicans have wanted for years. "We've certainly turned the corner, the management tools are now in place, and we must use them with the urgency that our forest conditions demand, and pray that we're not too late."

But the real focus Tuesday was on climate change, a challenge that extends far beyond Tahoe's shoreline. "The proverbial ground on which we stand continues to shift, and the change we confront today is in fact much larger than Tahoe. This change quite literally is global," said Marchetta.

One threat officials have managed to control pretty well so far is invasive species like weeds, clams and mussels. That's why they've inspected and decontaminated tens of thousands of boats. But one species that is coming in greater numbers is humans. Three million people now visit Tahoe every year. That number is expected to surge and will require management as well.

Opinion: Addressing the challenges of climate change at 2017 Tahoe Summit

Sen. Dianne Feinstein & Joanne Marchetta

August 24, 2017

http://www.sierrasun.com/news/opinion/opinion-addressing-the-challenges-of-climate-change-at-2017-tahoe-summit/

Twenty-one years ago, President Clinton came to Lake Tahoe to announce a major environmental restoration effort. That first Lake Tahoe Summit launched an unprecedented public-private partnership that has since invested more than $2 billion to save the lake. Over two decades, through the Environmental Improvement Program, the Tahoe Partnership has created one of the nation's most ambitious and successful environmental restoration and conservation programs. In fact, according to Lake Tahoe scientists, had this partnership not formed, lake clarity could be nearly 20 feet worse than it is today.

While the lake and its forests are healthier now from this work, we must double-down on our effort in the face of threats from climate change. Earlier this month, the Tahoe Environmental Research Center at UC Davis released its annual report on the state of Lake Tahoe. The report is a clarion call-to-action for all who love this lake.

While the report makes it clear our investments are having a positive effect, climate change is having a profound impact on the Lake Tahoe Basin. Climate change is also making the existing challenges in the Tahoe Basin harder to address. One of the most notable effects of climate change is the rising temperature of the lake. Surface temperatures are rising at half a degree each year — 14 times faster than the historical average. We know that rising temperatures make it easier for algae to grow.

Partners around Tahoe are reducing stormwater pollution that harms lake clarity and helps fuel algae growth. Over the last five years, we have reduced clarity-harming fine sediment pollution by 12 percent, and reduced phosphorus and nitrogen pollution, nutrients that spur algae growth, by 8.5 percent and 6 percent, respectively. That's more than 268,500 pounds of fine sediment that is no longer washing into the lake each year. This important work to protect and restore Lake Tahoe's clarity and Keep Tahoe Blue must not only continue, it must accelerate to protect the lake's water quality from climate change.

The problems aren't only in the water. Lake Tahoe is experiencing longer summer seasons, affecting the delicate ecosystems around the lake. The hot summer season has increased by 26 days over the last 50 years. Longer, hotter summers and more severe droughts are killing trees around the lake at an alarming rate. The U.S. Forest Service estimates there are 136,000 dead trees in the Tahoe Basin. While we've made progress thinning forests and removing the overabundance of fuel for forest fires, drought and climate change continue to stress Tahoe's forests. We must do more to improve the health and resilience of Tahoe's forests and prepare our communities for wildfire.

Climate change is happening now, and we must act. Facing a seemingly impossible challenge 20 years ago, this community came together to save the lake. We believe we can again.

Of course, addressing climate change will require a global effort. But with all our success over the last two decades, the world already looks to Lake Tahoe as proof that environmental change for the better is possible. This is our opportunity to continue to lead on an international stage.

We must keep working together to solve the problems of climate change — not just globally but right here in Lake Tahoe. We must strike at the heart of the issues detrimental to the lake. This is going to require continued and increased focus on forest management and wildfire preparedness, the control — if not eradication — of invasive species, and finding more ways of reducing the amount of nutrients flowing into the lake.

Transportation is another key issue we must address. Car emissions threaten both air and water quality. We can reduce that traffic by expanding public transportation and biking options. Just like two decades ago, the federal government is ready to help with those efforts. Last year, we passed the Lake Tahoe Restoration Act, which reauthorizes $415 million of federal funding over the next seven years to fund programs vital to the lake's health.

This is an important commitment, but only one piece of the puzzle. On Tuesday, Aug. 22, we held the 21st Lake Tahoe Summit at the Tallac historic site in South Lake Tahoe. All four senators from California and Nevada were joined by supporters of the lake from the public and private sector, including representatives from the federal, state and local levels of government. A keynote address was delivered by former Secretary of the Interior Bruce Babbitt, who served under President Clinton during the first summit.

The summit was a chance to celebrate all we've accomplished to restore Lake Tahoe. It was also a chance for the public-private partnership formed 20 years ago to recommit its efforts toward solving the problems created by climate change. Tahoe is ready to meet this new challenge. We hope you will join us.

2016 Lake Tahoe Summit: A Time to Reflect
http://www.npr.org/sections/thetwo-way/2016/08/31/492177267/obama-at-lake-tahoe-praises-conservation-efforts

This year's summit was hosted by retiring Nevada Sen. Harry Reid and Sens. Barbara Boxer and Dianne Feinstein of California were also in attendance. The summit brings together lawmakers on all levels that are committed to protecting North America's largest alpine lake, according to the summit website. The Obama administration announced a number of Lake Tahoe-centric conservation efforts ahead of his remarks, including private-public investments and a recommitment to the Salton Sea. During his remarks, Obama noted that both he and Reid will soon be parting ways with their offices in Washington, though he said both would remain committed to the cause.

Against the backdrop of the picturesque Lake Tahoe, President Obama said environmental conservation is a key part of fighting the impact of global warming.

Obama spoke on the first of a two-day environmental tour at an annual summit designed to keep the health of Lake Tahoe a priority for the federal government and the states it borders, Nevada and California.

"We embrace conservation because healthy and diverse lands and waters help us build resilience to climate change," the president said. "We do it to free more of our communities and plants and animals and species from wildfires, and droughts, and displacement. We do it because when most of the 4.5 million people who come to Lake Tahoe every year are tourists, economies like this one live or die by the health of our natural resources."

The president then quoted an unnamed former leader of the Washoe Tribe (which has called Lake Tahoe home for thousands of years): "The health of the land and the health of the people are tied together, and what happens to the land also happens to the people."

Lake Tahoe, sometimes called "the Jewel of the Sierra", is 22 miles long and 12 miles wide. It contains so much water that if it were emptied it would cover the entire state of California with one foot of water.

Its stunningly clear, cobalt-blue water is legendary. Mark Twain wrote of the water in his 1872 semi-autobiographical novel, *Roughing It*.

"Down through the transparency of these great depths, the water was not merely transparent, but dazzlingly, brilliantly so," he wrote.

But development, storm water runoff, pollution, warming water and algae, to name but a handful of factors, have all combined to reduce Tahoe's fabled clarity. In 1968, researchers could see a disk lowered into the water at a depth of 102.4 feet. By 1997, they could see only down to 68 feet.

That was the year President Bill Clinton visited to inaugurate the Lake Tahoe Summit, which annually draws national, state, and local leaders, researchers, and residents together to discuss ways to "Keep Tahoe Blue." The federal government has since spent about $2 billion on the health of the lake and the surrounding environment. Obama announced that the Department of Interior will spend nearly $30 million on wildfire prevention at Tahoe this year.

Federal Funding Announcement at Tahoe Summit
http://www.latimes.com/politics/essential/la-pol-sac-essential-politics-updates-white-house-promises-more-federal-aid-1472666674-htmlstory.html

The White House on Wednesday announced a series of new funding and environmental programs to address the deteriorating health of Lake Tahoe and the surrounding forests caused in part by the increasing temperatures brought about by climate change.

The announcement came just hours before President Obama was scheduled to address the Lake Tahoe Summit, an annual environmental conference that California and Nevada leaders began two decades ago because of concerns about the declining water clarity in the once crystal-clear Sierra lake.

Tahoe's surface water temperature in 2015 was the highest ever recorded, while annual snowfall levels have been on the decline. The increasing air temperatures in the Lake Tahoe region also have stressed the surrounding forests, causing an alarming increase in tree mortality and fire danger, according to the UC Davis Tahoe Environmental Research Center.

In response, the Obama administration announced the following assistance:

- The Department of the Interior will provide $29.5 million to reduce dead trees and other hazardous fuels to improve forest health and decrease the threat of catastrophic wildfires.

- The Environmental Protection Agency will provide $230,000 to manage and reduce storm water runoff in the Tahoe region.
- The National Forest Foundation, working with the U.S. Forest Service and local communities, announced it has raised over $4 million for creek restoration projects, for sustainable recreation and to improve forest health throughout the nearby Truckee River watershed.

Along with assistance for the Lake Tahoe region, the White House also announced a new partnership between California and the Department of the Interior to assess the future of the Salton Sea.

More media coverage:
http://www.unr.edu/nevada-today/news/2016/20th-anniversary-of-lake-tahoe-summit

President Barack Obama talked about "riding off into the sunset" soon with the man behind the annual Lake Tahoe Environmental Summit, Nevada Sen. Harry Reid.

Both Obama and Reid will be leaving office following the November elections. Yet, if there was a theme to Wednesday's 20th Lake Tahoe Summit - which was highlighted by Obama's keynote address, before a standing-room-only crowd of about 9,000 in the sun-splashed Harvey's Outdoor Arena at Stateline - it was one of celebration, mixed with the realization that there is still work to be done at Tahoe.

"Lake Tahoe is better today than when we started two decades ago," said Reid, whose invitation to President Bill Clinton and Vice President Al Gore led to the first Tahoe Summit and brought unprecedented attention the Tahoe's declining clarity in 1997. Since then, about $2 billion in federal, state, local, individual and private funding has reversed Tahoe's ecological decline. "We've had the best scientific research in the world here," Reid added, "the best minds at the universities in Nevada and California are working on this 12 months of the year. ... Today's Lake Tahoe Summit is a celebration of progress, of unity, though there is much more work to be done."

Obama, who was visiting Lake Tahoe for the first time, cast the effort to save Lake Tahoe against the much broader backdrop of the issues associated with global climate change. Obama said global climate change is being felt at Lake Tahoe through rapidly warming waters and air temperatures that will lead to new challenges in the management of the lake and the science and innovation developed to save it.

He quoted words that were spoken by Brian Wallace, the former Chairman of the Washoe Tribe, who spoke eloquently in 1997 at the first Tahoe Summit of how tightly interwoven people, land and the future are tied together: "The health of the land and the health of the people are tied together, and what happens to the land also happens to the people. When the land suffers so too are the people."

"The challenges of conservation and combating climate change," Obama said, "are interconnected."

Later, he added: "So this isn't just a challenge. This is an opportunity. We share a sacred connection with those who follow us. ... The important changes are the changes made by us ... Our healing of Lake Tahoe proves we can pass along this incredible bounty to future generations."

Obama praised Reid for the central role the 30-year Nevada senator has played in defending the environment and in ensuring that Lake Tahoe remained a top priority for the congressional delegations of Nevada and California, as well as the governors and state legislatures of those two states.

"As he prepares to ride into the sunset, this 20th anniversary Summit proves that the light Harry lit burns brightly as ever," Obama said.

Obama also joked that he's learned with Reid, who is known to cut off phone conversations in mid-sentence with individuals ranging from the media to Obama himself, to not take such occurrences personally. "He's not mad at you," Obama said, smiling broadly. "He just doesn't have much patience for small talk." Then Obama grew more serious: "I could not be prouder to work alongside with the Democratic Leader of the Senate."

California Sen. Dianne Feinstein echoed Obama, praising Reid's relentless powers of persuasion in making the Lake Tahoe Summit such a universally regarded success. "It was his leadership that made the first Summit possible, and it was Harry Reid who brought President Clinton to Lake Tahoe to really dramatize it," Feinstein said.

California Sen. Barbara Boxer, who like Reid will be retiring after the November elections, reminded the audience that passage of the Lake Tahoe Restoration Bill - which would provide $415 million over the next 10 years in additional Tahoe funding - remains an important priority for both delegations. "It's working its way to the Senate floor and I hope you keep the pressure on," Boxer said. "If we get that done, we're on our way."

Obama showed a mix of the type of soaring language that has made him the most gifted political orator of his generation, and, as well, provided needed humor at what seemed to be just the right moments. When he noted it was his first time at Tahoe, the audience sounded a loud, disapproving groan. "It's not like I didn't want to come," he said, drawing cheers from the crowd. "Now that I've been here, I'm going to come back. ... This place is spectacular."

It was a sentiment that was shared well before the President hit the stage. At nearby educational booths, University researchers were sharing their latest discoveries, technologies and plans to help combat Tahoe's biggest challenges, from invasive species to wildland fire.

Just as the President of the United States would say a little while later, the beauty of Tahoe and the hard work to save it, though planted firmly in the present, was actually work that, if done right, would benefit future generations in ways that were both magical and inspiring.

"We do it," Obama said of the work of the past 20 years and the work that is still to come, "because places like this nurture and restore the soul ... and we want to preserve treasures like this for our kids, too."

UNR/DRI Tahoe Summit Research Reports
https://tahoe.blogs.unr.edu/2015/08/2015-tahoe-summit

In conjunction with the annual Tahoe Summit, the University of Nevada, Reno and the Desert Research Institute publishes a report highlighting their collective research and outreach efforts in the Tahoe Basin.

Lawmakers at 2015 Lake Tahoe Summit address funding to protect Sierra's crown jewel
http://carsonnow.org/story/08/24/2015/lawmakers-2015-lake-tahoe-summit-address-funding-protect-sierras-crown-jewel
Lawmakers from Nevada and California met Monday (Aug. 24,2015) on the shores of Lake Tahoe to discuss how to protect a national treasure as it faces continued threats to water clarity, invasive species, wildfire and drought. Ever since President Bill Clinton held the first meeting in South Lake Tahoe in 1997, the annual focus of the Lake Tahoe Summit is to protect what Mark Twain called "the fairest picture the whole world affords."

Millions have been spent already to preserve Lake Tahoe through a number of initiatives and projects that range from forest thinning, invasive species eradication, storm water management and shoreline protection. However scientists say there's still much work to be done and the message was made crystal clear at this year's summit. The U.S. Senate and the House both have bills before their members called the "Lake Tahoe Restoration Act." But going about protecting the lake's cobalt blue waters varies with political interests wanting less money spent on water clarity issues and more spent on fire protection and forest management.

Nevada Republican Sen. Dean Heller is the co-sponsor of the Senate's Lake Tahoe Restoration Act of 2015. He, along with California Sen. Dianne Feinstein, spoke at the summit in bipartisan support of the Senate version that calls for $415 million to be spent on preserving Lake Tahoe.

"Anybody who's been to Lake Tahoe, anybody who's spent any time on these beaches, this sand, knows how important Lake Tahoe is, and the clarity of the lake," said Heller. "By working together we can produce a healthier region." The other sponsors of the bill are California Sen. Barbara Boxer, and retiring Nevada Sen. Harry Reid, who has been a champion of efforts to protect Lake Tahoe.

Besides sharing the same bill title, the similarities end. The House version of the bill, sponsored by Congressman Tom McClintock, who represents California's 4th District, and Nevada Congressman Mark Amodei calls for far less spending. Both bills are a follow-up to the original $300 million Lake Tahoe Restoration Act, which expired in 2010.

The Senate's bill covers a lot more territory including fire protection, and costs a lot more money and resembles the original Lake Tahoe Restoration Act. The $415 million would be spread over 10 years and be spent on eliminating invasive species, wildfire management and innovative transportation solutions.

The House bill would largely be focused on fuels reduction. McClintock's district covers the Lake Tahoe region and has seen the Rim Fire, Angora Fire, King Fire in the past and current fires are burning currently on both the north end and south end."If a superfire like we've seen in other parts of the west came here, it would decimate the clarity of the lake and destroy the region for lifetimes," said McClintock. He wants good forest protection and management."Excess timber can either be burned out of here or cut out, but either way it leaves the basin," he said about efforts for fuels reduction. Always one to lighten serious policy matters with levity, Nevada Congressman Amodei joked by saying two things should be taken away from the summit. First, California Gov. Jerry Brown doesn't like the Dodgers, and secondly, Feinstein is not pro-choice for quagga mussels.

He was referring to the California Senator's display of a pipe from Lake Mead that was covered with the invasive mussels. The foot-long pipe had enough of the creatures on it to spawn one million new mussels if it were allowed in Tahoe. She highlighted TRPA's successful boat inspection and decontamination program which tries to keep those mussels out of Lake Tahoe. "We need to take care of the responsibility of the lake while the responsibility is still ours," said Amodei.

As the division grows in Washington, the collaboration between Nevada and California gets greater. This teamwork was highlighted by California Gov. Brown. "It wasn't that long ago that there were battles and conflict," he said. He praised the collaborative efforts said it will take teamwork to continue protecting the lake, fighting fires smarter, reducing the buildup of carbon and taking care of forests more intelligently. "We need to make changes to the way we handle the lake to keep up with the increases of people," said Brown.

Nevada Gov. Brian Sandoval couldn't be at the Summit though he attended Sunday night's Tahoe Fund dinner. Sandoval was with President Obama in Las Vegas to discuss keeping the Sage Grouse off the endangered species list. In his absence, Lt. Governor Mark Hutchinson spoke for him, saying leadership needed to continue to contribute to the preservation of Lake Tahoe.

California and Nevada share more than just a border, they share the same visitors, travelers and solutions to keeping Tahoe blue. He called on a continued partnership between the states and to share the commitment to keeping the clarity of Lake Tahoe on the forefront.

A devastating wildfire could wipe out decades of efforts to keep the lake clean and clear, said Feinstein. “You can't look at the lake without thinking forest fires,” she said. "The federal government has to lead the way in keeping Tahoe blue…It won't happen without funds for removal of hazard fuels and keeping mussels out."

The biggest difference in the two versions of the Lake Tahoe Restoration Act is the $150 million dedicated to fuels reduction in the Senate's version.

2014 Summit: Drought, Wildfire, and Invasive Species; Confronting the Effects of Climate Change on Lake Tahoe

http://www.sacbee.com/news/politics-government/capitol-alert/article2607152.html

One year after California and Nevada resolved a long-standing feud over development around Lake Tahoe, John Laird, secretary of the California Natural Resources Agency, arrived at a summit near the water’s edge Tuesday and said “peace is at hand.”

The annual gathering of politicians, environmentalists and researchers has been colored in previous years by tension over the governance of the basin surrounding Lake Tahoe, with Nevada passing a law in 2011 threatening to withdraw from a two-state partnership known as the Tahoe Regional Planning Agency unless California made concessions to allow more development. The two sides reached an accord last year, and California Gov. Jerry Brown in October signed legislation ratifying the agreement. Now, Laird said, “people are talking.” Yet major concerns persist about preservation efforts at the lake, exacerbated by climate change and, in the shorter term, drought. Researchers at University of California, Davis, expect the lake to fall below its natural rim level this year. Dry conditions have forced dock closures, affected river rafting in the area and raised alarms about invasive species in the lake, said Julie Regan of the Tahoe Regional Planning Agency. Effects, she said, are “widespread.” “We’re really concerned,” she said. Democratic U.S. Sen. Dianne Feinstein cited improvements in water clarity, erosion control measures and wildfire management in recent years, and she cheered the introduction of a $415 million preservation bill for the lake. “That’s restoration projects focused on water quality, storm water management, invasive species protection,” she said. “It’s hazardous fuels mitigation and wildfire prevention projects.”

But the bill has yet to be heard in the Republican-controlled House, and its prospects are uncertain. "We face an uphill battle to get the bill passed," Feinstein said. "The federal budget isn't what it used to be." Asked about the prospect of the bill gaining Republican support, U.S. Senate Majority Leader Harry Reid, D-Nev., told reporters, "It's always an issue. The tea party seems to hate public land." U.S. Rep. Tom McClintock, a Republican whose district includes the California side of the lake, said the current bill is too expensive and should be reduced to focus on wildfire prevention efforts. He called a catastrophic wildfire the "greatest natural threat facing Lake Tahoe."

The uncertainty of the bill weighed heavily on the summit, at the Tallac Historic Site near South Lake Tahoe. Regan said the funding is "critical" for the future of the lake. But considering the divisions in Washington, she said, "We understand it's a difficult climate." Local disputes are not entirely resolved, either. The Sierra Club and other environmentalists remain in court over the California-Nevada pact, objecting to a provision delegating many planning decisions to local governments. Environmentalists fear local officials will authorize more development around the lake. U.S. District Judge John A. Mendez dismissed the lawsuit in April, but the Sierra Club has appealed. "We don't think development is going to help the situation at all," said David Von Seggern, chairman of the Toiyabe Chapter of the Sierra Club. As to the improved relations Laird and other summit attendees referenced, Von Seggern said dryly, "We still have a bit of an edge."

One year ago at the summit, Brown criticized environmentalists for their opposition to the agreement, saying the interests of Nevada and California amount to more than "just what some Sierra Club chapter around Tahoe wants." He was far less contentious Tuesday, offering the Legislature's passage of a plan to put a $7.5 billion water bond on the fall ballot last week as evidence bipartisan agreements can be reached. Brown said disagreements with Republicans on the composition of the bond were so significant he did not know on the eve of the vote – when Brown said Republicans "marched out" of his office – if a pact could be reached. "Well, the next day the California Senate voted unanimously, with every single Republican and every single Democrat voting for the water bond, and that's pretty unusual," Brown said. "And I can tell you there are Republicans in that state Senate who are more conservative than Mr. McClintock."

2013 Summit: Challenges of Climate Change
http://www.tahoedailytribune.com/news/7711494-113/tahoe-lake-summit-monday

INCLINE VILLAGE, Nev. — Al Gore and the concept of climate change are no strangers to each other. But inviting the former vice president and subject of the 2006 film "An Inconvenient Truth" to speak at Lake Tahoe just days before scientists concluded the weather phenomenon will impact the basin for years to come?

Well, that's just a convenient coincidence, said Amy Berry, CEO of the Tahoe Fund.
"They're completely unrelated," Berry said with a chuckle on Wednesday. "But I don't think it's a coincidence that UC Davis has identified climate change as an issue of the basin, and that Al Gore was here in 1997, and ever since has consistently talked about the long-term impacts of climate change."

Gore delivered the 17th annual Lake Tahoe Summit hosted by U.S. Sen. Harry Reid, D-Nev. Republican Nevada Gov. Brian Sandoval, Democratic California Gov. Jerry Brown and U.S. Sen. Dianne Feinstein, D-Calif., also attended. At the first summit in 1997, Gore and President Bill Clinton unveiled a sweeping plan to protect Lake Tahoe, and the resulting Environmental Improvement Program forged an unprecedented public/private partnership that's led to nearly $1.7 billion in investments here since. Clinton later authorized the $415 million Lake Tahoe Restoration Act to aid efforts to restore the lake's steadily declining water clarity, and to reduce the risk of fire by thinning forests of dangerous fuels such as shrubs and dead trees.

An updated version of the act was entered onto the Senate floor on Aug. 1, sponsored by Feinstein, Reid, Dean Heller, R-Nev., and Barbara Boxer, D-Calif. The legislation would authorize $243 million over 10 years for the highest-priority restoration projects at the lake, based on scientific data.

"When Gore was here in '97, that really kicked off the EIP," said Berry, whose nonprofit Tahoe Fund is sponsoring Monday's summit. "Since that time, thanks to incredible support from the feds and the two states, there has been a tremendous amount of progress in terms of environmental improvement projects on the ground." It's the hope of many Tahoe stakeholders that Gore's return will help usher in a "renewed commitment to funding the environmental improvement program for years to come," said Berry. That commitment could be key, considering findings published last week in UC Davis' annual State of the Lake report.

In the report, while scientists point to Lake Tahoe's clarity improving for the second consecutive year in 2012, trends suggest climate change is continuing to impact the lake. Last year, the lake's average surface water temperature of 52.8 degrees was the warmest on record.
The science community is pointing to the report as a reminder that while progress has been made since 1997 to protect Tahoe, much work remains.

"While clarity is improving in the offshore this year, things are not as positive on the nearshore, which is where most of the public engages the lake," said Sudeep Chandra, University of Nevada, Reno, researcher and longtime limnologist at Lake Tahoe, in a Wednesday statement.
Monday's summit also comes amid legal challenges to the Tahoe Regional Planning Agency's Regional Plan Update — which sets guidelines for development for the next 20 years for the Lake Tahoe Basin.

The Sierra Club and Friends of the West Shore filed suit against the Regional Plan Update earlier this year. Rogert Patching, executive director of the nonprofit group Friends of Lake Tahoe, which has supported the lawsuit, said he doesn't expect it to be mentioned Monday at the summit.
"I expect reiterations about how smart growth planning at Tahoe will result in both economic and environmental gain, when it will actually result in urban sprawl, increased pollution of all kinds and the destruction of local businesses by corporate resorts," he said in a statement to the Bonanza. "TRPA's rhetoric, politics and happy talk have been very successful in painting a wonderful picture for politicians and the masses. They don't know what they don't know, and our side, with minuscule resources, has not been successful in its countervailing campaign. "Wall Street forces are winning while everyone else is losing. But, you will not hear a peep about this at the summit."

Monday's summit also figures to have one of the largest crowds ever. Nearly 800 residents and officials had registered to attend, Berry said, about twice as many as in 2012.

2012 Summit: Public-Private Partnerships
www.tahoebonanza.com
The need for more public-private partnerships to complete environmental projects at Lake Tahoe was the focus of the 16th annual Lake Tahoe Summit held on Monday, August 13 at the Edgewood Tahoe resort at Stateline, NV.

"This need is directly addressed by the non-profit Tahoe Fund," said Amy Berry, CEO of the Tahoe Fund, which for a second year is the Tahoe Summit Organizing Sponsor. "Our goal is to engage people and organizations with a passion for Tahoe and raise the money needed for environmental projects in the Tahoe Basin. The message at the Summit from our elected leaders will motivate people to become involved in the efforts to improve and enhance the recreation and natural resources of this incredible lake."

Host U.S. Senator Dean Heller, U.S. Senator Dianne Feinstein, U.S. Congressman Tom McClintock, Nevada Governor Brian Sandoval, California Governor Jerry Brown and other officials and experts spoke about the issues facing Lake Tahoe and the need for public partnerships with private sources like private citizens, businesses and foundations to accomplish environmental and recreational improvements in the Tahoe Basin.

2011 Lake Tahoe Summit: Stewardship and Sustainability in Challenging Fiscal Times
The event theme, acknowledged the issues facing the Tahoe Basin. In the period 1997 to 2006 the Tahoe Basin put to work a $1.1 billion investment in environmental improvements. Participants in the 2011 Summit included host, Senator Dianne Feinstein of California, Senators Harry Reid and Dean Heller of Nevada, Nevada Governor Brian Sandoval, California Governor Jerry Brown and the public.

2010 Lake Tahoe Summit: Healthy Ecosystem Equals Healthy Economy
"Protecting Lake Tahoe is the right thing to do environmentally and economically," U.S. Senate Majority Leader Harry Reid of Nevada said Tuesday as he hosted this year's annual Lake Tahoe Summit. Several hundred people gathered in brilliant sunshine at Sand Harbor State Park's Shakespeare Festival Amphitheater to collaborate on ways to improve the lake's world famous clarity and stimulate the economy of this resort community on the Nevada-California border.

2009 Lake Tahoe Summit
The 2009 Lake Tahoe Summit was held at Round Hill, Nevada on Aug. 20, 2009.

Lake Tahoe Restoration Acts

$415 million Lake Tahoe Restoration Act signed by Obama in December 2016
http://www.tahoedailytribune.com/news/senate-approves-415-million-lake-tahoe-restoration-act

WASHINGTON, D.C. – The Senate approved the Lake Tahoe Restoration Act of 2015, which was included as part of a $10-billion water projects bil. The Lake Tahoe Restoration Act of 2015 allocates $415 million over 10 years to environmental restoration and preservation projects in the Basin. The legislation authorizes $415 million over 10 years for forest management, environmental and watershed restoration, storm water management and other environmental projects in Lake Tahoe. It has now moved on to the House of Representatives.

The Lake Tahoe Restoration Act was included as underlying text in the national Water Resources Development Act, which allocates funds for other projects like the replacement of lead-contaminated pipes in Flint, Michigan, and the restoration of Florida's Everglades. The Senate measure sanctions 29 projects in 18 states for dredging, flood control and other such projects overseen by the U.S. Army Corps of Engineers.

Nevada Senator Harry Reid — who sponsored the Lake Tahoe Restoration Act alongside California Senators Dianne Feinstein and Barbara Boxer and Nevada Senator Dean Heller—said that the bill's passage in the Senate is an important step, but meaningless unless it gets through the House of Representatives and onto the president's desk. "Last month, at my invitation, President Obama visited Lake Tahoe for the very first time to speak at the 20th anniversary of the Lake Tahoe Summit," said Reid in a statement. "At that event the federal government, the states of Nevada and California, local businesses, residents and philanthropists all rededicated ourselves to the work of protecting this unique and wonderful lake. As the entire world saw last month, the beauty of Lake Tahoe is unparalleled. We must do everything we can to keep it that way."

Darcie Goodman Collins, executive director of the League to Save Lake Tahoe, said the Senate approval of the legislation was "fantastic news." "This is a critical step for this important piece of legislation, which we have been working on for years," said Goodman Collins. "Now we need the U.S. House of Representative to pass a similar version of the water act so that these vital measures to protect Lake Tahoe can advance."

The $415 million set aside for the Lake Tahoe Restoration Act is earmarked for a number of different environmental restoration and protection projects, including:

• Wildfire Prevention – $150 million for wildfire fuel reduction and forest management.
• Environmental Improvement Program – $80 million for projects like bike trails, creek restoration and fire treatment.
• Invasive Species Management Program – $45 million to prevent and manage invasive species.
• Stormwater Projects – $113 million for storm water management, erosion control and watershed restoration projects.
• Lahontan Cutthroat Trout Recovery Program – $20 million to recover this threatened species, which is also Nevada's state fish.
• Project Oversight – $5 million will go towards monitoring these projects, and another $2 million to cover the cost of land exchanges and sales in the Tahoe Basin.

This is a follow-up to the original $300 million Lake Tahoe Restoration Act, which expired in 2010.

NOT FUNDED: **Lake Tahoe Restoration Act of 2013**
http://www.feinstein.senate.gov/public/index.cfm/files/serve/?File_id=95f88ea0-efe5-4ab5-84ff-a2446c12c162

H.R. 3390: Lake Tahoe Restoration Act of 2013 (Amodei - NV) The Lake Tahoe Restoration Act of 2013 continues the federal commitment at Lake Tahoe by authorizing $415 million over 10 years to improve water clarity, reduce the threat of fire, combat invasive species and restore and protect the environment in the Lake Tahoe Basin.

http://www.trpa.org/tahoe-leaders-hail-house-introduction-of-restoration-act/

"The original Lake Tahoe Restoration Act has proven invaluable in helping the Forest Service and its federal, state, and local partners implement projects that restore and protect Lake Tahoe and its surrounding forests," said Nancy Gibson, forest supervisor for the Lake Tahoe Basin Management Unit. "We look forward to continuing to work with our partners to ensure that the great beauty and rich resources of Lake Tahoe outlast us all."

Since 1997, EIP accomplishments include:

- Fuels reduction treatment of more than 54,000 acres
- Wildlife habitat improvements on more than 15,000 acres of land, including 1,509 acres of marsh and wetlands restoration
- Approximately 29,000 watercraft inspections with more than 10,000 watercraft decontaminations for aquatic invasive species
- Treatment of more than 24 acres of weeds and Asian clam infestations in Lake Tahoe
- Construction of 136 miles of bike and pedestrian routes

The Tahoe Regional Planning Agency leads the cooperative effort to preserve, restore, and enhance the unique natural and human environment of the Lake Tahoe Region, while improving local communities, and people's interactions with our irreplaceable environment.

NOT FUNDED**:** **Lake Tahoe Restoration Act of 2011**
The Lake Tahoe Restoration Act of 2011 was introduced but did not pass Congress. It had proposed a federal commitment at Lake Tahoe by authorizing $415 million over 10 years to improve water clarity, reduce the threat of fire, and restore the environment. This lack of federal funding may create a dramatic slowdown in research projects, improvement projects, and infrastructure upgrades in the Tahoe Basin.

FUNDED: **Lake Tahoe Restoration Act of 2009-10**
The Lake Tahoe Restoration Act 2009 was introduced for congressional review and approved.
The 2009 legislation was the successor to the Lake Tahoe Restoration Act of 2000, which was introduced by Senators Feinstein, Reid, Boxer and then-Senator Richard Bryan (D-NV). That legislation led to major investments in the environmental health of the Tahoe Basin, including $424 million by the federal government, $612 million by the state of California, $87 million by the state of Nevada, $59 million by local governments, and $249 million in in-kind contributions from the private sector.

Regulatory: Regional Planning Efforts

TRPA Water Quality 208 Plan Lake Tahoe (208) Water Quality Management Plan
Adopted June 2013
http://www.trpa.org/wp-content/uploads/Final-U.S.-EPA-Adopted-Lake-Tahoe-208-WQMP_2013.06.19.pdf
208 Plans are required for certain areas by the Federal Clean Water Act (section 208). These plans promote efficient and comprehensive programs for controlling water pollution in a defined geographic area. The Lake Tahoe 208 Plan was updated by TRPA on December 12, 2012, which initiated the need for parallel updates of the Plan by the states of Nevada and California and the U.S. Environmental Protection Agency.

The Lake Tahoe Water Quality Management Plan (also known as the 208 Plan or WQMP) is a framework that sets forth the components of the water quality management system in the Lake Tahoe Region, the desired water quality outcomes for the Tahoe Basin, and the mechanisms adopted by all the relevant entities to achieve and maintain those outcomes. The WQMP is organized to reflect the water quality management plan elements required by the U.S. Environmental Protection Agency's (U.S. EPA) regulations at 40 C.F.R. Section 130.6, which implements Sections 208 and 303(e) of the Clean Water Act, as well as the unique situation in the Lake Tahoe Region.

Because Lake Tahoe is located in both California and Nevada, to protect and enhance the unique environment in the Lake Tahoe Basin, the respective State legislatures approved a bi-state compact, which was ratified by the US Congress in 1969. The Lake Tahoe Regional Planning Agency Compact created a unique bi-state regional planning agency, the Tahoe Regional Planning Agency (TRPA), which has the responsibility to set environmental carrying capacity thresholds for water quality and other aspects of the environment, create and keep updated a regional plan and regulations to attain and maintain the thresholds, and implement the regional plan and regulations through various permitting processes and memoranda of understanding. Given that the Regional Plan includes bi-state water quality policies and the TRPA implements regulations to realize the objectives of those policies, in the 1970's, both Governors also designated, with approval by the U.S. EPA, the TRPA as the area-wide planning agency for the Tahoe Region under Section 208 of the Clean Water Act.

Since that designation more than 30 years ago, water quality administration has grown in complexity and programs have been added to make the management system more comprehensive. Water quality improvement programs are administered, managed, and implemented today in the Tahoe Region by a multitude of agencies at different levels of government under a wide array of statutory and regulatory authorities.

Furthermore, since the last comprehensive revision of the WQMP was approved in 1988, the State of California and the State of Nevada have determined the total maximum daily load (TMDL) of fine sediment particles, total phosphorus, and total nitrogen that may enter the Lake in order to restore the desired water clarity. The TMDL effort was the result of more than 10 years of research and analysis at a cost of approximately $10 million. The U.S. EPA approved the Lake Tahoe TMDL in 2011. Both States are now working with their respective local governments, state transportation agencies and other resource management agencies in the Lake Tahoe Region on an ongoing basis to identify and implement the necessary steps to reduce pollutant loads. Concurrent with WQMP adoption, the TRPA Regional Plan is being updated to complement and support TMDL implementation.

Tahoe Regional Planning Agency (TRPA) - Code of Ordinances Updated 2012, Adopted Feb. 2013
The overriding regulations on development in the Tahoe Basin are the codes set by the Tahoe Regional Planning Agency Ordinances. These documents are available at:
http://www.trpa.org/regional-plan/code-of-ordinances/

2014 Amendments related to transfer of occupancy units
The Code of Ordinances was amended to include the amendments to Chapters 50 and 52 related to implementation of the transfer of development bonus unit incentive program as shown in the revised Attachment C of the October 2014 TRPA Governing Board staff summary October 22, 2014.

Historical Action on Shorezone Ordinance
Taking 20 years of negotiation and preparation, the TRPA Shorezone Ordinance (Preferred Alternative 6A) was adopted by the Tahoe Regional Planning Agency (TRPA) Governing Board in October 2008. However on Sept. 16, 2010 - the 2008 passage of the Shorezone Ordinance by TRPA was revoked by federal court ruling. The Shorezone Ordinance had been legally challenged since its adoption, by several Tahoe area environmental groups. The decision sends the Tahoe Regional Planning Agency "back to the drawing board" in regulating development near Lake Tahoe's shore. After extensive legal review - in 2013, these new codes became effective.

There is extensive regulation on land and water based activities that affect overall Lake Tahoe Water Quality. The snapshots below from the TRPA Code of Ordinance Chapter 60 indicate the type and extent of these regulatory actions.

CHAPTER 60: WATER QUALITY

60.1. WATER QUALITY CONTROL

60.1.1. Purpose

This section implements the Water Quality Subelement, Land Use Element, of the Goals and Policies. This section also implements, in part, TRPA's programs to attain and maintain federal, state, and local water quality standards under Article V(d) of the Compact.

60.1.2. Applicability

This section sets forth standards for the discharge of runoff water from parcels and regulates the discharge of domestic, municipal, or industrial wastewaters. These standards and prohibitions apply to discharges to both surface waters and ground waters.

60.1.3. Discharge Limits

Discharges shall not exceed the following standards:

A. Surface Runoff

Pollutant concentrations in surface runoff shall not exceed the readings in Table 60.1.3-1 at the 90th percentile.

TABLE 60.1.3-1: SURFACE RUNOFF

Constituent	Maximum Concentration
Dissolved Inorganic Nitrogen as N	0.5 mg/l
Dissolved Phosphorus as P	0.1 mg/l
Dissolved Iron as Fe	0.5 mg/l
Grease and Oil	2.0 mg/l
Suspended Sediment	250 mg/l

1. If the constituent levels of water entering a site from upstream areas are of a superior or equal quality to the above, those waters shall meet the quality level listed in Table 60.1.3-1 prior to discharge from the site.

2. If the constituent levels of waters entering a site do not meet the quality levels in Table 60.1.3-1, there shall be no increase in the concentrations of these constituents in water discharged from the site, based on a 24-hour average.

B. Discharges to Ground Waters

Waters infiltrated into soils shall not exceed the maximum constituent levels in Table 60.1.3-2.

TABLE 60.1.3-2: DISCHARGES TO GROUND WATERS	
Constituent	**Maximum Concentration**
Total Nitrogen as N	5 mg/l
Total Phosphate as P	1 mg/l
Iron as Fe	4 mg/l
Turbidity	200 NTU
Grease and Oil	40 mg/l

Where there is a direct hydrologic connection between ground and surface waters, discharges to groundwater shall meet the standards for surface runoff. A direct hydrologic connection shall be presumed to exist wherever, by virtue of proximity to a surface water body, nature of soils, or slope or gradient, the residence time of runoff water discharged into the ground is too short to remove pollutants from the runoff. Sediment traps, consistent with the *Handbook of Best Management Practices,* shall be used to protect infiltration devices from excessive levels of siltation.

C. Prohibition of Wastewater Discharge

The discharge of domestic, municipal, or industrial wastewater to Lake Tahoe, its tributaries, the ground waters of the Tahoe region, or the Truckee River within the Tahoe region, is prohibited, except for existing discharges under alternative plans for wastewater disposal authorized by state law and approved by the state agency of appropriate jurisdiction, and for catastrophic fire protection of the STPUD Luther Pass Pump Station as detailed in subparagraph 4 below. California and Nevada prohibit wastewater discharge through the enactment of the Porter-Cologne Act, and the Executive Order by the Governor of Nevada dated January 27, 1971.

1. Holding Tanks and Other No-Discharge Systems

To avoid a discharge of wastewater that is prohibited, holding tanks or other no-discharge systems may be approved in the following instances:

a. As a temporary measure associated with a temporary use, including but not limited to, sporting events, community events, and construction; or

b. As a permanent measure associated with remote public or private recreation sites, including but not limited to, trailheads, and undeveloped walk-in campgrounds, and summer home tracts where connection to a sewer system is not feasible or would create excessive adverse environmental impacts.

2. Accidental Releases of Sewage

To help prevent accidental releases of sewage, all sewage collection and treatment districts shall prepare and submit a report to TRPA within 120 days of a determination by the district that any unit treatment process, or major component of its collection system serving the Tahoe region, has reached 85 percent of its design capacity. Such report shall identify

what measures, if any, will be needed to accommodate projected population increases consistent with the Regional Plan, including capital improvements, operational changes, changes in discharge permits, and changes in financial programs.

3. **Sewage Exfiltration**
In conjunction with TRPA project approvals for all agencies that collect or transport sewage, TRPA shall require that such agencies have in place and vigorously implement plans for detecting and correcting sewage exfiltration problems in their collection and transport facilities.

4. **Recycled Wastewater Use for Fire Protection**
This exception allows for the use of recycled wastewater in emergency conditions to prevent severe harm to life, property, and the environment and to protect public facilities from destruction by wildfire in accordance with applicable state laws. Such emergency condition of catastrophic wildfire and authorization for recycled wastewater use shall be made and certified by the fire incident commander and reported to the TRPA Emergency Response Coordinator.

D. Prohibition of Toxic or Hazardous Waste Discharge
The discharge of toxic or hazardous waste to Lake Tahoe, other lakes in the region, their tributaries, the ground waters of the Tahoe region, the lands of the Tahoe region, or the Truckee River within the Tahoe region is prohibited.

E. Prohibition of Certain Watercraft
Commencing June 1, 1999, the launching, mooring, or operation of all two-stroke engine powered watercraft within the region is prohibited, except:

1. Any two-stroke engine powered watercraft whose fuel is directly injected into the cylinder shall be exempt from the prohibition;

2. Injected in to the crankcase prior to entering the cylinder and the fuel injection engine was purchased before January 27, 1999, shall be prohibited commencing October 1, 2001;

3. Any watercraft powered by a two-stroke engine whose engine is certified as meeting the U.S. EPA 2006 standard or the CARB 2001 standard shall be exempt from the prohibition;

4. Sailboats utilizing two-stroke engines as auxiliary power shall be prohibited commencing October 1, 2001;

5. Any watercraft powered by a two-stroke engine rated at ten horsepower or less shall be prohibited commencing October 1, 1999; or

6. Any watercraft powered by an engine that has been certified as meeting EPA's 2001-2005 emission standard shall be prohibited commencing October 1, 2001.

60.1.4. Snow Disposal

All persons conducting public, commercial, or private snow removal or disposal operations shall dispose of snow in accordance with site criteria and management standards in the *Handbook of Best Management Practices*, the Design Review Guidelines, and the criteria below.

A. Requirements for Individual Parcels

Removal of snow from individual parcels shall be limited to structures, paved areas, and unpaved areas necessary to safely park or provide safe pedestrian access. Snow shall not be plowed into or stored in a SEZ.

B. Requirements for Dirt Roads

Snow removal from dirt roads is subject to regulation pursuant to Section5.12 Remedial Action Plans. When TRPA approves snow removal from a dirt road, pursuant to project approval or in accord with provisions of Section5.12, the agency shall specify required winterization practices, BMPs, the specific means of snow removal, and a schedule for either paving the dirt road or ceasing snow removal.

60.1.5. Deicers and Abrasive Control

Salt and abrasives used to control ice on streets, highways, sidewalks, and parking areas shall be regulated in accordance with the standards provided below.

A. Storage Areas

Storage areas for deicing salt and abrasives shall be in conformance with the *Handbook of Best Management Practices*.

B. Reporting

The state highway departments and other large users of deicers and abrasives identified by TRPA shall maintain a tracking and reporting program to monitor the use of deicers and/or abrasives in their respective jurisdictions pursuant to State of California and Nevada requirements. TRPA shall incorporate this information into its annual monitoring report in accordance with Chapter 16: *Regional Plan and Environmental Threshold Review*.

C. Restrictions

The use of deicing salt and abrasives may be restricted where damage to vegetation in specific areas may be linked to their use or where their use would result in a violation of water quality standards. Mitigation for the use of road deicing salt or abrasives may be required and may include requirements to use alternative substances or change distribution patterns, frequency of application, and amount of application. Revegetation of parcels may be required where evidence indicates deicing salts or abrasives have caused vegetation mortality. Memorandums of understanding may be entered into with highway and street maintenance organizations to address use of salts or abrasives in relation to safety requirements.

60.1.6. Spill Control

All persons handling, transporting, using, or storing toxic or hazardous substances shall comply with the applicable requirements of state and federal law regarding spill prevention, reporting, recovery, and clean-up. Sewage collection, conveyance, and treatment districts shall have sewage spill contingency, prevention, and detection plans approved by the state agency of appropriate jurisdiction and submitted to TRPA for review and approval within three years of the effective date of the Regional Plan.

A. Cooperative Sewage Spill Plans

Sewage collection, conveyance, and treatment districts may join together to develop cooperative plans, provided that the plans clearly identify those agencies covered by the plan, are agreed to by each agency, and are consistent with applicable state and federal laws.

B. Sewage Spill Plan Criteria

Sewage spill contingency, prevention, and detection plans shall comply with the criteria set forth by the state agencies of appropriate jurisdiction and TRPA. Such plans shall include provisions for detecting and eliminating sewage exfiltration and stormwater infiltration from sewer lines and facilities.

60.1.7. Pesticide Use

The use of insecticides, fungicides, and herbicides shall be consistent with the *Handbook of Best Management Practices*.

A. Pesticide Use Discouraged

TRPA shall discourage pesticide use for pest management. Prior to applying any pesticide, potential users of pesticides shall consider integrated pest management practices, including alternatives to chemical applications, management of forest resources in a manner less conducive to pests, reduced reliance on potentially hazardous chemicals, and additional environmentally sound pest management tactics.

B. Criteria for Pesticide Use

The following criteria apply to pesticide use:

1. Only chemicals registered with the Environmental Protection Agency and the state agency of appropriate jurisdiction shall be used and only for their registered application;

2. Alternatives to chemical application shall be employed where practical; and

3. No detectable concentration of any pesticide shall be allowed to enter any stream environment zone, surface water, or ground water unless TRPA finds that application of the pesticide is necessary to attain or maintain the environmental threshold standards.

60.1.8. Fertilizer Management

A. Fertilizer Management Approaches Generally

Fertilizer management allowing for site-specific management approaches shall be consistent with the *Handbook of Best Management Practices*. The recommended approaches for landscaping are found in the *Home Landscaping Guide for Lake Tahoe and Vicinity* or its approved equivalent. Section 61.4 Revegetation, contains requirements for revegetation approaches. Fertilizers shall not be used, except as described below, in or near stream and drainage channels or in stream environment zones, including setbacks determined under Section 53.9: Procedure for Establishing SEZ Boundaries and Setbacks, and in shorezone areas except as otherwise provided in this subsection (see Chapter 90: *Definitions*, and Section 80.3: Definitions). Fertilizer use for maintenance of preexisting landscaping according to subparagraph 61.3.3.B.2 shall be minimized in stream environment zones and adjusted or prohibited if found through evaluation of continuing monitoring results to be in violation of applicable strictest water quality discharge and receiving water standards. These ordinances are applicable to both inorganic and organic fertilizer applications. Fertilizer management involves use and application approaches to achieve management standards and shall include the following considerations where appropriate:

1. The appropriate type of fertilizer to avoid release of excess nutrients;
2. Fertilizer management programs proposing the use of phosphorus shall demonstrate the need for the particular site conditions and vegetation to be maintained or established, and shall consider the use of slow release and phosphorus-free fertilizer;
3. The rate and means of application to avoid excessive application or application to non-target areas or native vegetation;
4. The timing and frequency of application to minimize the use of fertilizer, avoid early and late season fertilizer use when vegetation growth is not active;
5. Appropriate watering schedules and efficient irrigation systems to avoid excessive leaching and runoff of nutrients;
6. Preferred plant materials for the intended use and site conditions with an emphasis on native and adapted species to minimize the need of fertilizer;
7. Landscape design that minimizes the use and impacts of fertilizer application;
8. Critical areas such as backshore areas and SEZ setbacks in close proximity to Lake Tahoe and other bodies of water, or water quality treatment basins where the use of fertilizer shall be avoided;
9. Design and maintenance of drainage control systems including holding ponds where necessary;

10. Surface and groundwater monitoring programs to determine compliance with existing nitrogen and phosphorus discharge standards; any required monitoring will be at owners expense, where annual reporting is required in critical areas and as determined in program review or compliance determination;

11. Public outreach, either in the form of public and private programs, fliers for utility district and other organization distribution, and workshops, or affiliate membership outreach on fertilizer management shall be included in fertilizer management plans. Public outreach applies in particular to small residential users for agency outreach programs, owners associations, condominiums, property and landscape managers, and landscapers; and

12. For large users (defined under subparagraph 60.1.8.C below) and large turf projects, a soil testing program may be appropriate to assess the required concentrations of nitrogen and phosphorus in the soil for vegetation use, adjusting for Tahoe Basin growing conditions. This may mean no or low application rates of phosphorus-containing fertilizer will be required for some sites and uses.

B. Fertilizer Management Programs

Projects that include landscaping or revegetation shall include, as a condition of approval, a fertilizer management program that addresses each of the considerations set forth in subsection 60.1.8.A, as appropriate to the size of the project.

C. Existing Uses

1. At TRPA Request and Large Users

At the request of TRPA and for large users that require regular fertilizer maintenance, including but not limited to golf courses, parks, cemeteries, plant nurseries, recreational ball fields, and large residential yards with an acre or more of turf, certain uses shall be required to submit fertilizer management programs for review and approval by TRPA. Review criteria shall include the considerations listed in subsection 60.1.8. Failure to comply with the request or to provide a program satisfactory to TRPA may result in an enforcement action.

2. Monitoring Report

Following the first growing season after the approval of fertilizer management programs, large users of fertilizers such as plant nurseries and those managing more than one acre of turf, or as otherwise identified by TRPA under an existing large user survey, shall initiate a tracking program to monitor fertilizer use on lands under their control. Such users shall review fertilizer management programs with TRPA or Lahontan RWQCB staff and present annual reports for the prior season's use and monitoring if required to TRPA by June 1 (or as required by Lahontan) of each year. The report shall include information on the rate, amount, and location of use. This information shall be presented in a format developed by TRPA consistent with the reporting requirements of other agencies to eliminate duplication and shall be verifiable. TRPA shall include this information in its annual monitoring report under

Chapter 16, including such measures of progress as numbers of approved programs, annual fertilizer use reports received, and reported reductions in fertilizer use or monitored parameter improvement.

D. Requirements for Fertilizer Sales
Public outreach, including seller fertilizer recommendations consistent with subsection 60.1.8, provision of agency-developed fliers, and brochures of user information and recommended fertilizer rates from the *Home Landscaping Guide for Lake Tahoe and Vicinity* or its authorized equivalent, shall be required in conjunction with fertilizer sales in the Tahoe Basin. Outlying fertilizer retailers with potential purchases from the Tahoe Basin shall be requested to provide the same public outreach.

E. Snow Hardeners
The use of ammonium nitrate or other substances containing nitrogen or phosphorus to harden snow is prohibited.

60.2. WATER QUALITY MITIGATION

60.2.1. Purpose

The purpose of this section is to implement the Goals and Policies, Goal 4, Policy 1, Development and Implementation Priorities Subelement, Implementation Element, and specifically the requirement that new residential, commercial, and public projects completely offset their water quality impacts.

60.2.2. Applicability

A. General Applicability
This section is applicable to all projects and activities that result in the creation of additional impervious coverage, unless the project or activity is exempted pursuant to subparagraph B below.

B. Exemptions
The projects and activities provided below that create impervious coverage shall be exempt from water quality mitigation requirements:

1. Transfer
Impervious coverage permitted as a result of transfer of coverage.

2. 208 EIP Projects
Capital Environmental Improvement Program projects for erosion and runoff control and stream environment zone protection and restoration projects as described in TRPA's Water Quality Management Plan for the Lake Tahoe Region.

3. Limited Exception for Additional or Transferred Development Within Adopted Community Plans
Additional or transferred development located within an adopted community plan, the water quality impacts of which were evaluated in the EIS for the community plan and mitigated by the provisions of the community plan, shall be exempt from the requirement of subsection

60.2.3 provided TRPA finds that the implementation element of the community plan, as a whole, meets the standards of subsection 60.2.3.

60.2.3. Required Offsets

All projects and activities that result in the creation of additional impervious coverage shall completely offset the potential water quality impacts of the project through one, or a combination, of the methods listed below.

A. Mitigation Projects
Implementation of offsite water quality control projects or stream environment zone restoration projects as a condition of project approval, pursuant to TRPA guidance on identification, design, and effectiveness of offsite mitigation projects. Applicants who wish to exercise this option shall include plans for the offsite mitigation project with their application. TRPA shall approve the offsite mitigation plans in conjunction with the approval of the project. Before issuing an approval, TRPA shall find that the offsite mitigation proposal completely offsets the expected impacts of the project.

B. Water Quality Mitigation Fund
Contribution to a water quality mitigation fund established by TRPA for implementing offsetting programs.

60.2.4. Fee Required

A fee shall be assessed for each square foot of additional land coverage created. The amount of contribution shall be established in the Rules of Procedure.

60.2.5. Use and Distribution of Mitigation Funds

TRPA shall deposit water quality mitigation funds in a trust account. Interest accruing to the trust account shall remain in the account until used on water quality mitigation projects or water quality planning. TRPA shall keep track of the amount of funds collected for each local jurisdiction and shall disburse funds to the local jurisdictions, upon their request, for expenditure within the jurisdiction of origin, provided TRPA finds that the expenditure is consistent with TRPA's Water Quality Management Plan. Accrued interest may be used for water quality planning in the region. TRPA shall encourage the local jurisdictions to use funds as expeditiously as possible.

60.2.6. Stream Environment Zone Restoration Program

To provide financial resources for implementation of the stream environment zone restoration program, at least 25 percent of the water quality mitigation funds collected for each local jurisdiction shall be used for stream environment zone restoration projects included in the TRPA's Water Quality Management Plan. This jurisdictional set-aside shall be individually evaluated and may be waived if TRPA determines that there are no more SEZ restoration projects identified in a given jurisdiction.

60.2.7. Water Quality Revolving Fund

TRPA shall establish a separate fund, to be known as the Water Quality Revolving Fund, for the purpose of depositing funds received through grants, fines, and voluntary contributions. TRPA may make grants from this fund to local governments and other

public entities for abatement and control of water quality problems by the same procedures as set forth in subsection 60.2.5.

60.3. SOURCE WATER PROTECTION

60.3.1. Purpose

This section contains regulations pertaining to recognition of source water, prevention of contamination to source water, and protection of public health relating to drinking water. It strengthens provisions of the Goals and Policies that address groundwater protection, and implements elements of the TRPA Source Water Protection Program.

60.3.2. Applicability

This chapter applies to projects that are identified as a possible contaminating activity located in identified source water protection zones as depicted on TRPA Source Water Assessment maps, and retrofit of existing development with Best Management Practices that identified source water protection zones as depicted on TRPA Source Water Assessment maps, and retrofit of existing development with Best Management Practices.

60.3.3. Source Water Protection Standards

To protect public health and to insure the availability of safe drinking water, TRPA shall review proposed projects identified as possible contaminating activities to source water that are located within a source water protection zone depicted on TRPA Source Water Assessment maps according to the following standards and procedures:

A. Source Water Defined
Water drawn to supply drinking water from an aquifer by a well or from a surface water body by an intake, regardless of whether such water is treated before distribution.

B. Possible Contaminating Activity Defined
Activities equivalent to TRPA primary uses identified by either the California Department of Public Health or the Nevada Bureau of Water Quality Planning, regardless of where the project is located, as having the potential to discharge contaminants to surface or groundwaters. Such uses are listed in subsection 60.3.5.

C. Source Water Protection Zone Defined
A zone delineated around drinking water sources in the following manner as depicted on the TRPA Source Water Assessment maps.

1. Protection Zone
A protection zone consisting of a fixed 600 foot radius circle shall be identified around wells, lake intakes, and springs assessed by TRPA. Protection zones shall be delineated using the best available source water location data known to TRPA. Protection zones may be located using the centroid of the parcel in which the well, lake intake, or spring is found. Protection zone delineations may be modified by TRPA as follows: Upon receipt of source water assessment information collected by the California Department of Public Health, the Nevada Bureau of

Water Quality Planning, or other public agencies responsible for conducting drinking source water assessments in accordance with state Source Water Assessment and Protection Programs and if recommended by the California Department of Public Health or the Nevada Bureau of Water Quality Planning; or upon receipt of source water assessment information provided by the property owner in which the well, spring, or lake intake is located and if the California Department of Public Health or the Nevada Bureau of Water Quality Planning concurs with the new delineation.

D. Review of Proposed Possible Contaminating Activities Located in Source Water Protection Zones

Proposed uses determined by TRPA to be projects that are identified as a Possible Contaminating Activity, with a project area located in a source water protection zone, shall not be approved unless TRPA finds that:

1. The project complies with the requirements to install BMPs as set forth in subsection 60.4.3;
2. TRPA has solicited comments from the operator/owner of the source water, and the department of environmental health with jurisdiction over the source water, and all such comments received were considered by TRPA prior to action being taken on the proposed project;
3. A spill control plan is submitted to TRPA for review and approval. The plan shall contain the following elements:
   a. Disclosure element describing the types, quantities, and storage locations of contaminants commonly handled as part of the proposed project;
   b. Contaminant handling and spill prevention element;
   c. Spill reporting element, including a list of affected agencies to be contacted in the event of a spill;
   d. Spill recovery element; and
   e. Spill clean-up element.
4. Submittal of a spill control plan may be waived provided a state or local agency with jurisdiction over the subject source water provides a written statement to TRPA that a plan containing the above elements remains on file with that agency, or TRPA staff determines, at its discretion, that requiring a spill control plan would not result in significant additional protection of the source water.

E. Requirements of Existing Uses Located in Source Water Protection Zones

Existing uses that are identified as a possible contaminating activity located in a source water protection zone shall comply with subparagraph 60.3.3.D.3. Compliance with subparagraph 60.3.3.D.3 shall occur pursuant to the deadlines set forth in subparagraph 60.4.4.A.

60.3.4. Source Water Assessment

An inventory of wells, springs, and lake intakes that serve five or more user service connections shall be prepared for the Lake Tahoe Region. An inventory shall be prepared in consultation with local and state environmental health agencies. Sources omitted from the inventory due to a lack of information provided by local and state environmental health agencies shall be added as appropriate if additional source information is received by TRPA. Source water protection zones delineated on the source water assessment maps shall be modified pursuant to subparagraph 60.3.3.C.1.

60.3.5. Possible Contaminating Activities

A. Residential

1. Domestic animal raising

B. Commercial

1. **Retail**
   - **a.** Service stations
2. **Services**
   - **a.** Auto repair and service
   - **b.** Business support services
   - **c.** Laundries and dry cleaning plant
   - **d.** Repair services
3. **Light Industrial**
   - **a.** Batch plants
   - **b.** Fuel and ice dealers
   - **c.** Industrial services
   - **d.** Recycling and scrap
4. **Wholesale/Storage**
   - **a.** Storage yards
   - **b.** Vehicle storage and parking
   - **c.** Vehicle and freight terminals

C. Public Service

1. **General**
   - **a.** Airfields, landing strips, and heliports
   - **b.** Collection stations
   - **c.** Hospitals
   - **d.** Local public health and safety facilities
   - **e.** Regional public health and safety facilities
   - **f.** Power generating
   - **g.** Public utility centers
   - **h.** Schools

2. Linear Public Facilities
a. Transit stations and terminals

D. Recreation
1. Beach recreation
2. Boat launching facilities
3. Developed campgrounds
4. Golf courses
5. Marinas
6. Recreational vehicle parks
7. Rural sports

E. Resource Management
1. Timber Management
a. Timber stand improvement
2. Range
a. Grazing
b. Range pasture management
3. Watershed Improvements
a. Runoff control

F. Shorezone
1. Construction equipment storage
2. Seaplane operations
3. Tour Boat operations
4. Water-oriented outdoor recreation concessions

60.4. BEST MANAGEMENT PRACTICE REQUIREMENTS

60.4.1. Purpose

This section sets forth the requirements for installation of Best Management Practices (BMPs) for the protection or restoration of water quality and for attainment of minimum discharge standards.

60.4.2. Applicability

BMPs, as described in the *Handbook of Best Management Practices* (Volume II of the Lake Tahoe Basin Water Quality Management Plan), or equivalent practices approved by TRPA, shall be applied to all public and privately owned lands.

60.4.3. Project Compliance Program

TRPA shall enforce the project compliance programs as provided below.

A. Temporary BMPs
Temporary BMPs in accordance with the *Handbook of Best Management Practices*, and as required in Section 33.5, shall be implemented on construction sites and maintained throughout the construction period until winterization and permanent BMPs are in place.

B. Permanent BMPs
Application of required permanent BMPs within the parcel or entire project area boundaries, whichever is greater, shall be a condition of project approval. Standard requirements are set forth in subsections 60.4.5 and 60.4.6.

1. Conditions of project approval shall set forth a schedule for installation of permanent BMPs on the project area. In no case shall permanent BMP installation be scheduled later than the date set for the completion of the project (see Chapter 2: *Applicability of the Code of Ordinances*).

2. Retrofitting of the project area outside the construction site boundary with permanent BMPs shall also be made a condition of project approval. If the project area involves more than one parcel, the entire project area will be treated as one parcel for purposes of this section. TRPA shall keep track of the status of retrofitting of project parcels, and or project areas, as provided in Chapter 6: *Tracking, Accounting, and Banking*.

3. The below categories of projects, if not carried out in conjunction with another type of project, may be exempt from the requirements of subparagraph 60.4.3.B.2.

   a. Installation of erosion control facilities;

   b. Restoration of disturbed areas;

   c. SEZ restoration;

   d. Underground storage tank removal, replacement, or maintenance;

   e. Hazardous waste spill control or prevention facilities;

   f. Sewage pump-out facilities for RVs or boats; and

   g. Minor utility projects pursuant to subparagraph 30.6.2.F.

60.4.4. BMP Retrofit Program

Persons owning property not subject to a retrofit requirement prior to January 1, 1993, under subsection 60.4.3, or a discharge permit under subparagraph 60.4.4.D, shall install and maintain BMPs on their property with existing uses in accordance with the provisions below.

A. Priority System
Properties with existing uses shall install BMPs in accordance with subsection 53.10.5, the watershed priority system:

1. **Priority Group 1**
   Properties with existing uses in watersheds with a point score less than or equal to 30 shall install BMPs not later than October 15, 2000.

2. **Priority Group 2**
Properties with existing uses in watersheds with a point score of 30 to 46, inclusive, shall install BMPs not later than October 15, 2006.

3. **Priority Group 3**
Properties with existing uses in watersheds with a point score of 47 or greater shall install BMPs by October 15, 2006, or not later than October 15, 2008, pursuant to a fee schedule to be developed for BMP inspections, evaluations, and certifications.

B. Parcels and Unpaved Roadways without Appropriate BMPs
Parcels and unpaved roadways without appropriate BMPs in place pursuant to the dates described above are subject to enforcement under Article IX Compliance Procedures, Section 9.19, of the Rules of Procedure for violation of 60.4.

C. Disclosure Requirements
Owners of property for sale shall, prior to sale, disclose to a purchaser the property's BMP status on a TRPA approved form. The purchaser of the property shall provide the disclosure form to TRPA within 30 days of sale.

D. Discharge Permits
Not later than December 31, 1992, TRPA shall notify property owners with existing uses in the following categories 1 through 3 below of the requirements of this subsection. Not later than March 31, 1993, the persons so notified shall inform TRPA that: (1) they have an existing valid state or federal stormwater discharge permit, (2) they will apply for a state or federal stormwater discharge permit, or (3) they will submit to TRPA a remedial action plan pursuant to Section 5.12 of the Code of Ordinances. Not later than June 30, 1994, all persons so notified shall have either a valid state or federal stormwater discharge permit or an approved remedial action plan pursuant to Section 5.12. Such permits and action plans shall be consistent with the provisions of the Water Quality Management Plan for the Tahoe Region.

1. **Commercial Uses**
Retail or entertainment facilities, greater than one acre, and storage yards.

2. **Recreation Uses**
Downhill ski areas, marinas, and golf courses.

3. **Public Service Uses**
Transportation routes, and corporation yards.

60.4.5. Priority for Installation of Retrofitting Measures

Schedules for BMP compliance shall include the measures proposed for each year and the estimated cost for those measures. The estimated cost shall be based on unit costs established by TRPA. Unless otherwise approved by TRPA, a schedule that phases BMP compliance shall implement the BMP measures in the following order:

A. Pave legally established roads, driveways, and parking areas;

B. Install drainage conveyances;

C. Install walkways and stabilize cut and fill slopes;

D. Vegetate denuded areas; and

E. Treat surface runoff from land coverage.

60.4.6. Standard BMP Requirements

Pursuant to subsection 60.4.3, standard conditions of approval for projects shall meet the requirements provided below.

A. Runoff Water
Runoff water from impervious surfaces shall meet the discharge standards of Section 60.1 and shall be controlled as provided below.

1. Infiltration Requirements
Except as provided in subsection 60.4.8, infiltration facilities to discharge runoff to groundwater shall be required. Infiltration facilities shall be designed to accommodate the volume from a 20-year, one-hour storm. An average intensity of one inch per hour shall be used for this calculation. Infiltration facilities shall be designed utilizing the methodology set forth in the BMP Handbook. The bottom of infiltration trenches or dry wells shall be a minimum of one foot above the seasonal high water table. If TRPA finds that the runoff from impervious surfaces from a 20-year, one-hour storm will infiltrate naturally on the parcel, TRPA may waive the requirement to install infiltration facilities.

2. Excess Runoff
Runoff in excess of that infiltrated pursuant to paragraph 1 above shall be controlled in accordance with the methods and design standards in the Handbook.

B. Cut and Fill Slopes
Cuts and fills with slopes greater than 2:1 shall be stabilized with methods consistent with the BMPs.

C. Denuded Areas
All denuded areas, including slopes less than 2:1, shall be vegetated with approved species listed in the Handbook.

D. Drainage Conveyances
Drainage conveyances through a parcel shall be designed for at least a 10-year, 24-hour storm. Storm drain culverts and drain channels shall be designed by a qualified professional. Drainage conveyances through a SEZ shall be designed for a minimum of a 50-year storm.

E. Roads, Driveways, and Parking Areas
All roads, driveways, and parking areas proposed for year-round use shall be paved in accordance with Chapter 34: *Driveway and Parking Standards*.

F. Protection of BMPs
After installation, all BMPs shall be provided with adequate protection to prevent damage from vehicles.

G. Consistency with Defensible Space Requirements
In addition to subsections A – F above, water quality BMPs shall be installed and maintained consistent with the defensible space requirements of the applicable fire agency.

60.4.7. Additional Requirements

In addition to the standard requirements of subsection 60.4.6, project conditions of approval shall list any other appropriate required BMPs to meet minimum discharge standards. Construction in stream environment zones or Land Capability Districts 1 through 3, inclusive, normally shall require special conditions of approval because of the sensitivity of those areas to disturbance.

60.4.8. Special Circumstances

A. Where special circumstances occur, alternative BMPs may be approved to meet water quality standards. Special circumstances may include, but not be limited to, streets, highways, bike trails, existence of high ground water table, unusual upstream or downstream flow conditions, and presence of unusual concentrations of pollutants.

B. Infiltrating runoff volumes generated by the 20 year, 1-hour storm may not be possible in some locations due to shallow depth to seasonal groundwater levels, unfavorable soil conditions, or other site constraints such as existing infrastructure or rock outcroppings. For new development or redevelopment projects, site constraints do not include the existing built environment. In the event that site conditions do not provide opportunities to infiltrate the runoff volume generated by a 20 year, 1-hour storm, project proponents must either (1) meet the numeric effluent limits in outlined in subsection 60.1.3 for the 20-year 1-hour storm, or (2) coordinate with the local municipality or state highway department to document that shared stormwater treatment facilities treating private property discharges and public right-of-way stormwater sufficiently contribute to meeting the jurisdiction's average annual fine sediment particle and nutrient load reduction requirements.

60.4.9. Maintenance of BMPs

BMPs shall be maintained to ensure their continued effectiveness.

TRPA Shorezone (Shoreline) Ordinance Passes
http://www.trpa.org/programs/shorezone

On October 24, 2018, TRPA Governing Board voted for adoption of Alternative 1, the Shoreline Ordinance. This completed a multi-year effort by the Tahoe Regional Planning Agency worked with community members and stakeholders to update its shoreline policies and regulations.

For more information about the shoreline planning process: www.shorelineplan.org.

Tahoe Regional Planning Agency (TRPA) and the Lake Tahoe Basin Management Unit (LTBMU) have developed regulations on land use related to water quality standards. While many of the standards support drinking water efforts, they do not directly address drinking water pathogens.

The Tahoe Water Suppliers Association has supported local source water protection projects and planning efforts with ongoing participation in the Tahoe Regional Planning Agency Shorezone Ordinance amendment process, Shorezone Development Review process, risk assessment of proposed projects and staff support on the Aquatic Invasive Species working group.

Alternative 1 – Proposed Shoreline Plan: The goal of this alternative is to enhance the recreational experience at Lake Tahoe while protecting the environment and responsibly planning for the future. This alternative, developed through a consensus-based approach, incorporates the policies developed by the Steering Committee and was endorsed by the Regional Plan Implementation Committee of the TRPA Governing Board. The Shoreline Plan would mete out new private and public development over time. At buildout, it would allow for up to 2,116 new moorings (buoys, lifts or public slips), 128 new private piers, 10 new public piers, and two new public boat ramps. Some new and existing buoys could be converted to slips, and vice versa at facilities open to the public (e.g., marinas).

TWSA member participation in the Shorezone (now called Shoreline) Ordinance amendments process has included:

- Submission of written and verbal comments on multiple occasions in 2016, and earlier in 2006, 2007 and 2008, to the "Lake Tahoe Shorezone Ordinance Amendments / Environmental Impact Statement (EIS)". The TWSA recommendation of a 1320 foot (¼ mile) 'buffer' around intakes was set as a trigger for water provider consultation, for proposed new piers into the current code. Buoy fields remain at 600 feet as the trigger for consulation, through the TRPA review and implementation process. This requires that any proposed project within the buffer goes through a risk assessment evaluation by the applicable water purveyor. The results will be provided to TRPA, with suggested mitigation measures.

- TWSA staff monitors and attends the TRPA/Interagency Shorezone Coordination Group (reviews all shorezone project proposals); providing input relative to water purveyor concerns.

- TWSA/USACE Risk Assessment Model Projects 2014/2008
  Phase 1 was completed in October 2008. Included is the 2008 project is a spreadsheet based tool that is to be utilized by the purveyors to analyze potential risk from shorezone development. In spring 2013, NDEP contracted with Tahoe Science Consortium on updates to the Lake Tahoe Risk Assessment model; with potential upgrades to include new current data collected by TERC, analysis of increased risk from two potential new beach recreation areas in the southeastern corner of Lake Tahoe; and the increased safety of pathogen destruction from purveyor's additional treatment processes required by LT2. Phase 2 was completed June 2014.

- TWSA offers staff support to TRPA / TRCD and other partners for water quality monitoring efforts during the Asian Clam removal projects.

EXECUTIVE SUMMARY – *http://shorelineplan.org/wp-content/uploads/2018/05/0-ExecSumm.pdf*
The Tahoe Regional Planning Agency (TRPA) adopted its first Regional Plan and Code of Ordinances in 1987 to guide resource management and development, and protect the Tahoe Region's natural ecology and unique values. The Regional Plan included a Shorezone Subelement and implementing ordinances that regulated development along the shoreline of Lake Tahoe. The 1987 ordinances recognized that there was uncertainty about the effect of shoreline structures on fisheries. Because of this uncertainty, the ordinances prohibited new structures in areas identified as prime fish habitat and called for further study to evaluate the effects of shoreline structures on fish habitat and spawning. By the early 1990s, the studies had been completed, and they concluded that the placement of piers and buoys in spawning and feed/cover habitat has limited effect on fish populations and that those effects can be mitigated (Byron et al. 1989; Beauchamp et al. 1991, 1994). In response to the conclusions of the fish habitat studies, TRPA led multiple shorezone planning initiatives to replace the prohibition of structures in prime fish habitat with a comprehensive shoreline plan that would allow for lake access structures while protecting the environment. Any plan that would govern development along Lake Tahoe's shoreline proved to be highly controversial. TRPA prepared multiple plans and environmental analyses, which were released in 1995, 1999, 2004, 2006, and 2008.

Each time, controversy centered around fisheries, scenic quality, air quality, water quality, recreation and other topics that prevented adoption and implementation of a shoreline plan. To find common ground between stakeholders, TRPA launched a collaborative process to develop a new Shoreline Plan in 2016. TRPA, along with partner agencies and organizations, engaged a third-party mediator to convene stakeholders and develop a consensus-based planning process. As part of this process, a Steering Committee was convened to frame key shoreline issues, identify approaches to address them, and develop policy recommendations. The Steering Committee consisted of senior-level representatives from the California State Lands Commission, Lahontan Regional Water Quality Control Board, Lake Tahoe Marina Association, League to Save Lake Tahoe, Nevada Division of State Lands, Tahoe Lakefront Owners' Association, and TRPA.

TRPA also convened a Joint Fact-Finding (JFF) Committee comprised of technical experts from public agencies, universities, and stakeholder organizations to provide scientific and technical recommendations. The JFF Committee identified the best available scientific studies to inform the Shoreline Plan and Environmental Impact Statement (EIS), oversaw baseline data collection for the 2016 and 2017 boating seasons, developed analytical approaches to estimate boat usage, provided technical recommendations to the Steering Committee, and provided input on the analytical approaches in this EIS. The Steering Committee considered technical recommendations from the JFF Committee and input from the public to develop a recommended set of policies that constitute the proposed Shoreline Plan. The Regional Plan Implementation Committee of the TRPA Governing Board reviewed and endorsed the proposed Shoreline Plan as the preferred alternative, and three other alternatives, described in this EIS.

This EIS evaluates the environmental effects of four alternatives, consistent with the Tahoe Regional Planning Compact, Code of Ordinances, and Rules of Procedure. The four alternatives include different strategies to meet the following objectives of the Shoreline Plan:

- protect and where feasible enhance the environment,
- provide a fair and reasonable system of access,
- adapt to changing lake levels,
- preserve high-quality recreation and public safety,
- implement predictable and consistent rules.
-

"Tahoe In Depth"
http://www.trpa.org/about-trpa/press-room/tahoe-in-depth/
Tahoe In Depth is a biannual publication coordinated by TRPA that aims to inspire environmental understanding and stewardship at Lake Tahoe. TWSA has submitted articles on water conservation and source water protection. The purpose of *Tahoe In Depth* is to give homeowners, landowners, visitors, and policymakers clear, straightforward, and interesting information about the Lake Tahoe environment – from successful restoration to ongoing challenges. The goal is to help people better understand the work being done to restore Tahoe's clarity and the role they can play in helping reach that outcome.

The publication explores the natural and cultural history of the Tahoe Basin while providing balanced, reliable information on a wide spectrum of scientific and planning efforts under way to protect Lake Tahoe's unique scenic and ecological qualities.

Spearheaded by the Tahoe Regional Planning Agency, various agencies working in the Tahoe Basin have contributed stories and financial assistance to *Tahoe In Depth*. Other stories and content for the publication have been written or selected by an independent editor working with TRPA and contributors.

New Gateway Signs Mark Nevada Entrances to Lake Tahoe Watershed
http://www.trpa.org/about-trpa/press-room/new-gateway-signs-mark-nevada-entrances-to-lake-tahoe-watershed

Visitors to the Lake Tahoe Summit on Tuesday, August 19, 2015 will notice new gateway signs along three Nevada highways leading into the Lake Tahoe Watershed. Installed near Daggett Summit on Nevada State Route 207, Spooner Summit on U.S. Highway 50 and on Nevada State Route 431 the Mount Rose Highway, the decorative gateway signs read, "Entering the Lake Tahoe Watershed — Help Protect It!"

The signs were installed in July in a collaborative project led by the Tahoe Regional Planning Agency, U.S. Environmental Protection Agency, Nevada Division of Environmental Protection and Nevada Division of State Lands.

The signs are meant to help remind the millions of people who visit Lake Tahoe each year that they are entering a special place and have a duty to help protect its famously clear waters and environment. Fourth of July celebrations this year left thousands of pounds of trash on area beaches for community volunteers to clean up, showing there is still a strong need to remind people of their responsibility to help protect Lake Tahoe and its beaches. That same responsibility goes for keeping trash and other pollutants out of stormwater drainage systems and the 63 streams flowing into Lake Tahoe in a watershed that covers 312 square miles.

"Everything drains into the lake. The purpose of these new signs is to bolster environmental stewardship, let all visitors know they are entering a special place, and remind them there's a responsibility we all share to take care of it," said Julie Regan, chief of external affairs at TRPA. "These signs are one more tool to help instill that awareness.

Wild West Communications Group in Homewood, California, designed the signs. They were engineered by Lumos and Associates in Stateline, Nevada, and K B Foster Civil Engineering in Truckee, California. Rapid Construction in Carson City, Nevada, installed the signs. The Lake Tahoe Environmental Gateway Signage Project was paid for with funding from the U.S. Environmental Protection Agency and the Nevada Division of Environmental Protection as well as funding from the Lake Tahoe License Plate Program run by Nevada Division of State Lands. The agencies are looking to partner with community

organizations to adopt the signs and help ensure they remain attractive and in good repair. TRPA is also seeking funding to install more signs on California roadway entrances into the Lake Tahoe Basin.

TRPA Annual Shorezone Program Report
Executive Summary - March 2010
http://www.trpa.org/documents/packets/gb_packets/2010_gb_packets/mar_2010_gb_packet_Shore_Report.pdf
The first year of Shorezone water quality monitoring was conducted in 2009. This program was a mitigation measure required after the adoption of the TRPA Lake Tahoe Shorezone Ordinance in October 2008. This Report was required to be submitted to the TRPA Governing Board before March 31 of each year. The purpose of the Report was to provide information and recommendations to the APC and Governing Board as part of the Shorezone Adaptive Management System. However, this report ceased in 2010, due to revocation of the Shorezone ordinance.

TRPA Blue Boating Program
Carbureted two-stroke engines are banned from the lake. Only cleaner, direct fuel-injected two-stroke engines and four-stroke engines are permitted. This program was developed to mitigate hydrocarbon pollution from motorized boating at Lake Tahoe. The fee based program consisted of boater safety education resources, an engine tuning inspection program, resources for preventing hydrocarbon spills, shorezone monitoring and boat sewage awareness information.
However, this program was also halted as a result of the 2010 Shorezone Ordinance revocation.

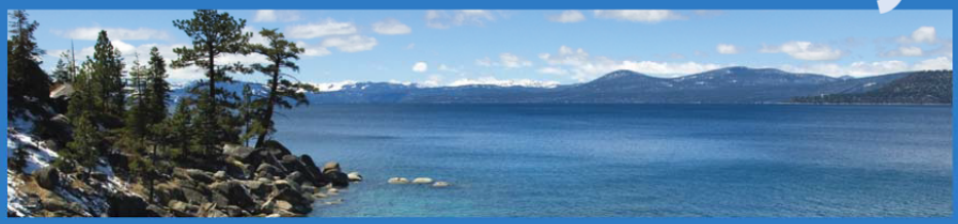
Water Quality: Chapter 4 of the 2011 and 2015 Threshold Report
http://www.trpa.org/documents/rp_update/Final_TVAL/1_2011_TEVAL_Chapters_Clean_2012-10-24/TEVAL2011_Ch4_WaterQuality_Oct2012_Final.pdf

http://www.trpa.org/wp-content/uploads/10_Ch4_WaterQuality_FINAL_9_30_2016.pdf

This chapter provides extensive information relative to monitoring conditions of nearshore and deep lake water quality conditions. Extensive data is presented on to suspended solids, nutrient loading, phytoplankton productivity, sechhi disk depths, and other water quality indicators. The chapter attempts to synthesize information in a complex intertwined grid of influences affecting water quality.

2015 TRPA Draft Threshold Evaluation Report
http://www.trpa.org/regional-plan/threshold-evaluation
The Draft 2015 Threshold Evaluation Report offers a snapshot of the health of the ecosystem in the Tahoe Basin by documenting the status and trends of 178 threshold standards in nine categories: Air quality, water quality, soil conservation, vegetation, fisheries, wildlife, scenic resources, noise, and recreation. This evaluation of the environmental threshold carrying capacities is the sixth report published since the adoption of the Regional Plan in 1987 and was reviewed by an independent panel of scientific experts who found the report to be technically sound. Excerpts are below:

Executive Summary



More 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.

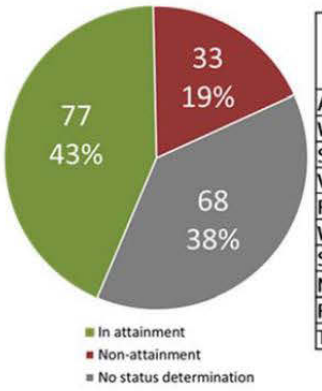
The reporting process is a collaborative endeavor that draws on the monitoring work and analytic expertise of federal, state, and local agencies, academic institutions, local businesses, and private consultants. The report provides a comprehensive overview of the environmental health of the Region as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

Threshold Standard Status

This report considers conditions relative to 178 standards in nine threshold categories (Figure ES-1)[1]. (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.

[1] 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.

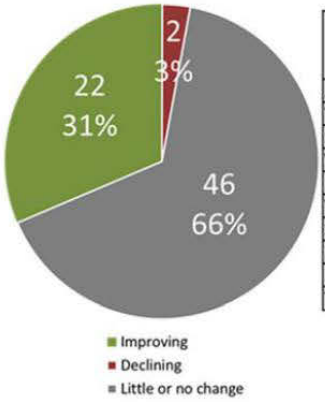


Category	Standards (#)	Status		
		Attainment	Non-attainment	No status determination
Air Quality	20	16	2	2
Water Quality	54	5	4	45
Soil Conservation	13	9	3	1
Vegetation	28	11	12	5
Fisheries	7	5	2	0
Wildlife	16	13	1	2
Scenic Resources	6	6	0	0
Noise	32	10	9	13
Recreation	2	2	0	0
Total	178	77	33	68

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
Total	178	22	46	2	84	24

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).

Water Quality

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.

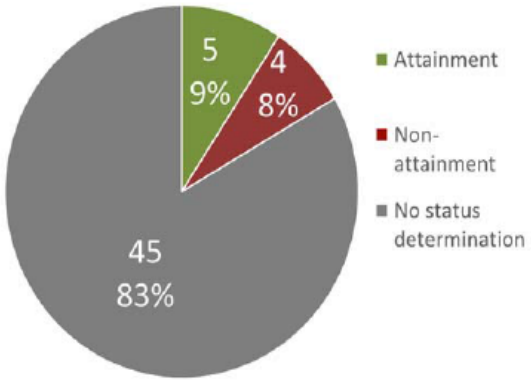


Figure ES-4: *Summary of the status of water quality standards*

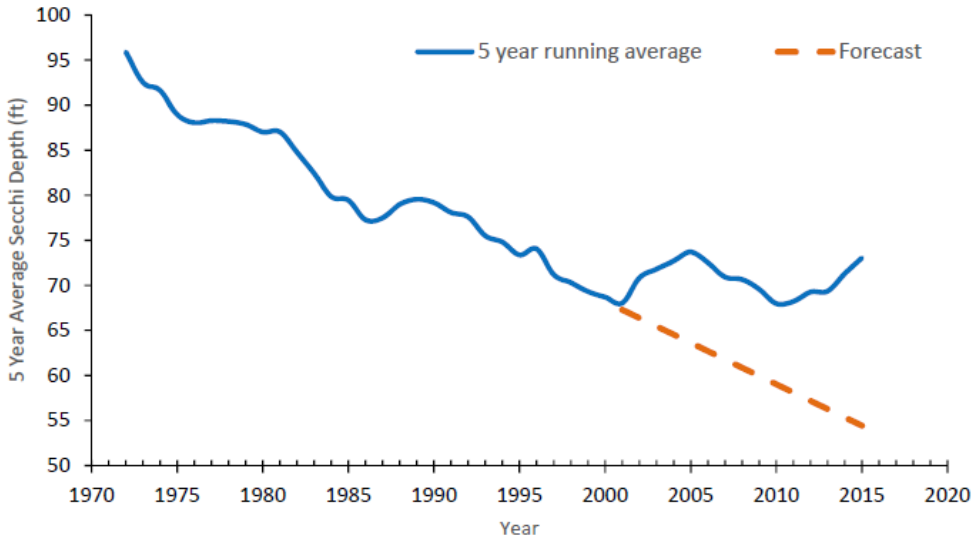


Figure ES-5. *Five-year average Secchi depth between 1970-2015. In 2000, forecasts based on observed trends between 1968 and 2000 suggested that by 2030 the lake's clarity could drop to less than 40 feet (Murphy & Knopp 2000). Today, the 2015 five-year average Secchi Depth (73 feet) is 18 feet better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

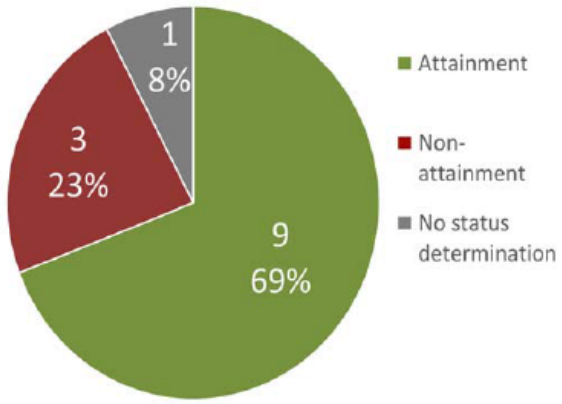


Figure ES-6: *Summary of the status of soil conservation standards*

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

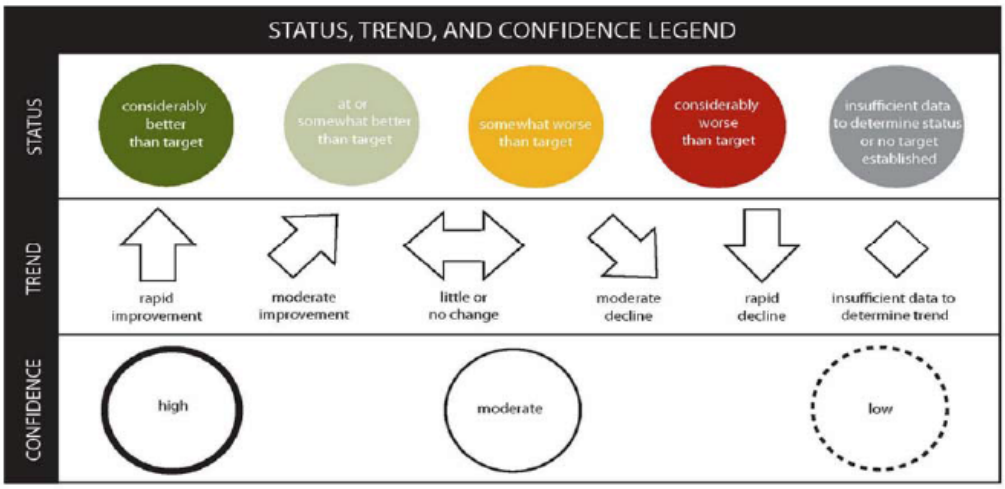
(DMDC Inc. 1978). Fortunately, that did not occur. The U.S. Forest Service and the California Tahoe Conservancy have acquired and protected over 900 acres of SEZ (TRPA 1988), and the permit review process and development restrictions prevented any new degradation of non-protected SEZs. To date, 924 acres 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.

Status and Trend Summary Charts for all Standards

Reporting Icon Legends



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
Implemented	The Management Standard has been integrated into the *Regional Plan* 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.	I
Partially Implemented	The Management Standard has been integrated into the *Regional Plan*, 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.	PI
Not Implemented	The Management Standard has not been integrated into the *Regional Plan* 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.	NI

Water Quality Status & Trend Summary

Standard	2011	2015
Pelagic Lake Tahoe		
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	
Littoral Lake Tahoe		
Nearshore Turbidity (Stream Influence)		
Nearshore Turbidity (No Stream Influence)		
Nearshore Attached Algae	Not assessed	
Aquatic Invasive Species	Not assessed	
Tributaries		
Suspended Sediment Concentration		
Phosphorus Concentration		
Nitrogen Concentration		
Suspended Sediment Load		
Fine Sediment Load		
Phosphorus Load		
Nitrogen Load		

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

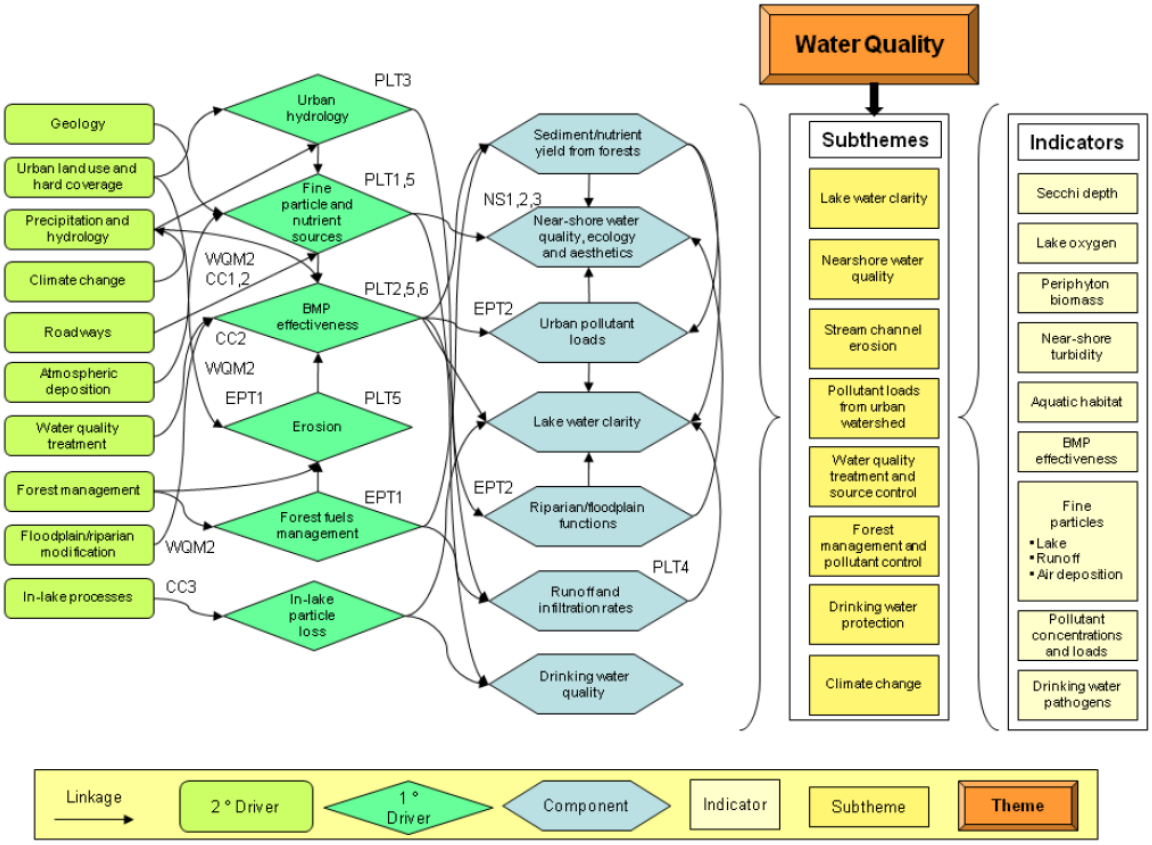


Figure 4-1. *Conceptual model for Tahoe Region water quality. This model focuses on the pollutant pathway for fine sediment particles (<16 µm) and nutrients (N and P). Key processes in this pathway include source identification, transport in the watershed, control and abatement, defining loads to Lake, fate in Lake, and assessment of water quality response. For ease of viewing only key linkages were drawn. Source: Hymanson and Collopy 2010.*

TRPA Regional Plan Update – Final EIS Released Oct. 2012
http://www.trpa.org/regional-plan/regional-plan-eis

Concurrent with the release of the TRPA Threshold Evaluation Report (previous section); was the release of the long awaited final TRPA Regional Plan Update. This plan, has been drafted to serve as the guiding document for basin wide human activities.

The Final Draft Environmental Impact Statement for the Lake Tahoe Regional Plan Update posted online October 24, 2012. An unprecedented level of public input has been received on the plan to date and public meetings were held October, November and December 2012 to provide opportunities for public input. The Tahoe Regional Planning Agency's Regional Plan Update is the blueprint for the Tahoe Basin's sustainable future The Regional Plan Update will help guide how communities evolve, how ecosystems function, whether the transportation network is efficient and effective, and whether the Basin at large is restored, more pristine, and sustainable.

Public involvement in developing the updated plan has been extensive with thousands of people participating in the last 7 years. The Final Environmental Impact Statement (EIS) includes all comments received on the EIS during the public comment period, agency responses to comments, as well as all contents of the Draft EIS. Legal challenges to the plan were dismissed in November 2016.

Water quality threshold standards adopted by TRPA set a target to return the Lake to the transparency observed in the late 1960s. Within the six major indicator categories, TRPA uses seven water quality standards to assess the water quality of Lake Tahoe and its tributaries. Table 3.8-1 lists each indicator category and associated standard(s). The status and trend of each threshold relative to the associated standard(s) is described in Section 3.8.2, Affected Environment.

Table 3.8-1. TRPA Water Quality Thresholds

Indicator Category	Standard	Numerical Standard and/or Management Standard
Littoral Lake Tahoe	Sediment Loading	Decrease sediment load as required to attain turbidity values not to exceed 3 NTU in littoral Lake Tahoe. In addition, turbidity shall not exceed 1 NTU in shallow waters of Lake Tahoe not directly influenced by stream discharges.
Deep water (pelagic zone)	Winter clarity, pelagic Lake Tahoe	Average winter Secchi depth, December-March, shall not be less than 33.4 meters.
Deep water (pelagic zone)	Phytoplankton primary productivity	Annual mean phytoplankton primary productivity shall not exceed 52 $gC/M^2/yr$.
Tributary water quality	Annual average concentrations of appropriate constituents	Concentrations of appropriate constituents in any tributary stream for which states have established standards (as mg/l); 90th percentile value suspended sediment of 60 mg/L.
Stormwater runoff quality	Surface discharge to surface water	Pollutant concentrations in surface runoff discharged to surface water shall not exceed the following concentrations at the 90th percentile: 〉 0.5 mg/L dissolved inorganic nitrogen as N 〉 0.1 mg/L dissolved phosphorus as P 〉 2.0 mg/L grease and oil 〉 0.5 mg/L dissolved iron 〉 250 mg/L suspended sediment
Stormwater runoff quality	Surface discharge to groundwater	Surface runoff infiltrated into soils shall not exceed the following concentrations at the 90th percentile: 〉 5.0 mg/L total nitrogen as N 〉 1.0 mg/L total phosphorus as P 〉 4.0 mg/L total iron 〉 40 mg/L grease and oil 〉 200 NTU turbidity Where there is a direct hydrologic connection between ground and surface waters, discharges shall meet the guidelines for surface discharges (WQ-5).
Other lakes	Concentrations of appropriate constituents	Water quality parameters and standards established by California and Nevada.

mg/l = milligrams per liter
NTU = Nephelometric Turbidity Units
$gC/M^2/yr$ = grams of carbon per square meter per year
Source: TRPA 2012a

Regional Plan

Goals and Policies

TRPA has established a number of goals and policies related to water quality. Goals include the reduction of sediment and nutrients to Lake Tahoe and the elimination or reduction of other pollutants. Policies address a range of issues, including snow removal, wastewater spill prevention, underground storage tanks, dredging, and reduction of impacts from motorized watercraft. The existing goals and policies for water quality protect and enhance lake clarity and beneficial uses within the following regulatory framework:

- Concentration-based discharge standards and infiltration requirements for stormwater treatment that control water quality impacts associated with new development;
- Regulations requiring the retrofitting of developed properties with Best Management Practices (BMPs) that reduce erosion and stormwater runoff;
- Regulatory preservation and restoration of Stream Environment Zones (SEZs) to protect and enhance their water quality values; and
- Prohibiting the discharge of wastewater, toxic waste, and solid waste into Lake Tahoe, its tributaries, and groundwater resources.

Code of Ordinances

The TRPA Code of Ordinances contains a range of requirements intended to help achieve water quality threshold standards, goals, and policies. Chapter 60 of the Code is the primary chapter directed at water quality and the installation of BMPs. A number of other chapters contain provisions pertaining to the protection of water resources and water quality for hydrology, coverage, and grading and excavation (Table 3.8-2).

Table 3.8-2. Selected Code Requirements Related to Water Quality Protection

Code Section	Requirements
Chapter 30	Sets forth regulations concerning the land capability system, land capability districts, prohibition of additional land coverage in certain land capability districts, and transfer and mitigation of land coverage.
Chapter 33.3	Sets standards for grading and excavation.
Chapter 33.4	Sets requirements for special investigations, reports, and plans, determined to be necessary by TRPA to protect the environment against significant adverse effects from grading projects.
Chapter 33.5	Sets forth the requirements for grading and construction schedules when grading or construction is to occur pursuant to a TRPA permit.
Chapter 35	Sets forth regulations pertaining to recognition of natural hazards, including floodplains, prevention of damage to property, and protection of public health relating to such natural hazards.
Chapter 60.1	Sets discharge standards for runoff and discharge to surface and groundwater.
Chapter 60.2	Sets forth requirements that new residential, commercial, and public projects completely offset their water quality impacts.
Chapter 60.3	Contains regulations pertaining to recognition of source water, prevention of contamination to source water, and protection of public health relating to drinking water.
Chapter 60.4	Sets standards for installation and maintenance of BMPs for the protection or restoration of water quality.

Source: TRPA 2012b

Regulations for stormwater discharge are based on maximum allowable concentrations for nitrogen, phosphorus, iron, turbidity, suspended sediments, and grease and oil. Standards for stormwater discharge to surface water are different than those for discharge to groundwater. In general, discharge standards to

groundwater are more lenient because of the natural filtering capacity of soils and the potential for nutrient uptake from vegetation. TRPA discharge standards for surface water and groundwater in the Code are the threshold standards for those indicator reporting categories (see Table 3.8-2). In addition to numerical discharge limits, the Code also restricts the discharge of wastewater and toxic substances, sets requirements for snow removal and control of salts, and sets criteria for pesticide use and fertilizer control.

In addition to stormwater runoff quality standards, regulations are in place for containment of stormwater runoff volumes and flows. These regulations are designed to reduce the hydrologic impacts of urbanization on peak runoff rates and volumes, protect water quality, and protect property and public safety. TRPA regulations require containment, at a minimum, of the stormwater runoff volume generated by a 20-year return period, 1-hour duration "design storm" from impervious surfaces. The calculation of runoff volume is made by multiplying the intensity of the 20-year, 1-hour design storm (taken as 1 inch of rain in 1 hour) by the impervious surface area. Runoff that is contained and subsequently infiltrated is required to meet the maximum concentration requirements for discharge to groundwater (Table 3.8-2).

Water Quality Management Plan for the Lake Tahoe Region (208 Plan)

The *Water Quality Management Plan for the Tahoe Region* (208 Plan) was prepared by TRPA in compliance with Section 208 of the federal Clean Water Act. The 208 Plan contains overlapping elements with the Regional Plan, including the Handbook of Best Management Practices, the Stream Environment Zone Protection and Restoration Program, and the Capital Improvement Program for Erosion and Runoff Control. The 208 Plan identifies pollution sources, control needs, and management practices to improve water quality.

The 208 Plan contains management programs that pertain to urban runoff and erosion, airborne nutrients, waste management, natural area management, and other water quality issues in Lake Tahoe and the Shorezone. Programs are implemented through designated management agencies, including TRPA, the U.S. Forest Service (USFS), and other federal, state, and local governments. To determine if water quality goals are attained and maintained, water quality programs require continuous scientific monitoring of environmental conditions related to the threshold standards for pelagic Lake Tahoe, littoral Lake Tahoe, tributary streams, surface runoff, groundwater, land coverage, and SEZs. TRPA must publish annual or semi-annual reports on monitoring program implementation and must evaluate the results at least every 5 years (Goals and Policies, p. VII-23).

FEDERAL

Federal Antidegradation Policy

The U.S. Environmental Protection Agency (EPA) has designated Lake Tahoe an Outstanding National Resource Water (ONRW). ONRWs are provided the highest level of protection under EPA's Antidegradation Policy, stipulating that states may allow some limited activities that result in temporary and short-term changes to water quality, but that such changes should not adversely affect existing uses or alter the essential character or special uses for which the water was designated an ONRW. EPA interprets this provision to mean that no new or increased discharges to ONRWs and no new or increased discharge that would result in lower water quality are permitted.

Clean Water Act

Section 404

The federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), provides for the restoration and maintenance of the physical, chemical, and biological integrity of the nation's waters. Section 404 of the CWA prohibits the discharge of fill material into waters of the United States, including wetlands,

except as permitted under separate regulations by the U.S. Army Corps of Engineers (USACE) and EPA. To discharge dredged or fill material into waters of the United States, including wetlands, Section 404 requires projects to receive authorization from the Secretary of the Army, acting through the USACE. Waters of the United States are generally defined as "waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide; territorial seas and tributaries to such waters."

Section 401

Under CWA Section 401, applicants for a federal license or permit to conduct activities that may result in the discharge of a pollutant into waters of the United States must obtain certification for the discharge. The certification must be obtained from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over the affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and may affect state water quality (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401. Water quality certification requires evaluation of potential impacts in light of water quality standards and CWA Section 404 criteria governing discharge of dredged and fill materials into waters of the United States. EPA delegates water pollution control authority under CWA Section 401 to the states.

Section 402

Section 402 of the CWA establishes the National Pollutant Discharge Elimination System (NPDES) permit program to regulate discharges of pollutants into waters of the United States. An NPDES permit sets specific discharge limits for point-source discharges of pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. EPA delegates water pollution control authority under CWA Section 402 to the states, which oversee compliance.

CALIFORNIA

Lahontan Regional Water Quality Control Board

The Porter-Cologne Act created the California State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCBs) in California. The SWRCB protects water quality by setting statewide policy, coordinating and supporting RWQCB efforts, and reviewing petitions that contest RWQCB actions. The RWQCBs issue waste discharge permits, take enforcement action against violators, and jointly administer federal and state laws related to water quality in coordination with EPA and USACE.

The Tahoe Region is located within the jurisdiction of the Lahontan RWQCB (LRWQCB). The LRWQCB Region is approximately 570 miles long, covering an area of 33,131 square miles, from the California-Oregon border to the Antelope Valley watershed in Los Angeles and San Bernardino Counties. In addition to the Tahoe Region, the Lahontan Region includes Death Valley, Mount Whitney, Owens Valley, Mono Lake, and portions of Lassen and Modoc Counties.

On the California side of the Tahoe Region, LRWQCB implements the CWA, 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. LRWQCB has authority to set and revise water quality standards and discharge prohibitions. It issues federal permits, including 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).

Water quality standards and control measures for surface and ground waters of the Lahontan Region are contained in the Water Quality Control Plan for the Lahontan Region (Basin Plan). The Basin Plan designates beneficial uses for water bodies. It establishes water quality objectives, waste discharge prohibitions, and other implementation measures to protect those beneficial uses. Chapter 5 of the Basin Plan, Water Quality Standards and Control Measures for the Lake Tahoe Basin, summarizes a variety of control measures for the protection and enhancement of Lake Tahoe.

NEVADA

NEVADA DIVISION OF ENVIRONMENTAL PROTECTION, BUREAU OF WATER QUALITY PLANNING

The Nevada Division of Environmental Protection (NDEP) Bureau of Water Quality Planning (BWQP) is responsible for several water quality protection functions, including: collecting and analyzing water data, developing standards for surface waters, publishing reports, providing water quality education, and implementing programs to address surface water quality. The BWQP is divided into four branches: water quality standards, monitoring, nonpoint source pollution management, and the Lake Tahoe management program. The branches are responsible for the following duties and responsibilities:

- The Water Quality Standards Branch is responsible for developing and reviewing water quality standards; determining total maximum daily loads and wasteload allocations from point sources; and determining load allocations from non-point sources.
- The Monitoring Branch is responsible for administering the state's water quality monitoring program. This branch maintains and updates water quality data for the national water quality data base (Water Quality Exchange Network - WQX) and is responsible for preparation of Nevada's Water Quality Assessment Report, which is required under CWA Section 305(b) of the Clean Water Act (CWA).
- The Nonpoint Source (NPS) Pollution Management Program aims to control nonpoint sources of pollution in Nevada. NPS pollution results from a variety of diffuse and dispersed human activities.
- The Lake Tahoe Watershed Program unit collaborates with LRWQCB to develop the Total Maximum Daily Load for Lake Tahoe.

LAKE TAHOE TOTAL MAXIMUM DAILY LOAD

Section 303(d) of the Clean Water Act requires states to compile a list of impaired water bodies that do not meet water quality standards and to develop a total maximum daily load (TMDL) for impaired water bodies to determine the key pollutants and contributing sources to the impairment. Lake Tahoe is one of 41,237 impaired waters in the United States listed in EPA's National Summary of Impaired Waters and TMDLs (EPA 2012). While both California and Nevada have identified Lake Tahoe as an impaired water body, the scientific basis for the impaired classification is different between the states:

- California has identified Lake Tahoe's lack of transparency as the primary basis for its impaired status under its Section 303(d) impaired water listings filed with EPA. To comply with California's Lake Tahoe transparency standard, a 25-centimeter (10-inch) white Secchi disk would need to be visible 29.7 meters (97.4 feet) below the surface of Lake Tahoe on an average annual basis.
- Nevada has identified Lake Tahoe's lack of clarity as the primary basis for its impaired status under its Section 303(d) impaired water listings filed with EPA. Clarity is defined as a quantitative measure of the vertical extinction of light (VEC) per meter of depth. A lower VEC reading indicates more clarity to the water. To comply with Nevada's Lake Tahoe clarity standard, a VEC of 0.08 per meter is necessary.

The science supporting the Lake Tahoe TMDL was developed collaboratively by LRWQCB and the NDEP and provides the framework for a comprehensive water quality restoration plan to address identified pollutant sources with shared goals to ultimately achieve the Lake Tahoe transparency and clarity water quality objectives (LRWQCB and NDEP 2010: p. 1-1). However, TMDLs established under CWA Section 303(d) function primarily as planning devices and are not self-executing. Each TMDL represents a goal that may be implemented by adjusting pollutant discharge requirements in individual NPDES permits or establishing nonpoint source controls. Because California and Nevada must comply with, administer, and enforce their own state laws and policies, each state has developed its own Lake Tahoe TMDL to address the impairment of Lake Tahoe as addressed in each state's Section 303(d) filings with EPA. The following items highlight the differences in implementation approaches between the two states:

- California's Lake Tahoe TMDL (dated November 2010 and approved by EPA in 2011) requires attainment of the California transparency objective for Lake Tahoe over a 65-year implementation period. Based on California law, LRWQCB has the obligation to implement and enforce the California Lake Tahoe TMDL through NPDES discharge permits (over which EPA has jurisdiction) issued to California government entities (City of South Lake Tahoe, Placer County, El Dorado County, and the California Department of Transportation).
- Nevada's Lake Tahoe TMDL (dated August 2011 and approved by EPA in 2011) is a modified version of the California Lake Tahoe TMDL. The Nevada Lake Tahoe TMDL clarifies Nevada's regulatory structure and approach to implementation and emphasizes that the proposed implementation timelines may need to be adjusted for a variety of reasons, but particularly based on the availability of future funding. NDEP's stated plan for implementing the Lake Tahoe TMDL for Washoe County and Douglas County is through Memoranda of Agreement (MOA) with each jurisdiction. MOAs are a collaborative, legally non-binding approach to implementing a TMDL. NDEP regulates the Nevada Department of Transportation and the Stateline Stormwater Association with NPDES discharge permits.

TRPA Regional Plan Development History
TWSA was an active participant of the multi-year Regional Pathway process over its entire process. The Pathway process was used to collaboratively update the Lake Tahoe Basin Regional plans led by Tahoe Regional Planning Agency, Lake Tahoe Basin Management Unit, Nevada Environmental Protection Agency and the Lahontan Regional Water Quality Control Board.

The 2012 Update: Restoring Lake Tahoe and Supporting Sustainable Communities
http://www.trpa.org/regional-plan

Legal challenges to the Regional Plan were dismissed in November 2016.
http://legal-planet.org/2016/11/05/tahoe-regional-planning-agency-wins-big-in-ninth-circuit/planet.org

The Tahoe Regional Planning Agency (TRPA) won a major legal victory in the U.S. Court of Appeals for the Ninth Circuit. A unanimous three-judge panel of that court rejected environmentalists' challenge to TRPA's adopted Regional Plan for the Lake Tahoe Basin in *Sierra Club v. Tahoe Regional Planning Agency.*

The Ninth Circuit decision effectively concludes a decade-long process by which TRPA formulated, held multiple hearings on, and ultimately adopted a revised Regional Plan for the Tahoe Basin. That Plan's most noteworthy element is its concentration of development in relatively densely-constructed "community centers" in already-urbanized portions of the Tahoe Basin. The environmental trade-off is that in exchange for that intensified development, currently-developed areas outside those community centers will be returned to open space.

A new way forward for Lake Tahoe was approved in December, 2012 with an update of the Lake Tahoe Regional Plan. The updates encourage greater private-public partnerships and created incentives for property owners to make Lake-saving improvements to their home or business. Use these fact sheets for an overview of the focused updates that went into effect in February, 2013:

RESTORING *lake Tahoe* & SUPPORTING COMMUNITIES

There is a new plan for Tahoe.

The 2012 Lake Tahoe Regional Plan is a blueprint for Lake Tahoe's sustainable future. The plan is an update to the bi-state regulatory system that aims to accelerate environmental gains while supporting the health of our communities. New policies pair longstanding regulations with new incentives for property owners to increase ecosystem restoration. The underlying goal is to encourage home improvements and environmental redevelopment of outdated properties as necessary to restore Lake Tahoe's environment.

Priorities of the 2012 Regional Plan

1. Accelerate water quality restoration
2. Help create walkable communities with alternative transportation options
3. Streamline the permitting process and integrate Area Plans with the Regional Plan

Homeowner Improvements

Property owners that were planning to use the new ordinances relating to land coverage this year are waiting for parallel approval of those amendments in other Lake Tahoe regulatory plans before they can be utilized. The changes allow land coverage credits and exemptions, such as for pervious paving and decks, on certain properties that have a completion certificate for their stormwater Best Management Practices (BMPs).

Litigation of the Regional Plan

Despite an unprecedented public participation process, a lawsuit has been filed against the 2012 plan by the Sierra Club. While the litigation makes its way through the legal process, the updated ordinances are currently in effect and TRPA is moving ahead implementing the plan.

To increase your understanding of what the plan is projected to deliver for Lake Tahoe, we have assembled some basic facts and figures on the next page.

For more information:
trpa.org · facebook/voiceforlaketahoe · trpa@trpa.org

March 2013

Regional Plan by the numbers

While maintaining the strict growth control system that's been in effect since 1987, the plan makes reinvestment in our communities more feasible and promotes strengthening Lake Tahoe's economy and communities.

55% reduction in the maximum rate of new residential building **allocation**

8% maximum increase in **residential units** possible by 2035

0 number of new **tourist accommodation units** allowed by the 2012 plan updates

24 acres of land coverage projected to be removed from sensitive lands through privately-funded development transfers

5,900 potential increase in the Basin's year-round population by 2035 expected from new development allowed by the Plan, or 0.5% per year—lower than the population measured in the 2000 census.

1,200 additional **parcels** anticipated to be protected or restored

27,500 number of developed properties targeted by RPU incentives to complete and certify **stormwater infiltration BMPs**

A more concentrated land use pattern in the Tahoe Region will:

- Revitalize existing communities
- Reduce automobile reliance and emissions
- Increase feasibility of walking, biking and transit use
- Accelerate implementation of stormwater treatment
- Decrease environmental impacts
- Provide a broader range of housing options

10,000 expected number of **vehicle miles traveled to be eliminated** from the Basin annually by transferring development from outlying areas to community centers

7% per capita **reduction in greenhouse gas emissions** projected by the Regional Transportation Plan in 2035

TAHOE REGIONAL PLANNING AGENCY

A Voice for Lake Tahoe

Tahoe Bi-State Compact Preserved

http://sd27.senate.ca.gov/news/2013-10-14-governor-signs-agreement-preserve-lake-tahoe
October 14, 2013
SACRAMENTO – On Saturday, Governor Jerry Brown signed Senate Bill 630 by Sen. Fran Pavley (D-Agoura Hills), Senate President pro Tempore Darrell Steinberg (D-Sacramento) and Sen. Ted Gaines (R-Rocklin), which preserves the bi-state Tahoe Regional Planning Compact. The bill duplicates Nevada's Senate Bill 229, which has been signed by Governor Brian Sandoval.

The compact is a 45-year-old framework for regulating land use in the Lake Tahoe Basin and enforcing environmental standards. In 2010, Nevada threatened to withdraw from the compact unless changes were made to the voting structure. These changes would have weakened conservation protections in the basin and were opposed by California. SB 630 reflects an agreement between the two states that keeps Nevada in the compact. Nevada agreed to keep the voting structure intact, and California agreed to amend the compact to require that economic considerations are taken into account by the Tahoe Regional Planning Agency (TRPA), the agency that enforces the compact.

"This agreement preserves a collaborative relationship between California and Nevada that has helped protect environmental quality in the Lake Tahoe Basin for more than four decades," Pavley said.

TRPA Environmental Improvement Projects (EIP)
http://www.trpa.org/about-trpa/how-we-operate/environmental-improvement-program

The primary goal of the TRPA Environmental Improvement Program is to "lead the cooperative effort to preserve, protect and enhance the unique natural and human environment of the Lake Tahoe Region," (TRPA 2004). The Environmental Improvement Project (EIP) is administered by the Tahoe Regional Planning Agency.

The EIP program identifies restoration and improvement projects needed to meet nine environmental thresholds in the basin. The information is quite extensive on EIP projects, past, current and future. TWSA members act as managers and/or resources on EIP water quality improvement projects identified within their watersheds. The EIP is a public-private partnership that rivals some of the largest collaborative restoration initiatives in the United States in its scope.

The program identified projects and programs needed to fulfill nine environmental thresholds in the Tahoe Basin. The thresholds include: water quality, air quality, soil conservation, vegetation, fisheries, wildlife, scenic resources/community design, recreation, and noise. TRPA, Nevada Tahoe Conservation District, and Lake Tahoe Basin Management Unit have completed extensive work on the tracking program to evaluate the progress of EIP project installations.

Launched in 1997, the Lake Tahoe Environmental Improvement Program (EIP) is a partnership of federal, state, and local agencies; private interests; and the Washoe Tribe, created to protect and improve the extraordinary natural and recreational resources of the Tahoe Basin. EIP partners implement projects that include everything from new bike trails to creek restorations to programs that protect the Lake from aquatic invasive species.

EIP Priorities:

- Improve forest health and reduce forest fuels
- Treat stormwater to improve Lake clarity
- Prevent and control aquatic invasive species
- Complete Basin-wide bike trail network

- Acquire and remove blighted structures, and transfer development rights from sensitive lands to town centers
- Restore Upper Truckee River and other key Tahoe watersheds.

Accomplishments 1997-2015:
More than 450 projects have been completed and 100 more projects are currently being implemented by EIP partners.

Accomplishments include:

- Improving erosion control measures on 703 miles of roadways
- Treating 59,520 acres of hazardous fuels
- Increasing public lake access by acquiring or enhancing 2,770 linear feet of shoreline
- Restoring over 16,000 acres of wildlife habitat, including 1,532* acres of stream environment zones (* Includes Truckee River Marsh Restoration Project which is currently in the planning phase. It will be one of the largest SEZ restoration projects undertaken in Lake Tahoe and the watershed is the largest contributor of fine sediment to the Lake.)
- Creating or improving 143 miles of bike and pedestrian routes

Between 2009-2015 the Aquatic Invasive Species Program has:

- Conducted approximately 44,000 watercraft inspections
- Performed over 21,000 watercraft decontaminations for all aquatic invasive species
- Treated 38.85 acres of weeds and Asian clams (includes multiple treatments on some acres).

Photo by Drone Promotion

Environmental Improvement Program

August 2015

Launched in 1997, the Lake Tahoe Environmental Improvement Program (EIP) is a partnership of federal, state, and local agencies; private interests; and the Washoe Tribe, created to protect and improve the extraordinary natural and recreational resources of the Tahoe Basin. EIP partners implement projects that include everything from new bike trails to creek restorations to programs that protect the Lake from aquatic invasive species.

Between 1997 and December 2014, all sectors collectively invested $1.8 billion which includes $593.4 million by the federal government, $693.4 million by California, $118.8 million by Nevada, $77.1 million by local governments, and $328.3 million by the private sector.

EIP Priorities

- Improve forest health and reduce forest fuels
- Treat stormwater to improve Lake clarity
- Prevent and control aquatic invasive species
- Complete Basin-wide bike trail network
- Acquire and remove blighted structures, and transfer development rights from sensitive lands to town centers
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Published by the Tahoe Regional Planning Agency
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- Increasing public lake access by acquiring or enhancing 2,770 linear feet of shoreline
- Creating or improving 143 miles of bike and pedestrian routes
- Since 2009 the Aquatic Invasive Species Program has:
  - Conducted approximately 44,000 watercraft inspections
  - Performed over 21,000 watercraft decontaminations for all aquatic invasive species
  - Treated 38.85 acres of weeds and Asian clams (includes multiple treatments on some acres).

** This includes the 592 acres of the Upper Truckee River Marsh Restoration Project which is currently in the planning phase. It will be one of the largest SEZ restoration projects undertaken in Lake Tahoe and the watershed is the largest contributor of fine sediment to the Lake.*

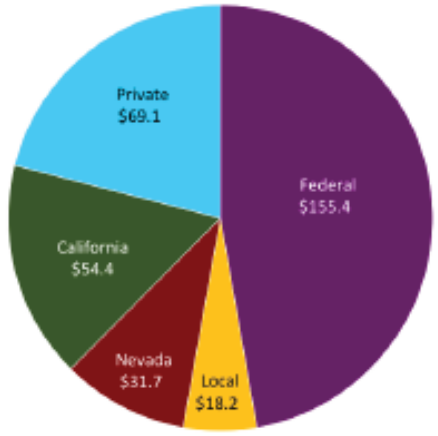
LAKE TAHOE
ENVIRONMENTAL
IMPROVEMENT PROGRAM

EIP Funding

As programs move forward, EIP partners continue to work together to identify the highest priority projects and funding needed to continue the commitment to restoring and protecting Lake Tahoe.

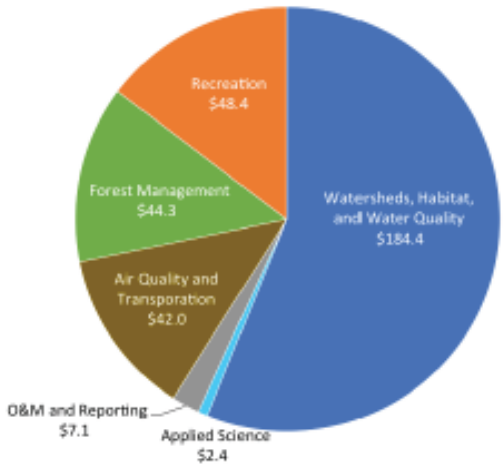
EIP Funding by Source

EIP investments are highly leveraged
(2010–14, in millions)



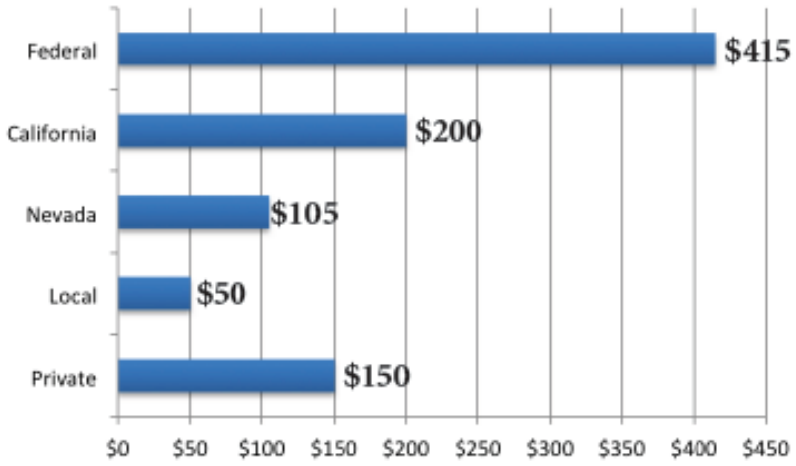
EIP Funding by Focus Area

EIP funding supports a broad range of projects
(2010–14, in millions)



10-Year EIP Funding Targets

(in millions)



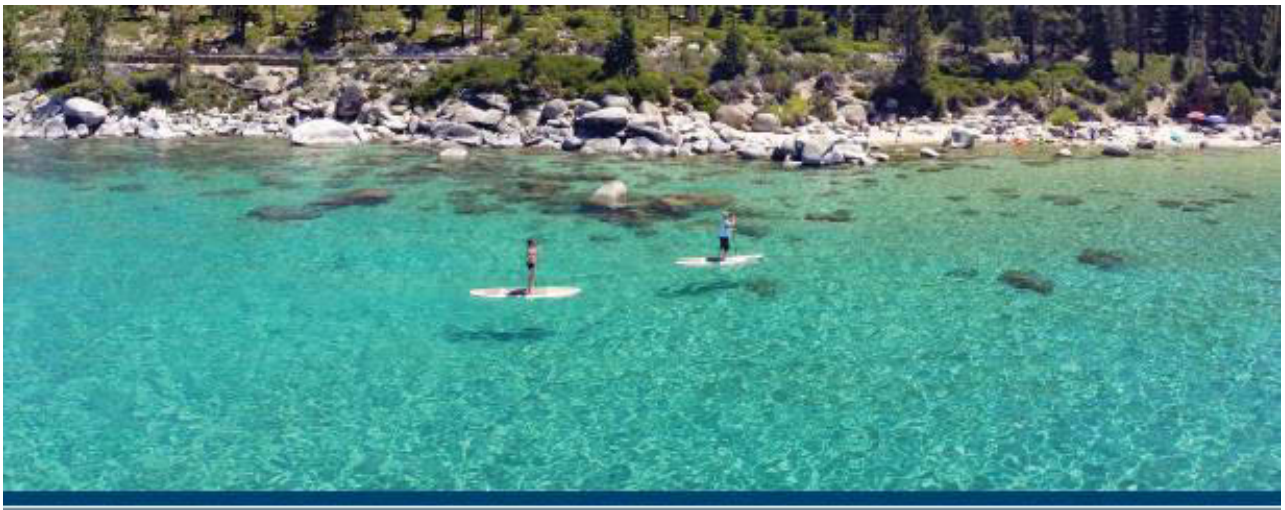
Federal: Reauthorize the Lake Tahoe Restoration Act (LTRA) for $415 million and seek funding from all applicable federal programs.

Nevada: Access $105 million in authorized bond funding (in phases).

California: Seek $200 million from Prop. 1, cap and trade, potential parks bond, and other sources.

Local: Maintain and increase O&M commitments and local assessments.

Private: Attract new investments, donations, and partnerships.



Water Quality and Clarity

Background

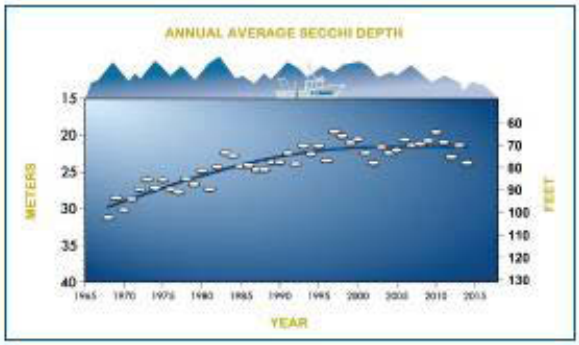
According to the 2015 State of the Lake Report by the Tahoe Environmental Research Center, average annual water clarity was the best in more than a decade, improving from 70.2 feet in 2013 to 77.8 feet in 2014. While some of this increased clarity can be attributed to the drought, research also indicates that investments in stormwater treatment facilities through the EIP are likely also driving this positive progress. Stormwater management projects on roadways, retrofitting parking areas on recreational facilities adjacent to the Lake, and installing Best Management Practices (BMPs) on private properties have all contributed to reversing the declining clarity trend.

Accomplishments

- Completed new major area-wide treatment projects including the Bijou Erosion Control Project, the Harrison Avenue Water Quality Improvement and Streetscape Project, and the Cave Rock Area-Wide Stormwater Treatment Basin Retrofit.
- Continued watershed restoration projects on the Upper Truckee River, Rosewood and Third Creeks, and other priority locations.

Priorities

- Implementing area-wide water quality treatments.
- Focusing private-parcel BMP installation on locations with high pollutant loading.



- Improving nearshore and deep Lake clarity.
- Continuing stormwater and tributary monitoring.

Guiding Policy

- Lake Tahoe Water Quality Management Plan
- Lake Tahoe Total Maximum Daily Load (TMDL)
- BMP Action Plan

August 2015 | Photo by Drone Promotions

LAKE TAHOE ENVIRONMENTAL IMPROVEMENT PROGRAM

Invasive Species

Background

Lake Tahoe continues to administer one of the most comprehensive and collaborative Aquatic Invasive Species (AIS) prevention programs in the country. All motorized watercraft are required to be inspected before entering Lake Tahoe. This year, California and Nevada recognized the importance of continuing these inspections by committing to fund half the program through their respective state budgets while the other half continues to be funded by boater fees.

This new stable funding for the prevention program has allowed agencies to prioritize projects that control AIS currently in the Lake. Controlling invasive weeds, warm water fish, and Asian clams is crucial to reducing the threat to native species and improving water quality.

Accomplishments

- No detections of new aquatic invasive species.
- Adoption of the AIS Control Implementation Plan.
- Expanded national leadership role through new membership on the Federal Advisory Committee that guides national AIS policy.
- California funding source (SB630) for control projects.
- Since 2009, 44,000 watercraft inspections and 38 acres of weeds and Asian clams treated (includes multiple treatments on some acres).

At left: Eurasian watermilfoil pre-treatment in Emerald Bay (2010). At right: the same location after treatment (2012) using diver-assisted suction and bottom barriers.

Priorities

- Obtaining funding for control projects and research to maintain a science-based program.
- Limiting the spread of existing invasive species.
- Continuing collaboration among all partner agencies through the Aquatic Invasive Species Coordination Committee.
- Continuing public education and outreach through the Take Care, Tahoe Keepers, and Eyes on the Lake programs.

Guiding Policy

- Lake Tahoe Region Aquatic Invasive Species Management Plan
- Lake Tahoe AIS Implementation Plan

August 2015 | Photo by Tahoe RCD

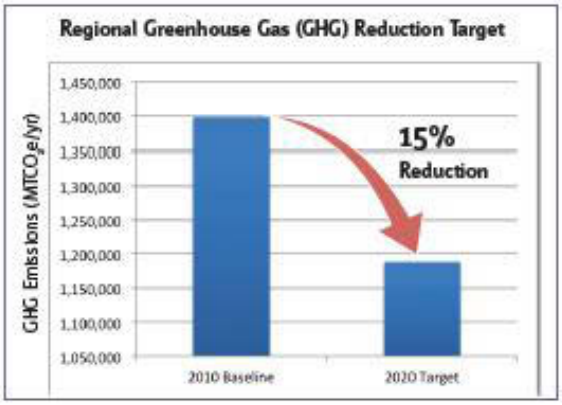
LAKE TAHOE ENVIRONMENTAL IMPROVEMENT PROGRAM

Sustainability and Regional Plan

Background

Sustainability for Lake Tahoe communities includes bringing new transportation options, finding innovative ways to build new infrastructure, encouraging health and social well-being, and building a healthy economy.

The Regional Plan and the Lake Tahoe Sustainability Action Plan serve as a framework for the Basin to implement strategies that will create more resilient communities in the face of a changing climate.



Accomplishments

- The inaugural Connections sustainability conference brought leaders together to discuss building more resilient communities through mountain-urban partnerships.
- The Sustainability Action Plan won the National American Planning Association's Award for Green Innovation.

Priorities

- Reexamining the regional development rights commodities system and determining how to accelerate environmental redevelopment.
- Working with the newly formed Bi-State Science Council to address nearshore and climate change implications.
- Implementing local Area Plans. To date, the TRPA Governing Board has approved three Area Plans and five more are under development by local jurisdictions.
- Implementing the Sustainability Action Plan and continuing the citizen-led Tahoe-Truckee collaborative.
- Working with regional partners to develop a Tahoe-Truckee Electric Vehicle Readiness Plan.

Guiding Policy

- Regional Plan
- Sustainability Action Plan

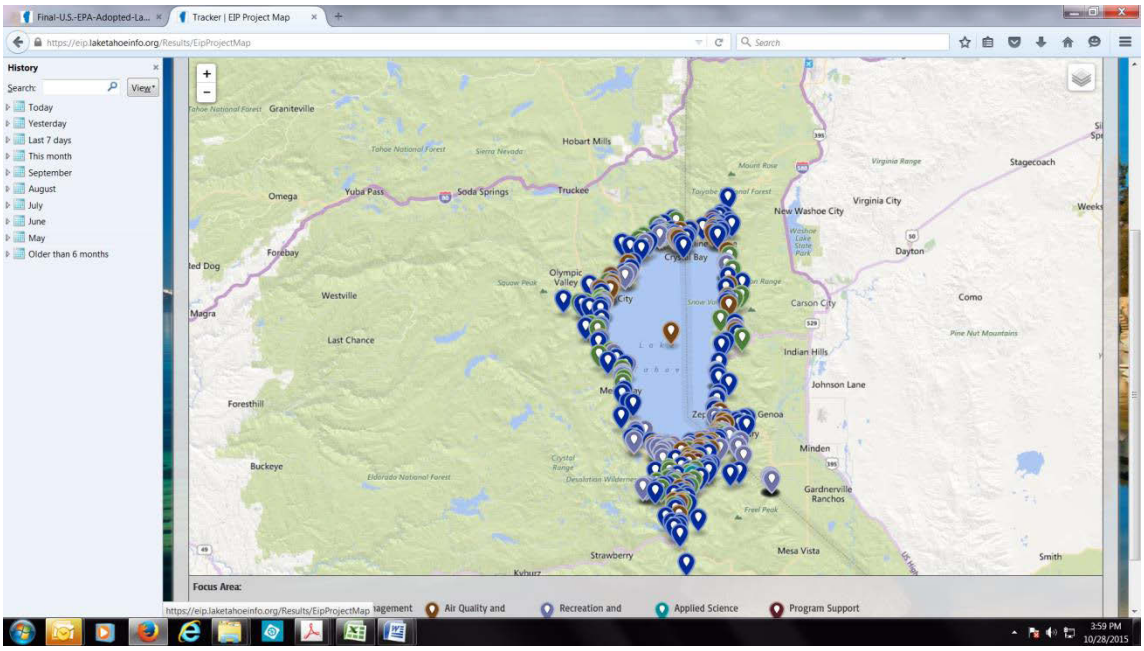
August 2015 / Photo by Tom Lotshaw

LAKE TAHOE ENVIRONMENTAL IMPROVEMENT PROGRAM

EIP Project Databases - TRPA EIP Projects Related to Water Quality

TRPA EIP tracker database

https://eip.laketahoeinfo.org



Overview of projects in the TRPA EIP Database: https://eip.laketahoeinfo.org

TRPA launched the EIP in an effort to better implement the Regional Plan and highlighted it at the Presidential Forum at Lake Tahoe in 1997. Recognizing that capital investments, research, and monitoring were essential components of the Regional Plan, the EIP called for an initial investment of $908 million in capital projects and $58 million in research and monitoring over 10 years. The EIP also identified hundreds of specific projects and programs to be undertaken by more than 50 funding partners including federal, state, and local agencies, and the private sector. The projects were focused on improving air, water, and scenic quality, forest health, fish and wildlife, and public access to the Lake and other recreation areas. The prime directive of the EIP was to move the Tahoe Basin closer to environmental threshold attainment. Today, over 400 EIP projects have been completed and hundreds more are in progress, with over $1.8 billion of investment in the highest priority environmental improvement projects.

Restoration In Progress: Environmental Improvement Program Update Planning Horizon to 2018
Full report: *http://www.trpa.org/wp-content/uploads/EIP_Report_Update.pdf*
4 page summary*:* *http://www.trpa.org/wp-content/uploads/EIP_4PG_2011_FNL.pdf*

A Conservation Plan for Lake Tahoe: The Environmental Improvement Program (1997-2006)
http://www.trpa.org/wp-content/uploads/EIP_4PG_SUMM-FINAL.pdf

TRPA Stormwater Management Program
http://www.tahoebmp.org

(Editor Note: The Updated TRPA Regional Plan shifts the burden of BMP compliance from individual property sites to a more regional approach to BMP Compliance. The following information is included as the current policy follows these guidelines.)

Erosion from developed land in the Tahoe Basin is the biggest driver of lake clarity loss. Stormwater runoff from residential, commercial, tourist, recreation, industrial and public service projects conveys sediment and nutrients onto public roads and ultimately to Lake Tahoe. By retrofitting developed public and private parcels with erosion control measures, known as Best Management Practices (BMPs), this program keeps runoff from entering roadways. Most of the rain and snow that falls on impervious surfaces on these lands (i.e., rooftops, driveways and parking areas) runs off and flows into roadside drainage channels. This runoff then combines with stormwater from public roads to produce a large volume of water containing nitrogen, phosphorus, and fine sediment. Roadside ditches erode and when these flows enter natural stream channels, the channels also erode. Once the stability of a natural stream is disturbed, the process continues for years or even decades.

Stormwater running off disturbed land picks up soil particles from unvegetated land or bare soil. During storms, soil particles from these bare areas are washed into street gutters or storm drains. In addition, vehicles driven or parked on bare dirt compact the soil, reducing infiltration and increasing runoff. Developed lands also contribute other types of pollutants. Fertilizer applied to lawns and gardens, releases nitrogen, phosphorus, and other nutrients. When these nutrients reach the Lake, they stimulate algae growth.

BMPs are the first line of defense to reduce stormwater erosion from developed properties. Private property owners are the primary implementers of BMPs throughout the Tahoe Basin. BMPs are improvements such as infiltration trenches and drywells that infiltrate roof and driveway runoff on-site which prevent runoff from entering the public right-of-way. Revegetation of disturbed areas and stabilization of eroding slopes keep soil in place and prevents the transport of sediment and nutrients off-site. Paving dirt driveways and parking areas also helps improve water quality. Large developed properties require a higher level of BMP implementation and may include the construction of detention and infiltration facilities as well as treatment vaults.

Public entities also implement BMPs on publicly-owned properties. To accelerate BMP implementation, EIP partners are working with private property owners on neighborhood or area-wide treatment solutions. Through outreach to residents in neighborhoods where public projects are being designed, property owners have opportunities to meet their retrofit requirements and public agencies can implement more effective water quality improvement projects.

Providing assistance to property owners is an important element in implementing BMPs. Local, regional, state, and federal agencies, and conservation districts assist private landowners in implementing BMPs. EIP partners provide technical assistance in the form of BMP site evaluations and implementation plans. TRPA, the Natural Resources Conservation Service, in conjunction with the Tahoe Resource Conservation District and the Nevada Tahoe Conservation District, will continue to provide this technical assistance. Public education and technical assistance are crucial components in integrating BMPs with defensible space for fire safety.

New for 2013: Residential BMP Designer tool online
http://www.tahoebmp.org/BMPDesigner.aspx
BMP Designer - Create a BMP Design for Single Family Residences
The BMP Designer allows homeowners, contractors, and consultants to create BMP designs in a friendly, self-guided web application. Specifically created with single family homes in mind, this unique tool directs the user through the BMP design process from laying out site conditions to a complete BMP plan. Users can even submit their plan for approval and help the TRPA Final Inspection by uploading photos of the work performed.

U.S. Forest Service Projects and Actions – Lake Tahoe Basin
The US Forest service maintains a database of ongoing projects. These projects include extensive erosion control and water quality improvement projects. Project details on the following items are located at**:**
http://www.fs.usda.gov/projects/ltbmu/landmanagement/projects

Local Projects

Follow the links provided below to view detailed project documents. For older local projects, visit the Projects & Plans Archive. Scroll down or follow this link to learn more about Access and Travel Management Plans (ATMs).

- Angora Restoration
- Aspen Community Restoration
- Big Meadow Creek Watershed Fire Regime Restoration
- Blackwood Creek Restoration
- Burke Creek Highway 50 Crossing and Realignment Project
- CalPeco Electrical Line Upgrade Project (FEIS)
    - CalPeco Electrical Line Upgrade Project(ROD)
- Camp Richardson Corral Permit Reissuance
- Camp Richardson Resort Campground and Vehicle Circulation BMP Retrofit
- Camp Richardson Resort Permit Renewal
- Carnelian Hazardous Fuels Reduction and Healthy Forest Restoration
- Diamond Peak Ski Area Reissuance of Special Use Permit
- Emerald Fire Restoration Project
- Heavenly Mountain Resort Epic Discovery Project
- Heavenly Mountain Resort 2010 Capital Projects

- Heavenly Mountain Resort 2011 Capital Projects
- Heavenly Mountain Resort 2012 Capital Projects
- Heavenly Mountain Resort 2013 Capital Projects
- Heavenly Mountain Resort 2017 Capital Improvement Projects
- Heavenly Mountain Resort Tamarack Project
- Historic Facilities BMP Retrofit
- Homewood Mountain Resort 20-Year Ski Slope Permit
- Homewood Snowcat Tours
- Incline Fuels Reduction and Healthy Forest Restoration Project
- Incline Lake Dam Project
- Incline Management Plan
- Integrated Management and Use of Roads, Trails and Facilities
- Kingsbury Stinger Trail Reconstruction and BMP Upgrades Project
- Lahontan Cutthroat Trout Restoration in the Upper Truckee River
- Lake Tahoe Ecosystem Underburn
- Lower Truckee Riverbank Stabilization
- LTBMU Routine Road Maintenance
- LTBMU Trails Maintenance
- Meeks Bay Campground BMP Retrofit
- Meeks Bay Restoration Project
- Meeks Creek Meadow Ecosystem Restoration
- Meeks Meadow Washoe Restoration
- Meyers Landfill
- Non-Federal Lands Hazardous Fuel Reduction Projects
- NV Energy 634 Line Rebuild Project
- Ongoing Lands Projects
- Proper Food Storage Order
- Restoration of Fire Adapted Meadow Ecosystems
- Sierra Nevada Yellow-Legged Frog Restoration
- South Shore Fuel Reduction and Healthy Forest Restoration
- South Tahoe Fuel Treatment Project
- SR-28 Corridor Improvement Plan
- SR-28 Shared Use Path
- SR-89/Fanny Bridge Community Revitalization Project
- Tahoe Yellow Cress Conservation
- Taylor Creek Environmental Education/Visitor Center
- Taylor Tallac Restoration Project
- Terrestrial Non-Native Plant Species Treatment
- Truckee River First Four Mile Streambank Stabilization and Restoration
- Upper Echo Lakes Hazardous Fuels Reduction
- Upper Truckee River Reach 5 Restoration
- Valhalla Pier Erosion Control and Accessibility Retrofit
- West Shore Wildland Urban Interface Hazardous Fuels Reduction and Forest Health Project
- Zephyr Cove Pier Replacement
- Zephyr Cove Stable Upgrade
- Zephyr Point Fire Lookout Relocation

Incline Lake Dam Project - completed

Action Description for Incline Lake Dam Project

USDA Forest Service Pacific Southwest Region
Lake Tahoe Basin Management Unit, Washoe County, NV

LOCATION:
This project is located off of State Route 431 in Washoe County, Nevada near Tahoe Meadows. The reservoir and dams are situated on Assessor Parcel Number 048-041-15, at an elevation of approximately 8,300 feet. The total project area is approximately 43 acres and includes the roadway into the dam and the human influenced disturbance footprint of the dam (approximately 30 acres).

BACKGROUND:
Incline Lake Dam was purchased as part of a larger land acquisition (777 acres) on July 29, 2008. All buildings were removed from the property prior to the acquisition. As a part of the larger acquisition, a site investigation and assessment of the major dam and spillway were commissioned. The results of the site investigation and assessment indicated that the existing major dam and spillway do not meet Federal, State or local standards for a high hazard dam. Before long term planning can begin for the remainder of the property, the dam needs to be addressed.

EXISTING CONDITION:
The results of the site assessment indicated that the existing dam and spillway do not meet Federal, State or local standards for a high hazard dam. Subsequently, the lake was drained and the outflow pipe was disabled so that it would not refill.

DESIRED CONDITION:
The desired condition for the project area is to remedy the existing condition of a high hazard dam that does not meet Federal, State or local standards. Additionally, the desired condition for the project area is to provide a sustainable hydrological system which supports groundwater dependent ecosystems and other riparian ecosystems that characterized the site prior to when the dams were created.

PURPOSE AND NEED:
There is a need from a public safety and water quality protection standpoint to remove the existing dams and spillway and to replace them with a system that meets current standards. There is also a need to address the dams before long term planning can begin for the remainder of the property. In addition, there is a need to stabilize and restore the area impacted by the dam and reservoir to protect water quality and riparian/aquatic habitat by maintaining or improving the condition of wetland, fen and other riparian systems in the project area.

PROPOSED ACTION:
Under this Proposed Action the Incline Lake Dams would be completely removed and the topography around the dams and the historic disturbance footprint would be recontoured to match adjacent contours and grades. This would likely involve fill of part of the disturbance footprint. The goal of this Proposed Action would be to restore the human influenced disturbance footprint of the dams (approximately 30 acres) within the Incline Lake Dam project area, such that surface and groundwater hydrologic function are restored to a point where natural processes would restore the groundwater dependent ecosystems that characterized this site prior to when the dam was created. Additional restoration actions may be required outside of the Incline Dam project boundary and/or scope, to fully achieve restoration of hydrologic function supporting groundwater dependent ecosystems in this Incline Dam project area. Actions outside of this project area or project scope will be addressed in the future through a full analysis of proposed management of the entire Incline Lake Acquisition Area.

The Forest Service expects the restored ground water dependent ecosystem over the long term (15-20 years) to be characterized by a system of small to medium sized ponds, fens, and marsh, connected by undefined surface flow channels of low velocity during wet periods. One of the objectives of this Proposed Action would be to maintain or improve the condition of wetland, fen and other riparian systems in the project area.

There would be poorly defined surface flow channels within this system, and during dry periods the ecosystem would be hydrologically connected through subsurface and groundwater flows, with little to no surface flow.

In the short term, restoration actions would ensure that the site is stable in terms of soil stability and geomorphic processes, and would establish a trajectory that actively promotes natural processes of ground water dependent ecosystem recovery that sustain water flow, water quality, water temperature, and hydrological connectivity that is critical to sustaining fen, wetland and riparian ecosystems within the vicinity of the project area (upstream and downstream of the dam) and plant species that depend on these ecosystems.

The Santini-Burton Act
http://www.fs.usda.gov/detail/ltbmu/landmanagement/resourcemanagement/?cid=fsm9_046519
Congress passed Public Law 96-586, defined as the Santini-Burton Act, on December 23, 1980. In passing the Act, Congress declared that the environmental quality of the Lake Tahoe Basin was jeopardized by over-development of sensitive lands and that the unique character of the Lake Tahoe Basin is of national significance deserving further protection. The passage marked a major commitment and emphasis by the Lake Tahoe Basin Management Unit in land acquisition and watershed restoration focused on protecting and restoring the environmental quality of Lake Tahoe.

Specific provisions in the Act directed the Forest Service to:

1. acquire environmentally sensitive land
2. restore watersheds on acquired National Forest Systems lands
3. administer erosion control grants to units of local government.

The Act authorized the Forest Service to acquire, by purchase and donation, sensitive lands in the Lake Tahoe Basin. Receipts from the sale of surplus Federal land in the Las Vegas area, to be advanced through the Land and Water Conservation Fund, were earmarked for the purchases.

Properties eligible for purchase under the Act are wetlands, stream environment zones, or steep and fragile lands. The first acquisition recorded in October 1982. To date, over 3,500 parcels (or Urban Lots) totaling 13,000 acres valued at $105 million have been acquired under the authority of the Santini-Burton Act. Some recent significant acquisitions include more than half a mile of lakefront and acreage at Secret Harbor, approximately 300 feet of beachfront on the south shore, and several large acreage parcels adjacent to existing National Forest System lands in the Kingsbury area.

- A Map of Santini-Burton Purchase lots in the Tahoe Basin is available at: *http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5371156.pdf*

A provision of the Santini-Burton Act authorized a sum equal to 15 percent of the acquisition dollars for erosion control grants to local governments. Allocations to the five local jurisdictions are proportionate to the acres acquired under the Act. Over $16 million have been appropriated for these grants, funding in whole or in part over 80 water quality improvement projects.

LTBMU Forest Plan Revision Update 2012
http://www.fs.usda.gov/detail/ltbmu/landmanagement/planning/?cid=stelprdb5371037
In June 2012, The LTBMU released a revised Forest Plan for Public review; the *Draft Revised Land and Resource Management Plan - June 2012* for Alpine, El Dorado, and Placer Counties, California and Douglas and Washoe Counties, and Carson City, Nevada. The Proposed Land and

Resource Management Plan (Forest Plan) describes the framework that will guide on-the-ground projects and program activities of the Plan.

Forest Plan Revision Draft Environmental Impact Statement Documents (DEIS) are posted at: *http://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5371192.pdf*

Lake Tahoe Basin Management Unit

ABSTRACT: The Draft Environmental Impact Statement (EIS) analyzes the consequences of four alternatives for revising the 1988 LTBMU Land and Resource Management Plan (as amended), commonly referred to as the "Forest Plan". Plan revision provides an updated Forest Plan for the Lake Tahoe Basin Management Unit (LTBMU) that would guide management of National Forest System (NFS) lands in the Lake Tahoe Basin for approximately the next 15 years by providing:

- A framework to manage for ecological sustainability and contribute to social and economic sustainability, with resilient ecosystems and watersheds, diverse plant and animal communities, and the capacity to provide people and communities with a range of social, economic, and ecological benefits for present and future generations.
- Strategic direction to guide site-specific project decisions in the context of broader social and ecological considerations.
- Guidance that is flexible enough to remain effective in the face of changing conditions and policies and enable the Forest Supervisor to work with the public to make the best possible decisions in the future.

3.4.21.2. Overview of the Affected Environment

Lake Tahoe Basin Watershed Condition

An assessment of watershed conditions considers physical resource values such as water quality, water quantity, soil condition, and stream channel and stream environment zone geomorphic condition. However watershed condition also considers biotic values related to species and their habitats. In short watershed condition integrates the entire ecological function of a land area contained within a given hydrologic boundary. For the LTBMU, existing assessments describe watershed condition primarily as it relates to the upper watersheds in the Lake Tahoe Basin that are within Forest Service Management, and not lower watersheds and intervening areas that are largely not under Forest Service Management and are impacted by urban development.

Affected Environment and Environmental Consequences ▪ 3-491

The Forest Service Manual (FSM) uses three classes to describe watershed condition (USDA Forest Service 2004, FSM 2521.1):

Class 1 watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

Class 2 watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

Class 3 watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition.

The FSM classification defines watershed condition in terms of "geomorphic, hydrologic and biotic integrity" relative to "potential natural condition". In this context, integrity relates directly to functionality. Geomorphic functionality or integrity can be defined in terms of attributes such as slope stability, soil erosion, channel morphology and other upslope, riparian and aquatic habitat characteristics. Hydrologic functionality or integrity relates primarily to flow, sediment and water quality attributes. Biological functionality or integrity is defined by the characteristics that influence the diversity and abundance of aquatic species, vegetation, and soil productivity. In each case, integrity must be evaluated in the context of the natural disturbance regime, geoclimatic setting and other important factors within the context of a watershed. The definition encompasses both aquatic and terrestrial components because water quality and aquatic habitat are inseparably related to the integrity, and therefore the functionality, of upland and riparian areas within a watershed.

Within this context, the three watershed condition classes are directly related to the degree or level of watershed functionality or integrity: These three Classes relate directly to watershed functionality, and therefore watershed condition, as:

Class 1 = Functioning Properly;
Class 2 = Functioning at Risk; and
Class 3 = Impaired Function.

In March 2011, the Forest Service assessed the condition of all 6th field hydrologic units on all NFS lands using protocols recently developed by the Washington Office headquarters staff, at intervals of approximately 5 years (Forest Service Watershed Condition Classification Technical Guide, July 2011).

The watershed condition classification system described in this Technical Guide uses twelve (12) indicators comprised of attributes related to watershed processes. The indicators and their attributes are surrogate variables representing the underlying ecological functions and processes that affect soil and hydrologic function. For the majority of the indicators, the FS can take direct action, or cause actions to be taken by others that can contribute to maintaining or improving watershed condition (i.e. functionality). This provides for a direct linkage between the classification system and management or improvement activities the FS conducts on the ground. Because of this linkage, when a sufficient number of properly designed and implemented restoration and/or management actions occur within a watershed, the outcome can be expressed as a change in condition class and the information used for performance accountability purposes. Management activities that effect the watershed condition class are not limited to soil and water improvement activities, but include a broad array of resource program areas from hazardous fuel treatments, invasive species eradication, abandoned mine restoration, riparian area treatments,

aquatic organism passage improvement, road maintenance and obliteration, and others. To achieve a change in watershed condition class will in most cases require changes within a watershed that are significant in their scope and include treatments from multiple resource areas. Sound management or improvement to management practices can often be as effective as implementing restoration projects and must not be overlooked. In order to demonstrate improvement in condition class activities will need to be tracked at the smallest feasible watershed unit, the 6th level HUC (typically 10,000 to 40,000 acres in size).

The suite of watershed condition indicators includes:

1. Water Quality,
2. Water Quantity,
3. Aquatic Habitat,
4. Aquatic Biota,
5. Riparian/Wetland Vegetation,
6. Roads and Trails,
7. Soils,
8. Fire Regime or Wildfire,
9. Forest Cover,
10. Rangeland Vegetation,
11. Terrestrial Invasive Species, and
12. Forest Health.

The Lake Tahoe Basin HUC 6 watersheds contain several HUC 7 level watersheds that lie adjacent to each other. They all drain to Lake Tahoe, but are not hydrologically connected to each other. Therefore it is possible to have one or more HUC 7 watersheds within a HUC 6 watershed that exhibit poor ecological integrity, adjacent to highly functioning watersheds. For the purposes of this Forest Plan, watershed condition will be discussed as several scales, HUC 5, 6, and 7 levels.

The Lake Tahoe Basin constitutes one HUC 5 watershed and includes all the land that drains into Lake Tahoe. Condition of this HUC 5 watershed is best characterized by the TMDL evaluation report completed by the Lahonton Regional Water Quality Control Board, further described in the water quality section of this EIS (Lahontan, 2010). The Lake Tahoe Watershed is named on the EPA's 303d List as an impaired water body based on water quality.

The condition of HUC 6 watersheds on the LTBMU were assessed in March of 2011. The results of this assessment indicate that 2 watersheds were rated as Class 1, 8 watersheds as Class II, and no watersheds as Class 3.

Figure 3-79 displays a map of the nine HUC 6 watersheds defined in the Lake Tahoe Basin, and their current watershed conditions ratings. The rating and watershed names are also presented below.

1-Lake Tahoe-East Shore Frontal / North Half
1-Lake Tahoe-East Shore Frontal / South Half
2-Upper Truckee River –Angora
2-Upper Truckee River - Trout Creek
2-McKinney Creek-Bliss-Eagle Creek Frontal
2-Cascade Creek-Tallac Creek-Taylor Creek Frontal
2-Burton Creek-Watson Creek-Tahoe Vista Frontal
2-Ward Creek-Blackwood Creek-Eagle Rock Frontal
2-Stateline Point-Third Creek-Incline Creek Frontal

To describe watershed condition at the HUC 7 level we relied on existing survey and assessment information. This more informal assessment does rely on the same kind of data and analyses identified in the draft National protocol, but the qualitative assessment described below does not follow this specific protocol.

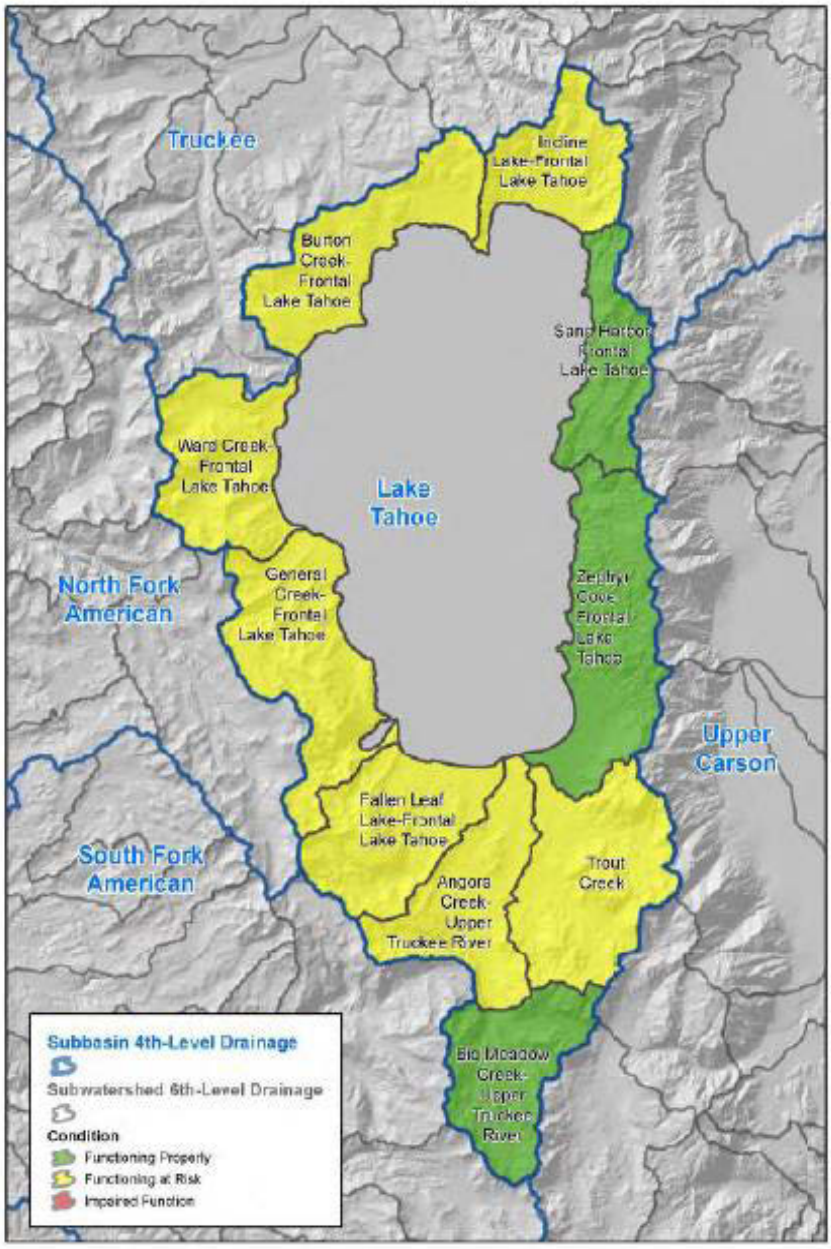


Figure 3-79. Map of HUC 6 Watersheds Defined in the Lake Tahoe Basin

Water Quality and Soil Erosion; Water Quantity; Watershed Condition

The LTMBU largely relies on the efforts of other agencies in the Lake Tahoe Basin to track and analyze metrics that would serve as measures of cumulative effects relative to lake clarity and tributary water quality.

The Lake Tahoe Basin has a long data record of tributary water quality data, provided through the Lake Tahoe Interagency Tributary Monitoring Program (LTIMP). This program is funded through TRPA and USGS, and from 2005 through 2012, has also been supported with funds through the USFS Erosion Control Grants program (for almost 1/3 of the cost of the program).

From this data, the State of California currently lists 8 tributary water bodies as impaired, and the State of Nevada lists seven tributary water bodies as impaired under Section 303(d) of the Clean Water Act (2010 List). These tributaries are located within the Lake Tahoe Basin boundary; therefore most of the tributaries mentioned include both USFS and private lands. The receiving water body, Lake Tahoe is listed by both states.

The Tahoe Regional Planning Agency has established seven thresholds related to Lake Tahoe Basin water quality that address Lake Tahoe, tributaries, stormwater runoff, groundwater, and other lakes. Based on LTIMP and other data provided to and utilized by the TRPA, none of these thresholds are currently in attainment with the exception of near shore turbidity (TRPA, 2006). One of the other seven thresholds (tributary water quality) is noted as having a positive trend, even though that threshold is not in attainment. Two of the thresholds related to Lake Tahoe clarity are noted as continuing to show a negative trend, with groundwater, other lakes, and stormwater runoff water quality metrics considered to show neutral trends.

Two of the California streams currently have approved Total Maximum Daily Load (TMDL) targets related to sediment, (Heavenly Creek, 2002 and Blackwood Creek, 2008) and TMDLs are scheduled to be developed for the other water bodies and constituents. The Lake Tahoe TMDL is a joint effort between the Lahontan Regional Water Quality Control Board in CA and the Nevada Department of Environmental Protection in Nevada NV. The Lake Tahoe TMDL was approved by EPA in August of 2011. The Lake Tahoe TMDL requires the USFS to track and report on efforts to reduce loading from NFS lands.

Most of the California streams (Table 1) and Lake Tahoe are 303(d) listed because of sediment and nutrient loading to Lake Tahoe and subsequent impacts to Lake Tahoe clarity. However based on the TMDL analysis, upland sources (the forested non-urban portions of the watersheds) are estimated to contribute only 9% of the total fine sediment loading to the Lake, with atmospheric (15%) and urban sources (72%) the largest contributors. In addition stream channel erosion is estimated to contribute 4% of the total fine sediment loading.

Forested non-urban sources are currently estimated to contribute 32% of the phosphorus and 18% of the nitrogen loading to the lake. Of the forested non-urban lands, the LTBMU is the primary land use manager, responsible for managing 75 % of the forested non-urban lands in the Tahoe Basin.

The six Nevada streams are listed (Table 3-70) because of zinc, iron, and in one instance pathogen violations. Two of the California streams are listed because of pathogens. The 303(d) listed waterbodies, other than Lake Tahoe, are listed below along with the pollutants causing listing.

Table 3-72. Listed 303(d) stream segments in the Lake Tahoe Basin (2010).

Segment	Measured Impact
California	
Blackwood Creek	phosphorus, nitrogen, sediment, iron
Cold Creek	nitrogen
General Creek	iron, phosphorus
Heavenly Valley Creek	phosphorus, chloride, sediment
Tallac Creek	pathogen
Trout Creek	phosphorus, nitrogen, pathogen , iron
Upper Truckee	iron, phosphorus
Ward Creek	phosphorus, nitrogen, sediment, iron
I	*Note* iron and chloride WQ stds may be revised*
Nevada	
Second Creek	zinc
Wood Creek	pathogen
Third Creek	zinc
Incline Creek	iron
Glenbrook Creek	iron
First Creek	zinc

Cumulative Watershed Effects of Alternatives

All the strategies and objectives proposed under all the alternatives will continue to support the LTBMUs goal of doing its part to achieve state water quality standards, TRPA water quality thresholds, and the Lake Tahoe Basin TMDL milestones related to stream channels and forest uplands. The TMDL 15 year milestones for these two pollutant sources are a 12% reduction in fine sediment from Forest Uplands, and a 53% reduction of fine sediment from stream channels. As described in the TMDL water quality control plan amendments (TMDL Plan), it is anticipated that these reductions will be achieved through past actions as well as through implementation of future strategies, as currently described under all the alternatives, including implementation of BMPs; facilities, roads, and trails retrofits and decommissioning; and implementation of currently planned restoration projects including removal of existing stressors. The TMDL plan goes on to state that the LTBMU is responsible for implementing forest fuels reduction projects to reduce the threat of wildfire in the Lake Tahoe basin, and these projects must include best management practices and appropriate monitoring to ensure fuels reduction efforts do not cause this source to exceed load allocations.

Because vegetation management treatments are primarily concentrated in a "ring" around lake Tahoe adjacent to urban areas (the WUI) , there is little to no potential for adverse consequences related to cumulative watershed affects under any of the alternatives relative to these activities.

Watersheds in Lake Tahoe are generally characterized by some level of urbanization in the lower third of the watersheds, with primarily stable forested uplands in the upper two thirds of the watershed. Regardless of the specific type and scale of treatment options used, as described under all the alternatives in the WUI, implementation of BMPs are expected to result in neutral environmental consequences as it relates to achievement of TMDL milestones, TRPA thresholds stream channel condition, or watershed hydrologic response.

However alternative D does create a slightly greater risk to water quality with a reduction in vegetation management activities outside of the WUI. With limited active fuels management outside of the WUI, there is a subsequently greater risk of catastrophic wildfire in the upper watersheds which could have the effect of not achieving the TMDL milestones.

Soil- Naturally Functioning SEZ

SEZ Current Condition –

The TRPA has also established a threshold for the preservation and restoration of naturally functioning SEZ lands. Currently no established set of uniform metrics have been developed for determining whether the ecosystem function of SEZ lands has been preserved or restored to "naturally functioning levels". The Lake Tahoe Basin land management and regulatory agencies are currently working together to determine whether the California Rapid Assessment Methodology for Wetlands (CRAM) could be used in the Tahoe Basin for the purpose of evaluating attainment of this threshold.

In the meantime, TRPA has reported the number of acres in which restoration efforts have been implemented. Individual agencies rely on their own internal monitoring programs and protocols for determining the degree to which those efforts have been successful. The TRPA, 2006 threshold evaluation report documents that 378.9 acres have received restoration treatments within the urban boundary. Over a 12-year period (1988-2000), the LTBMU applied restoration treatments on approximately 500 acres of SEZ lands. Between 2000 and 2011 the LTBMU has completed an additional 78 acres of restoration on lands considered to be SEZ.

SEZ Cumulative Effects –

The LTBMU manages a large amount of land that would be considered SEZ (reference Stephanies table that displays the current acreage of riparian and wetlands habitat). The LTBMU restoration program has identified a number of stream channel reaches and meadows where ecosystem function in terms of geomorphic stability and habitat quality can be enhanced, and this currently planned restoration is proposed equally in all four alternatives (Table 3-72. This planned restoration will continue to contribute to the TRPA threshold for restoring or enhancing SEZs to naturally functioning levels.

The impact of less active future restoration proposed in alternative D may result in a lower rate of restoration through natural processes of degraded SEZs that are not currently identified. However all of the large scale opportunities for SEZ restoration on lands managed by the LTMBU are already identified and restoration of these identified opportunities is proposed at an equal level under all the alternatives,

3.5.3. Conclusion

Since essentially all actions on private, county and state lands must pass through the multiple layers of regulation with TRPA involved in essentially all actions, there is a commonality of environmental protection that occurs in the Basin. Consequently while it is impossible to know the array of individual projects that might occur in the foreseeable future, it is reasonable to assume they will all meet the appropriate stringent regulations and therefore respond to threshold attainment. There is a high degree of integration between all the agencies that has the result that none of the planning documents work at cross purposes to each other.

The equation for cumulative effect is reached by taking the environmental consequences of each of the four Forest Plan alternatives presented in this DEIS for NFS lands in combination with the highly regulated actions of all other land owners/managers as guided by the TRPA Regional Plan and other regulatory agencies. As a result there is a common intent of maintaining or improving the environment on all lands within the Basin. With this common goal constraining all actions in the basin, there are no significant negative cumulative effects at the programmatic level, and in fact, for some resources and alternatives there are positive cumulative effects.

Stormwater Management

Tahoe RCD Stormwater Monitoring Programs
http://tahoercd.org/tahoe-stormwater-monitoring

The Tahoe Resource Conservation District (TRCD) has recently received two new grants to implement a basin-wide stormwater monitoring program in Lake Tahoe. Regulatory agencies, municipal jurisdictions, and scientists alike have agreed that establishing a collaborative monitoring program is vital to the goal of improving lake clarity. A regional stormwater monitoring program will not only serve to fill scientific gaps and provide a means by which jurisdictions can assess the cumulative effect of environmental improvement programs in specific watersheds, but it will help to track basin-wide progress toward achieving Lake clarity goals.

Tahoe RCD Monitoring Sites (click link to each specific site)

- SR431
- Incline Village
- Lakeshore
- Tahoma
- Rubicon
- Pasadena
- Speedboat
- Tahoe Valley
- Upper Truckee River / Hwy 50

The first grant, awarded on October 31, 2012, was funded through the USDA Forest Service, and will be used to solidify a partnership between the Tahoe RCD, the Nevada Tahoe Conservation District, the City of South Lake Tahoe, Placer, El Dorado, Washoe, and Douglas Counties, and the California and Nevada Departments of Transportation. This project will monitor several watersheds and stormwater treatment facilities around the Tahoe Basin in order to assess the effectiveness of pollutant load reduction efforts.

The second grant, awarded September 1, 2013, was funded through the CA State Water Quality Control Board, and will be used to unite university scientists, environmental agencies, and private contractors who have developed various methods for monitoring stormwater in the Tahoe basin over the last decade with the goal of agreeing on a collaborative, scientifically sound, cost-effective regional stormwater monitoring approach. The long-term goal will be to establish a lake wide monitoring effort that contributes to our understanding of stormwater treatment benefits.

Developing the administrative and scientific structure to implement the Regional Storm Water Monitoring Program (RSWMP) is a new role for the TRCD, but has been a long term planning effort for many Basin partners. The TRCD will work with partners to create a centralized yet flexible structure to integrate and coordinate future stormwater monitoring efforts around the Basin. A second major goal for the TRCD is to establish a comprehensive web-based database for housing all Lake Tahoe stormwater data in one location. To lead these efforts the Tahoe RCD has spent the last twelve months recruiting staff members and building partnerships integral to developing and implementing RSWMP. This work was possible through the Department of Conservation's Watershed Coordinator Program Funds.

Implementers' Monitoring Program (IMP) Component of the Regional Storm Water Monitoring Program (RSWMP)
http://tahoercd.org/wp-content/uploads/2013/08/Implementers-MP-130812.final_.pdf

Submitted to the Lahontan Regional Water Quality Control Board and the Nevada Division of Environmental Protection on April 30, 2013. Funds for this project are provided by the USDA Forest Service Lake Tahoe Basin Management Unit through the Southern Nevada Public Lands Management Act and the Department of Conservation for a Watershed Coordinator.

This document is intended to function as the Lake Tahoe Basin's first collaborative monitoring plan for implementation efforts related to the urban stormwater source category of the Lake Tahoe Total Maximum Daily Load (TMDL). This monitoring program was developed jointly by the California and Nevada implementing jurisdictions in an attempt to collectively fulfill California National Pollutant Discharge Elimination System (NPDES) Permit requirements or Nevada Interlocal Agreement commitments. However, this monitoring plan also represents a historic first step toward implementing a comprehensive Regional Stormwater Monitoring Program (RSWMP) envisioned for the Tahoe Basin. All data will be collected in a manner consistent with RSWMP monitoring protocols so it can easily be analyzed to align with the goals and objectives presented in the multi-agency driven RSWMP Data Quality Objective Plan (Heyvaert et al 2011a), Quality Assurance Project Plan (Heyvaert et al 2011b), and Sample Analysis Plan (Heyvaert et al 2011c).

The Lake Tahoe Total Maximum Daily Load (TMDL) is a comprehensive, long-term plan to reverse the decline in deep-water transparency of Lake Tahoe and restore mid-lake clarity to the 1967-1971 level of 29.7 meters (97.4 feet). TMDL science suggests that up to two thirds of the decrease in clarity is attributable to fine sediment particles (FSP, <16 µm in diameter), and that the urbanized areas, roadways in particular, account for approximately 72% of FSP that eventually enter the lake (Lake Tahoe TMDL Technical Report, 2010). Following the adoption of the TMDL in August 2011, the Lahontan Regional Water Quality Control Board approved a Municipal National Pollutant Discharge Elimination System (NPDES) permit (NPDES NO. CAG616001 Updated Waste Discharge Requirements and National Pollutant Discharge Elimination System (NPDES) Permit for Stormwater/Urban Runoff Discharges from El Dorado County, Placer County and the City of South Lake Tahoe within the Lake Tahoe Hydrologic Unit, Order No. R6T 2011-101A) (herein after "Municipal permit") on December 6, 2011, and later amended on October 12, 2012.

The Municipal permit requires California jurisdictions in the Lake Tahoe Basin to take measures to decrease pollutant loading from stormwater runoff in urbanized areas. Local California jurisdictions must implement pollutant controls to decrease FSP and nutrient inputs, and must monitor and evaluate select urban catchment outfalls and Best Management Practices (BMPs) for flow volumes and sediment and nutrient loads.

While monitoring data will not be used assess credits earned under the Lake Clarity Crediting Program for implementing effective pollutant controls, it will provide empirical data that will begin to (1) inform assumptions used to estimate runoff volumes and pollutant loads modeled with the Pollutant Load Reduction Model (PLRM) (2) assess nutrient and sediment loading at chosen catchments, (3) evaluate BMP effectiveness at chosen BMPs.

Similar permits or regulatory programs have been adopted for the California Department of Transportation (Caltrans) under NPDES NO. CAS000003, NPDES Statewide Stormwater Permit for Waste Discharge Requirements for State of California Department of Transportation, Order No. 2012-0011-DWQ effective July 1, 2013.

The three urban jurisdictions located within Nevada, Washoe County, Douglas County and the Nevada Department of Transportation (NDOT) will each enter into Interlocal Agreements with the Nevada Division of Environmental Protection to implement the Lake Tahoe Total Maximum Daily Load. These agreements were slated to become effective in August 2013.

This document will therefore outline a monitoring plan that is sufficient to achieve compliance with the requirements described in Attachment C, sections IIIA and IIIB of the California Municipal permit, as well as the stormwater monitoring commitments contained in the Nevada agreements.

Five catchments have been chosen to be monitored. These catchments are defined as the area that drains to an outfall monitoring site and can be modeled as a PLRM catchment. (In some instances, PLRM catchments are subsets of larger Urban Planning Catchments.)

Monitoring will include flow measurements and water quality sampling at eleven monitoring stations: the outfalls of the five selected catchments, and the inflows to and outflows from the selected BMPs located within three of those catchments.

The monitoring plan includes:
· Measuring continuous flow at each of the eleven monitoring stations,
· Measuring continuous turbidity at selected monitoring stations,
· Taking samples across the hydrograph during four different storm event types at ten of the eleven monitoring stations,
· Analyzing samples for total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), turbidity, and fine sediment particles (FSP),
· Calculating seasonal and annual runoff volumes at each of the eleven monitoring stations and nutrient and sediment loads at ten of the eleven monitoring stations.

The District is responsible for installations and, as needed, will coordinate with the University of California, Davis (UCD) and Desert Research Institute (DRI) staff to instrument the eleven stations and install the devices necessary to monitor flow, continuous turbidity, and to collect samples. Site instrumentation is expected to begin the summer of 2013 so that monitoring can commence on October 1, 2013 (the start of water year 2014 (WY14)).

The District is also responsible for coordinating and performing all tasks associated with sampling, with assistance from the NTCD and UCD. Sampling tasks include, but are not limited to, collecting data and samples from the monitoring stations, filtering samples for TSS, and ensuring delivery of the samples to appropriate analytical laboratories. The District will also coordinate site and equipment maintenance, database management, data analysis, and complete annual and final reporting.

Table 1: Selected monitoring sites and corresponding characteristics. Dark pink highlights the dominant urban land-use in the catchment, medium pink the second most dominant urban land-use, and light pink the third most dominant urban land-use.

Site Name	Outfall	BMP	# Monitoring Stations	Jurisdiction	Total Acres	% Impervious Area	Single Family Residential	Multi-Family Residential	CICU*	Primary Roads	Secondary Roads	Vegetated
SR431 (SR)	√	√√	5	NDOT	0.61	99%	0%	0%	0%	95%	0%	5%
Incline Village (IV)	√		1	Washoe	83.6	46%	3%	38%	33%	10%	3%	13%
Tahoma (TA)	√		1	Placer, El Dorado, Caltrans	49.5	30%	41%	4%	12%	2%	15%	25%
Rubicon (RU)	√	√	2	El Dorado	13.8	24%	76%	0%	0%	0%	15%	8%
Pasadena (PD)	√	√	2	CSLT	78.9	39%	52%	13%	5%	0%	16%	13%

*Commercial, Industrial, Communications, Utilities

Watershed Management Guidebook Published Jan. 2013
http://tahoercd.org/wp-content/uploads/2013/03/TIP-WEB-version-FINAL.pdf

A publication by Integrated Environmental Restoration Services, Inc. Produced in collaboration with the Lahontan Regional Water Quality Control Board and the Tahoe Resource Conservation District. The *Watershed Management Guidebook* presents a set of principles and practices for managing disturbed watersheds. It has been developed based on years of practice to help link initial project plan to actual outcomes in watershed projects. The Guidebook does not provide all the answers or completely prescriptive approaches. Instead, it offer tools to help achieve greater alignment between intentions and outcomes. There is a growing recognition that relying solely on mathematical models to help us manage dynamic watersheds and their complex processes is not practical. By assessing outcomes and embracing the uncertainty inherent in managing watersheds, we can produce not only high quality results but we can continue to add to our knowledge base and improve future projects. This Guidebook was created to share a process that has been evolving for over 20 years and that has produced surprising results. This process has achieved results by valuing direct assessment over expert opinion, embracing unexpected outcomes, and in the process, building relationships and a common language among participants at every level in watershed management efforts.

Nevada Tahoe Conservation District (NTCD) Stormwater Utility Feasibility Study
Tahoe - Douglas Stormwater Management Program Study 2009/2010
www.ntcd.org

As a result of a previous feasibility study, the Nevada Tahoe Conservation District initiated another study - a stormwater management program for Tahoe Douglas County, completed fall 2009.

Stormwater Operation and Maintenance Handbook
Prepared for: Nevada Division of Environmental Protection, Nevada Division of State Lands and Douglas County Prepared by: Nevada Tahoe Conservation District, May 2010

This Operation and Maintenance Handbook (Handbook) provides Douglas County jurisdictions in the Lake Tahoe Basin inspection and maintenance guidance for typical stormwater BMPs. Stormwater operation and maintenance handbooks have been generated for numerous jurisdictions throughout the world, but this document provides guidance tailored to the climate and water quality requirements of the Lake Tahoe Basin.

Nevada Tahoe Conservation District (NTCD) Best Management Practices Retrofit Program
http://ntcd.org

Nevada Tahoe Conservation District's (NTCD) Best Management Practices (BMP) Retrofit Program is part of the nationwide Backyard Conservation Program. The BCP is designed to educate private homeowners about simple, inexpensive conservation measures they can utilize in their own backyards. The Backyard Conservation Program is a joint effort of the Wildlife Habitat Council, the National Association of Conservation Districts, and the Natural Resources Conservation Service. The Conservation Districts in the Tahoe Basin are recognized throughout the country for progressive Backyard Conservation Programs.

The Nevada Tahoe Conservation District's BMP Program works primarily with single-family residences located on the Nevada side of the Lake Tahoe Basin, providing homeowners with information on how to control erosion and infiltrate stormwater runoff on their properties in compliance with the Tahoe Regional Planning Agency's (TRPA) BMP Ordinance. The Conservation District's have worked hard to maintain a close relationship with the local fire districts and the TRPA in order to develop a consistent message regarding BMP implementation and Fire Defensible Space practices. Nevada Tahoe Conservation District staff also works closely with the Natural Resources Conservation Service (NRCS), who provides engineering oversight, technical expertise and guidance with BMP designs.

Other programs and projects at the NTCD include: storm water management assessment, BMP asset inventory, a street sweeper effectiveness study, stream restoration projects, biologic base water quality improvement, water quality monitoring, forest health projects and outreach, biomass utilization and coordination; watershed storm water management planning.

Zephyr Cove Water Quality Improvement Project
The goal of the Zephyr Cove Water Quality Improvement Project is to treat sediment and nutrient laden stormwater flows from US Highway 50 by re-routing flows to an infiltration basin and safely conveying any overflow to Lake Tahoe while minimizing beach erosion. After many years of planning with multiple stakeholders and agencies, the design was finalized in 2016 and constructed in two phases, a 2016 Phase 1 and a 2017 Phase 2. Construction of the project was completed in June 2017 and the project is currently undergoing irrigation to establish vegetation. The project was funded by the Nevada Department of Transportation, the Nevada Division of State Lands, the Nevada Division of Environmental Protection, and the US Forest Service.

Hybrid BMP Project
This project constructed eight LID infiltration features in the Washoe County Right-of-Way during the Fall of 2011. The rain gardens were integrated into an existing landscaping and stormwater improvement project and are designed to hydraulically isolate themselves when full. Preliminary monitoring results are promising with nearly 80% of all water in the catchment area being treated through infiltration. Studies have shown infiltration to be the most promising method in the treatment of fine sediment and integrating off-line rain gardens throughout the Tahoe Basin could result in a significant reduction of fine sediment delivery to Lake Tahoe and surrounding water bodies.

Hybrid BMP Project Awarded TRPA Best in Basin
NTCD in collaboration with Washoe County and Gradex Construction was awarded the Best in Basin for Erosion Control for the Hybrid BMP Project located in Incline Village.

Cave Rock Estates GID Stormwater System Retrofit Project
In 1990 and 2003, the Cave Rock Estates Erosion Control Project and the Cave Rock Estates Slope Protection Project installed treatments to control the sediment load that comes from this area. Slope stabilization and conveyance systems were created to move the bulk of Cave Rock Estates stormwater runoff to a bed filter at the bottom of the subdivision where is it treated. It then joins with Nevada Department of Transportation (NDOT) stormwater, and is sent through two deep sediment traps before entering Lake Tahoe. The bed filter ***was*** now 22 years old and at the end of its operational life. It was designed prior to the identification of fine sediment particles (sub-16 µm sediment) as the target pollutant in the Lake Tahoe TMDL Program. NTCD and Cave Rock Estates GID have been working together on a plan to retrofit the existing bed filter to be more effective at fine sediment particle removal. This area-wide strategy is a new model for stormwater management and is paving the way for larger, more community based systems in the Basin. The Cave Rock Estates GID Stormwater System Retrofit Project was implemented in the summer of 2014 and a Phase 2 was implemented in Summer 2016 to improve the direction of runoff into the treatment area. The project is working well since installation.

Community Watershed Partnership (CWP)
In 2011, NTCD began working (as the Nevada coordinator) on a basin-wide Community Watershed Partnership. The Tahoe RCD serves as the California coordinator. One of the newest projects focused on community watershed protection is the Community Watershed Partnership (CWP) a holistic conservation initiative which engages locals, land managers and agencies in neighborhoods throughout the Lake Tahoe Basin. Funded by a grant from NRCS, Community Watershed Partnership is a holistic conservation process which takes place at the community scale. Montgomery Estates in South Lake Tahoe is the first neighborhood targeted through this pilot program. Residents are encouraged to provide input on current and planned conservation projects in their own neighborhood. Expected outcomes include enhanced recreational opportunities, defensible space, wildlife habitat and water quality.

Burke Creek Final Report
http://www.ntcd.org/NV_ourtahoewatershed
One of the NTCD major projects for 2011 was an overall analysis of the Burke Creek Watershed in the southeast corner of Lake Tahoe next to the Nevada/California state line.
Burke Creek serves as the watershed to several TWSA member municipal intakes.

Incline Village Community Watershed Partnership
In summer 2012, the program expanded to include initial development of the Incline Village, NV Community Watershed Partnership. A community survey on watershed and natural resources was conducted over the busy July 4 weekend.
Results are posted at: *http://inclinevillagecwp.org/wp-content/uploads/2012/06/Red-White-and-Blue-Survey-Results-web.pdf*

Tahoe Resource Conservation District (Tahoe RCD / TRCD) Watershed Resources Programs
www.TahoeRCD.org

Tahoe RCD's Watershed Resources Program manages large erosion control and revegetation projects and also educates property owners on conservation landscaping practices for the California side of the lake.

Johnson Meadows Acquisition
In 2018, the Johnson Meadows property on the Upper Truckee River (South Tahoe) was purchased.
https://tahoercd.org/home/programs-and-prjects-link-page/johnson-meadow/

Johnson Meadow is situated in the heart of the city of South Lake Tahoe, El Dorado County, California. It is located within the Upper Truckee River watershed, the largest watershed in the Lake Tahoe Basin, draining over 56 square miles and providing some of the most significant wet meadow floodplain habitat in the entire Sierra Nevada.

Tahoe RCD recently acquired title to approximately 206 acres comprising the Johnson Meadow property in order to provide continuous public ownership of the lower nine miles of the Upper Truckee River (UTR) before the river enters Lake Tahoe. This nine-mile reach of the UTR is centered downstream of property owned by the City of South Lake Tahoe and California Department of Parks and Recreation (Washoe Meadows State Park) and upstream of the Upper Truckee Marsh, owned by the California Tahoe Conservancy. Johnson Meadow is situated in the floodplain of the UTR and was the largest privately-owned meadow in the Tahoe Basin.

Acquisition of Johnson Meadow is a critical step in restoring the UTR watershed, and this river reach contains significant wildlife habitat, including river, riparian, meadow, and upland habitat areas. Acquisition was made possible through funding from California Tahoe Conservancy, California Department of Fish and Wildlife and the Tahoe Fund. The purpose of this land purchase is to provide ecosystem and watershed protection benefits through preservation, management, and future restoration of meadow, riparian, aquatic and upland habitats in Johnson Meadow.

The Tahoe RCD plays a critical role in addressing the most important natural resource concerns and opportunities in the basin, from preventing and eradicating aquatic invasive species from the lake, to helping communities mitigate the risk of fire. The mission of the Tahoe RCD is to promote the conservation, stewardship and knowledge of the Lake Tahoe Region's natural resources by providing leadership and innovative environmental services to all stakeholders. The Tahoe RCD is a flexible and adaptable organization that can serve as a link between public and private interests related to this

property. Additionally, the Tahoe RCD has extensive experience in natural resource management and will ensure that this unique property with sensitive habitat is properly restored and managed for generations to enjoy.

Best Management Practices (BMP) Retrofit Program
Tahoe Resource Conservation District's (Tahoe RCD or TRCD) Best Management Practices (BMP) Retrofit Program is also part of the nationwide Backyard Conservation Program. This program parallels the NTCD program, but works primarily with single-family residences located on the California side of the Lake Tahoe Basin, providing homeowners with information on how to control erosion and infiltrate stormwater runoff on their properties in compliance with the Tahoe Regional Planning Agency's (TRPA) BMP Ordinance.

Biological Resources Program
Tahoe RCD's Biological Resources Program consists of the Terrestrial Invasive Weed and Aquatic Invasive Species Programs. Through these programs, TRCS participates in the Lake Tahoe Aquatic Invasive Species Coordination Committee and the Lake Tahoe Basin Weed Coordinating Group. These groups are comprised of diverse agencies and community members dedicated to protecting the Lake Tahoe Basin from invasive species through education, research, prevention, early detection, survey and control. Our Aquatic Invasive Species (AIS) Program implements Lake Tahoe's mandatory Watercraft Inspection Program, Truckee Regional AIS Prevention Program (TRAISPP), and Lake Tahoe's Survey and Control Program. The Lake Tahoe Watercraft Inspection Program, prevents the introduction of AIS such as Quagga and Zebra mussels into the Tahoe Basin. With funding from the Truckee River Fund, TRAISPP implemented a pilot Watercraft Inspection Program in 2010, in the lower Truckee River watershed. Our Survey and Control Program includes projects aimed at controlling AIS currently in Lake Tahoe.

Watercraft Inspection Sub-Program Highlights
Tahoe RCD coordinates Lake Tahoe's Watercraft Inspection Program by providing qualified inspectors at public launch facilities, technical support for private launches, trainings, and decontamination of watercraft. The Watercraft Inspection Program was implemented in 2008. Details are also provided in previous chapter (Watershed Activities).

Other Tahoe RCD Projects:

Tahoe Basin Watershed Coordinator
In January 2011, Tahoe RCD was awarded $293,000 from the CA Dept. of Conservation to create a new Watershed Coordinator position for the Tahoe Basin. The Watershed Coordinator worked work with local jurisdictions, agencies, and the community to coordinate land use planning, increase environmental awareness, and address water quality issues within the Tahoe Basin. This position has continued under a new title.

Angora Community Demonstration Garden
With our partner agencies and the Tahoe community, Tahoe RCD has re-vegetated a property burned in the Angora Fire to create a demonstration garden. The garden is located at 1383 Mt. Olympia Circle in South Lake Tahoe. The garden includes examples of Tahoe native and adapted vegetation, defensible space, water conservation, and erosion control practices specific to properties in the Angora Burn area. Additionally, the garden features irrigation techniques and a variety of composts and mulches.

Angora Forest Stewardship Project
With funding from the National Forest Foundation, Tahoe RCD partnered with the Nevada Tahoe Conservation District and the US Forest Service to organize over 1,000 South Tahoe community members and students to plant more than 7,000 tree seedlings during the spring of 2009 on urban USFS lots in the Angora burn area. The majority of the trees planted were Jeffrey and Sugar pines and Incense cedars. Additionally, community groups and local homeowners have adopted lots and are performing on-going maintenance and monitoring of the trees. Prior to the spring tree planting, the Tahoe RCD, US Forest Service, and partner agencies developed and implemented an interdisciplinary forest health curriculum for all Lake Tahoe unified elementary schools. The curriculum was based on the Project Learning Tree curriculum and reached over 1,700 students in grades K-5.

Large Scale Erosion Control Projects:

Brockway Erosion Control Project
With funding received from the California Department of Transportation, Tahoe RCD began to conduct revegetation and slope stabilization work along the Highway 267 corridor over Brockway summit. The goal of the Brockway Summit Cal Trans Project is to reduce the overall contribution of fi ne sediments and nutrients entering Lake Tahoe from the Highway 267 corridor. Revegetation and slope stabilization practices are being implemented, thus improving the overall scenic quality of the area. TRCD worked with CalTrans and Integrated Environmental Restoration Services (IERS) on project design and installation. To date, approximately 50,000 square feet of bare, eroding slopes have been treated within the project area, and over 2000 plants, trees and shrubs have
been planted.

Homewood Erosion Control Project
With funding from the Department of Water Resources, Tahoe RCD developed a public-private partnership to implement erosion control and water quality improvement practices at Homewood Mountain Resort to achieve pollutant load reductions within the Homewood Creek Watershed. The goal of this program is to make this the first watershed in the Lake Tahoe Basin to achieve the Lake Tahoe Total Maximum Daily Load (TMDL) Clarity Challenge of a 32% reduction in fine sediment loading. Through the Homewood Erosion Control Project and partnership with Homewood Mountain Resort (JMA Ventures) important improvements to Tahoe's water quality have been made. . The restoration activities conducted through this project help to reduce non-point source pollutant loading in Homewood and Madden Creeks, which rank among the leading sources of upland erosion in the Tahoe Basin, contributing fine sediments and nutrients into Lake Tahoe. Erosion control and water quality improvements have been completed on over 125,000 square feet of disturbed bare soil within the Homewood property.

Tahoe Yellow Cress Conservation Program
Beginning summer 2011, Tahoe RCD worked with the Natural Resources Conservation Services and Nevada Tahoe Conservation District doing Tahoe Yellow Cress conservation work with lake front private property owners. This included creating site specific stewardship plans for Tahoe Yellow Cress populations with recommendations for care, planting and protection, and an educational brochure.

North and South Tahoe Environmental Education Coalition (STEEC) School Programs
http://nteec.webs.com
http://steec.org
A not-for-profit, collaborative network local agencies and organizations dedicated to bringing high quality environmental education programs to all North and South Tahoe students in grades K-12. LTEEC/STEEC has joined hundreds of Lake Tahoe volunteer educators and reached thousands of Tahoe Basin elementary students annually.

LRWQCB Load Reduction Planning Tool / Lake Tahoe Watershed, Nevada & California
http://tahoebmp.org/BMPHandbook.aspx

The Pollutant Load Reduction Model (PLRM) is intended to be used for evaluating and comparing pollutant load reduction alternatives for storm water quality improvement projects in the Tahoe Basin. The PLRM uses publicly available software and source code to provide users with complete access to the tools developed. The PLRM is intended to be practical for application by users possessing a basic understanding of hydrology, water quality, and water resources modeling.

The purpose of this document is to provide a step- by- step methodology for estimating and comparing potential water quality pollutant loads from redevelopment projects under both existing conditions and proposed redeveloped conditions in the Lake Tahoe Basin on a parcel or multiple parcel scale. This Load Reduction Planning Tool (LRPT) methodology can be used as a planning tool to estimate changes in potential water quality pollutant loading associated with the proposed redevelopment projects. The LRPT could be used early in the planning process by planners, developers and/or regulators to identify alternatives and design modifications that could be made to the redevelopment project to reduce pollutant loads generated from the site. This methodology is applicable to a much smaller spatial scale than the Pollutant Load Reduction Model (PLRM) and it is not intended to replace PLRM or other water quality planning tools approved by Lahontan Regional Water Quality Control Board (RWQCB), the Tahoe Regional Planning Agency (TRPA), or the Nevada Division of Environmental Protection (NDEP).

The Pollutant Load Reduction Model is part of a multi-stakeholder effort to provide technical tools for project planners, funders, implementers, and regulators to work collaboratively to minimize the deleterious effects of urban storm water on the remarkable clarity of Lake Tahoe, a keystone in the ecological and economic health of the Lake Tahoe Basin. This project is pursuant Section 234 of the Water Resources Development Act of 1996 (PL 104-303) which provides for coordinated interagency efforts in the pursuit of water quality and watershed planning.

Regional EIP/ CIP Projects

CIP/EIP infrastructure projects include: storm drains, storm water collection and retention systems; street curbs, gutters, sidewalks, lighting, pavement; bike paths, land and stream restoration, revegetation projects, public access improvements and ADA retrofits.

TWSA Member Agency CIP Projects:
This section has been moved to Chapter 5 - Description of Water Supply

Tahoe Basin CIP/EIP projects are listed in detail in the master EIP list provided at EIP Project Tracker. *http://www.trpa.org/about-trpa/how-we-operate/environmental-improvement-program*

To date, partner agencies have completed more than 400 lake-saving projects in your neighborhood and on your favorite trail and beach. When you see "Another Lake-Saving Project" and the EIP logo around the Tahoe Basin, you know that public-private partnerships are making a difference for Lake Tahoe.

The EIP Project Tracker is an online user-friendly database that displays information about projects with interactive maps, charts, and photos.

The following information provides links to projects by jurisdiction.

Nevada Department of Transportation (NDOT) road improvement projects in the Tahoe Basin:
https://www.nevadadot.com/projects-programs/road-projects/lake-tahoe-environmental-improvement

California Department of Transportation (CalTrans) Projects
http://www.dot.ca.gov/dist3/Projects/

El Dorado County (CA) Department of Transportation (DOT); 2009 – 2018 ; CIP / EIP Program
DOT's Tahoe environmental improvement program continues to be funded entirely by federal, state, and local agency grants that have water quality improvement as one of their main goals.

Placer County (CA) Environmental Improvement Program (EIP)
Placer County Tahoe Basin Projects
http://www.caltrans.ca.gov/dist3/departments/envinternet/placer28/Appendix%20G.pdf

Placer County (DPW) completes semi-annual (spring and fall) project monitoring and reporting for all completed Lake Tahoe erosion control projects within Placer County. There are approximately 55 completed projects to date. Reports include tracking of road sanding materials reclamation and storm water BMP device operating and maintenance. Reports are on file in the Truckee office. Contact: Nova Lance-Seghi [NSeghi@placer.ca.gov] for more information.

Douglas County (NV) Environmental Improvement Program (EIP)
Douglas County projects are listed in detail in the master EIP list provided at
https://eip.laketahoeinfo.org/Results/EipProjectMap

Washoe County (NV) Environmental Improvement Program (EIP)
These projects are listed in detail in the master EIP list provided at
https://eip.laketahoeinfo.org/Results/EipProjectMap

Washoe County schedules EIP projects over two years with one year overlap. The first projects were scheduled for 2006-2008 and the last project is scheduled for completion in 2018. Washoe County prefers to construct projects with a total project costs between $1 million and $2 million (today's dollars) to ensure that all of the improvements can be constructed during one season. Wshoe County Public Works has a continuing effort to construct erosion control and water quality improvements within county right-of-way in order to reduce sediment and nutrient loads in stormwater runoff that reaches Lake Tahoe. The improvements have included timber retaining walls, block walls, curb and gutter, storm drain pipe, detention/infiltration basins, sediment traps, rock lined ditches, check dams, plants and vegetation. The projects are funded by Washoe County Water Quality Mitigation funds which are collected by the Tahoe Regional Planning Agency, (TRPA), federal grants, state bonds and local funds.

City of South Lake Tahoe CIP
http://www.cityofslt.us/index.aspx?NID=629

The Engineering Department is responsible for implementation of the City's adopted five year Capital Improvement Program (CIP), which consists of a variety of projects to construct, maintain, repair, and rehabilitate the City's infrastructure, facilities, and specialized equipment.

Lake Tahoe Basin Prosperity Plan
http://tahoeprosperity.org
The Lake Tahoe Basin Prosperity Plan (LTBPP) is a regional collaboration effort to develop a Basin-wide economic prosperity strategy. The region includes all land that sheds water into the Lake Tahoe Basin in California and Nevada. The LTBPP will result in an action plan to create a more resilient economy that enhances environmental quality and ensures an improved standard of living for all residents. The Plan will provide a framework for a competitive regional strategy that recognizes local differences, leverages

the distinct attributes of all communities throughout the Basin, and enables local governments, institutions, and businesses to work as partners in revitalizing the Basin economy.

United States Environmental Protection Agency (US EPA) Activities
https://www.epa.gov/lake-tahoe

US EPA Region 9 has provided more than $31 million since 1997, to promote water quality efforts in and around the lake. Several years ago, the EPA placed a full-time staff person in Tahoe to work with the community and local agencies to coordinate ongoing watershed projects in the area. The EPA supports a variety of watershed projects in an effort to reduce sediment and pollutants from flowing into the lake.

Recently funded projects include the following:

- Complete Lake Tahoe's water pollution control plan
- Evaluate trends and patterns in water quality;
- Evaluate nutrients and sediment loading into Lake Tahoe from urban runoff;
- Monitor and model air pollution sources, including mobile emissions;
- Tahoe Integrated Information Management System.

U.S. EPA approves TMDL collaborative bi-state plan (August 2011)
http://yosemite.epa.gov/opa/admpress.nsf/2dd7f669225439b785257359004 00c31/54821f7aaa6df567852578ee00629305

SAN FRANCISCO 8/16/11 – U.S. Senator Dianne Feinstein today hosted the 15th Annual Lake Tahoe Summit, at which California Governor Edmund G. Brown, Jr., Nevada Governor Brian Sandoval and U.S. EPA Regional Administrator Jared Blumenfeld signed a roadmap to return the lake to almost 100 feet of clarity within 65 years.

The water clarity of Lake Tahoe declined from a visibility level of 105 feet in 1967 to an all time low of 64 feet in 1997. Ten years of scientific study ascertained that fine particulate matter is the prime factor in diminished clarity at Lake Tahoe. The Clean Water Act allows states and U.S. EPA to develop a "diet" for impaired waters like Lake Tahoe to help them recover. This diet is called the Lake Tahoe TMDL (Total Maximum Daily Load).

The TMDL represents a decade of collaborative effort between federal, state and local agencies and public stakeholders to better understand the pollutants and sources affecting the Lake's clarity and to develop a cost-effective, workable solution for improvement.

"I am pleased that California and Nevada have demonstrated unprecedented levels of collaboration in crafting this agreement," said Nevada Governor Brian Sandoval. "Years of hard work and scientific study have paid off, paving the way for much-needed future success at Lake Tahoe."

"Lake Tahoe provides enormous environmental and economic value to California and the nation," said California Edmund G. Brown, Jr. "These benefits are directly related to the quality and clarity of the Lake. It is incumbent upon all of us to protect and enhance Lake Tahoe's clarity. This historic agreement will ensure that future generations can continue to enjoy Lake Tahoe's beauty and clarity."

"The Total Maximum Daily Load offers a roadmap to improve Lake Tahoe's clarity so future generations can enjoy this majestic lake," said U.S. Senator Dianne Feinstein of California. "More than a decade of research went into this plan and I commend California, Nevada and the Environmental Protection Agency for coming together to implement it."

"Common-sense regulations regarding water clarity at Lake Tahoe are critical to the health, preservation and restoration of this national treasure," said U.S. Senator Harry Reid of Nevada. "They will also ensure that Lake Tahoe remains a valuable economic resource that is helping put Nevadans back to work."

"I commend Nevada Division of Environmental Protection and the Lahontan Water Quality Control Board for developing a scientific plan to restore the clarity of Lake Tahoe. The years of hard work and collaboration have paid off," said U.S. Senator Dean Heller of Nevada.

"Lake Tahoe is one of the largest, deepest, and clearest lakes in the world. Its shimmering blue waters, biologically diverse alpine setting, and remarkable water clarity are legendary," said Jared Blumenfeld, U.S. EPA's Regional Administrator for the Pacific Southwest. "By establishing rigorous benchmarks and accountability, this plan ensures that Lake Tahoe's environment and economy will thrive long into the future."

The lake contributes significantly to the economies of California, Nevada and the United States. The communities and the economy of the Lake Tahoe Basin depend on the protection and restoration of its stunning beauty and diverse recreational opportunities in the region.

Scientific analysis demonstrates that restoring lake clarity is possible if pollutant load reductions can be achieved in each of the four primary sources of these pollutants: urban stormwater runoff, forest runoff, stream channel erosion and atmospheric deposition. The TMDL outlines measures to reduce each of these sources, with a focus on the urban stormwater runoff source, as it is both the greatest source and the best opportunity to control the pollutants. The TMDL calls for advanced and innovative controls to achieve the needed pollution reductions.

"The water quality goals have long been agreed to. The TMDL makes it possible to go forward by knowing how much pollutant loads need to be reduced, where those reductions can be found, and the rate of improvement that will follow," said Dr. Geoffrey Schladow, Director of the UC Davis Tahoe Environmental Research Center.

Achieving the load reductions outlined in the TMDL will be challenging. California's Lahontan Regional Water Quality Control Board and the Nevada Division of Environmental Protection are working closely with local jurisdictions including the counties, departments of transportation, the City of South Lake Tahoe, and other stakeholders to reduce the amount of fine sediment and nutrients entering the lake. The two state agencies are also collaborating with the Tahoe Regional Planning Agency to ensure that the Regional Plan, which will soon be updated, supports the local government actions needed to implement the TMDL.

"The Basin's private stakeholders welcome the opportunity to help implement science-based strategies to protect and restore Lake Tahoe's famed water clarity. Since much of the pollutants of concern are the result of a 50 to 60-year-old built environment, one opportunity for meaningful load reduction is to rebuild many of these older structures incorporating state-of-the art green technologies," said Lewis Feldman, a local land-use attorney for businesses throughout the Lake Tahoe Basin.

2014 TMDL Report *http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/lake_tahoe/*

Online Interface *https://www.enviroaccounting.com/TahoeTMDL/Program/Home*

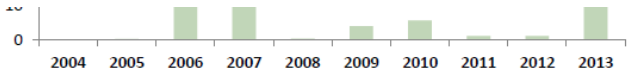
The 2014 TMDL Performance Report provides a high-level summary of TMDL implementation efforts. The report summarizes the most compelling accomplishment information, provides a brief trend analysis for each TMDL source category and highlights water quality improvement projects of interest. Accomplishment information contained in the report is a compilation of the data for projects implemented between 2004 and 2013. In the future, this report will be released annually, providing an update of TMDL implementation accomplishments from the past year. Regular reporting of accomplishments facilitates transparency, demonstrates accountability and helps retain support for the expenditure of public funds on water quality improvements. Excerpts from the report are below:

2014 TMDL PM Implementation Summary

The table below lists activity implementation for each performance measure during 2004 to 2013, as well as the accomplishments of each entity implementing water quality improvement projects in the non-urban source categories.

Table 2 | **2014 TMDL PM Implementation Summary Table**

	MILES OF ROADS TREATED	MILES OF ROADS INSPECTED & MAINTAINED	MILES OF ROADS CREATED	ACRES OF DISTURBED AREA RESTORED OR ENHANCED	FACILITIES WITH STORMWATER RETROFITS	LINEAR FEET OF STREAM CHANNEL RESTORED OR ENHANCED
USFS LTBMU	256.11	947	0	5.11	7	20,000
CTC	1.59	0	0	84.88	0	1,200
NTRT	1.36	347.34	0	39.30	2	1,900
CA State Parks	1.74	23.45	0.1	0.90	3	0
Heavenly	0.58	151.24	0	38.33	1	0
Homewood	13.15	128	0	0.89	0	0
Diamond Peak	0	28.6	0	0	0	0
Other	0	0	0	0	0	3,681
Basinwide Total	**274.53 miles**	**1,625.63 miles**	**0.1 miles**	**169.41 acres**	**13 facilities**	**26,781 linear feet**



Heavenly	38.3	22%
Homewood	0.9	1%

FACILITIES

Facilities with Stormwater Retrofits

Thirteen (13) public facilities in the Forested Uplands received stormwater retrofits since 2004. There was no consistent implementation trend to stormwater retrofit implementation during the reporting period with most entities reporting a single facility retrofitted every 2-4 years. The majority of facilities (5) were retrofitted in 2013 with California State Parks completing elements of the Emerald Bay Eagle Point Campground Erosion Control and Rehabilitation project and USFS LTBMU completing work on campgrounds and day use areas at Nevada Beach, and at Meeks Bay Resort. Other retrofits during the reporting period were completed on picnic areas, visitor centers, trailheads and parking lots. Over time the total number of facilities retrofitted each year should diminish as existing facilities have fully implemented retrofits and new facility construction slows.

Table 6 | **Facilities with Stormwater Retrofits 2004-2013 by implementing entity**

IMPLEMENTER	TOTAL FACILITIES	% OF TOTAL
USFS LTBMU	7	54%
NTRT	2	15%
CA State Parks	3	23%
Heavenly	1	8%

Figure 7 | **Cumulative Facilities with Stormwater Retrofits 2004-2013**

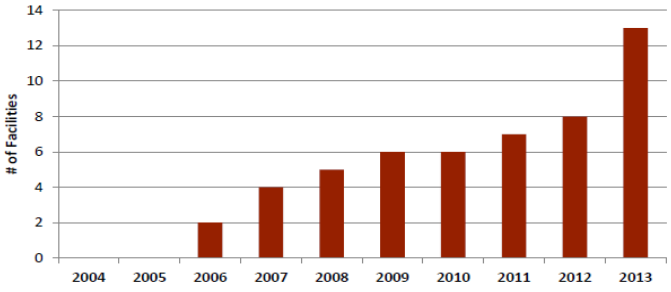
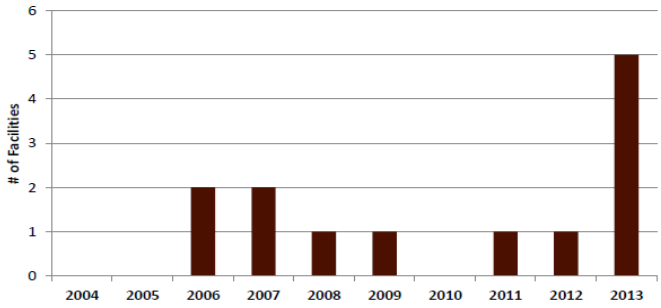


Figure 8 | **Annual Total Facilities with Stormwater Retrofits 2004-2013**



STREAM CHANNELS

Figure 9 | **Cumulative Linear Feet of Stream Channel Restoration or Enhancement, 2004-2013**

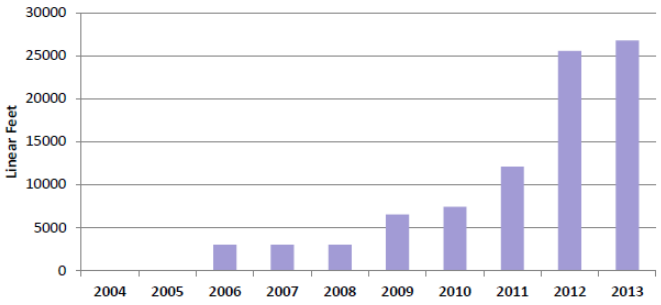
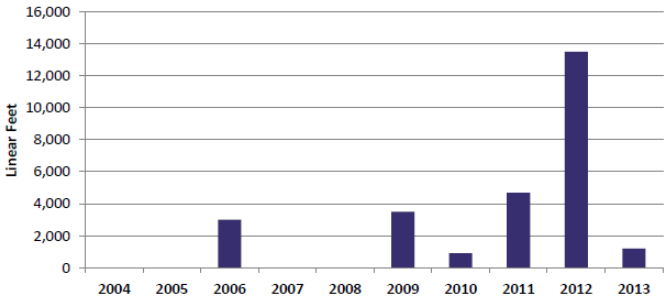


Figure 10 | **Annual Linear Feet of Stream Channel Restoration or Enhancement, 2004-2013**



Linear Feet of Stream Channel Restored or Enhanced

Between 2004 and 2013, land managers implemented 11 stream channel restoration and enhancement projects. These projects cumulatively restored or enhanced approximately 34,600 linear feet, or 6.5 miles of stream channel. Of this total, approximately 21,300 linear feet were located on the Upper Truckee River, Blackwood Creek and Ward Creek, which together contribute 96 percent of the total FSP loading from the stream channel source category. A considerable increase in restoration and enhancement activity in 2012 can be attributed to USFS LTBMU Cold Creek-High Meadows Ecosystem Restoration project that resulted in restoration of some 10,500 linear feet of stream channel along Cold Creek.

The Upper Truckee River Middle Reach Restoration Project (Reaches 3 and 4), implemented by the City of South Lake Tahoe in 2011, is included in the data for this PM. Although Non-Urban Source Category TMDL PMs rarely include projects implemented by urban jurisdictions, this project is the among the largest restoration project on the Upper Truckee River to date and significantly contributed to reducing FSP loading from the stream channel erosion source category.

Table 7 | **Linear Feet of Stream Channel Restoration or Enhancement 2004-2013 by implementing entity**

IMPLEMENTER	TOTAL LINEAR FEET	% OF TOTAL
USFS LTBMU	20,000	75%
CTC	1,200	4%
NTRT	1,900	7%
CSLT	3,681	14%

For more information about Clean Water Act TMDLs, please visit:
http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/

For more information about California's TMDL for Lake Tahoe, please visit:
http://www.waterboards.ca.gov/lahontan/water_issues/programs/tmdl/lake_tahoe/index.shtml

For more information about Nevada's TMDL for Lake Tahoe, please visit:
http://www.epa.gov/region9/water/tmdl/nevada.html *and* *http://ndep.nv.gov/bwqp/tahoe.htm*

Lake Tahoe Water Pollution Control Plan (TMDL):
http://ndep.nv.gov/bwqp/file/lccp_handbook_v099.pdf

Additional information can be found in the:
Lake Tahoe Total Maximum Daily Load Technical (Tech) Report http://ndep.nv.gov/bwqp/tahoe.htm

The United States Environmental Protection Agency (US EPA) Lahontan Regional Water Quality Control Board (LRWQB) and Nevada Division of Environmental Protection (NDEP) have been working together collaborating with numerous other federal, state and local entities to develop a water quality plan (known as the Lake Tahoe Total Maximum Daily Load (TMDL). The plan will identify the sources of pollution and specify reductions in sediment and nutrients that are necessary to restore the lake's clarity.

The State of Nevada has designated Lake Tahoe as a Water of Extraordinary Aesthetic or Ecologic Value. However, NDEP was forced to list the waterbody on its 303(d) List of Impaired Waterbodies due to exceedances in the clarity standard. In addition, monitoring conducted over the last 40 years has indicated a steady trend of loss in the Lake's transparency.

The Lake Tahoe TMDL is a scientific effort at the forefront of the campaign to return Lake Tahoe water clarity to historic levels. The scale of the TMDL effort signifies the importance of this national treasure; to date the TMDL Program has involved research by nearly 200 scientists and engineers and more than a $10 million investment by the federal government and the states of Nevada and California as well as eight years of cooperation and participation by Tahoe resource management agencies, local governments and the public. In order to better manage the enormous undertaking of the Lake Tahoe TMDL, it was necessary to break the effort into three distinct phases, for which key questions were posed

Phase 1 involved the establishment of a comprehensive research program to answer the following questions:

- What pollutants were causing Lake Tahoe's clarity loss?
- What are the sources and quantities of each of these pollutants?
- How much of each pollutant can Lake Tahoe accept and still reach the clarity goal?

The analysis indicates that the primary pollutants controlling clarity are fine sediment particles and the nutrients phosphorous and nitrogen. Fine sediment particles (FSP) cloud the water while nutrients fuel algal growth. Although each affects the distance that light is able to penetrate into the water column, the analysis indicates FSP, particularly those less than 16 micrometers, appear to be more important than nutrients due to their light scattering effect. The vast majority of FSP entering the Lake are derived from the urban area. Modeling results suggest that a 65% reduction in FSP, accompanied by reductions in nitrogen and phosphorous, are necessary to restore historic clarity within Lake Tahoe.

Phase 2 of the TMDL attempts to answer these questions:

- What are the options for reducing pollutant inputs to Lake Tahoe?
- What strategy should be implemented to achieve the clarity goal?

Pollutant Reduction Opportunity (PRO) Report
http://ndep.nv.gov/bwqp/tahoe.htm

A basin-wide analysis which quantified load reductions achievable from implementing various levels of pollutant control efforts. Together the Tech and PRO Reports provide the scientific and technical basis for the development of a recommended implementation strategy capable of achieving the Clarity Challenge. This interim target of 80 feet annual average Secchi disk depth to be achieved within 20 years is important because scientists may then state with confidence that we have actually reversed the trend in clarity loss and are now moving in the path of restoring Lake Tahoe to its historic clarity. Approximately a 32% load reduction in FSP with accompanying reductions in nitrogen and phosphorous are needed to achieve the Clarity Challenge.

The recommended strategy to achieve the Clarity Challenge was born from a public/ stakeholder input process carried out between the fall of 2007 through the spring of 2008. The process was designed to evaluate the political and social acceptability of the strategy alternatives, with the goal of crafting a preferred strategy that received broad stakeholder support. While the recommended strategy calls for load reductions from the atmosphere, stream channels and the forested areas, it emphasizes FSP reductions through the control, treatment and prevention of urban stormwater. This stems from the conclusions that urban stormwater represents both the greatest source of these pollutants as well as the greatest opportunity to achieve needed load reductions.

The analysis suggests that while broader application of conventional pollution controls will be beneficial, more innovative and advanced controls are required in order to meet the Clarity Challenge. Examples of such controls include, but are not limited to, alternatives to roadway abrasives applications, advanced roadway sweeping practices using the latest technology and equipment, and conveying stormwater to local or regional facilities featuring enhanced treatment through biological or chemical processes.

Phase 3 of the TMDL addresses the following questions:

- How will the strategy be implemented?
- How will progress be assessed?

Phase 3, the current phase, represents the transition from the science-based policy formation phases to the implementation and performance evaluation phase. In this phase the recommended strategy will be implemented by local government agencies, as well as state, regional and federal regulatory and land management agencies through their respective programs. Load reduction requirements will be established based on allocations contained in the TMDL document.

Progress toward meeting the Clarity Challenge will be assessed through the TMDL Management System, a program intended to define the process and protocols by which consistent methods and tools are used to quantitatively estimate and track the amount of load reductions achieved through specific actions on the ground. In addition, monitoring programs are a key part of evaluating progress.

Lake Clarity Crediting Program
https://www.enviroaccounting.com/TahoeTMDL/Program/Display/ForUrbanJurisdictions

The Crediting Program Support Services project has recently been completed. Through this project, the local governments and transportation agencies who will implement the TMDL as well as NDEP and Lahontan Water Board staff trained and tested the Crediting Program protocols, methods and tools. The project enabled participants to gain valuable experience, knowledge and skills and resulted in recommendations to improve Crediting Program efficiency, effectiveness and function. The revised Handbook and associated forms are now available for download.

NDEP and the Lahontan Water Board have successfully secured funding to carry out recommendations beyond the scope of the Crediting Program Support Service Project. The Stormwater Tools Integration Project will integrate the existing Crediting Program tools, databases and forms into a single web-based platform. Doing this will reduce the time, cost and complexity of using the tools; improve the ability of jurisdictions and funders to target investments and identify priorities for stormwater pollutant controls to achieve effective load reductions; simplify and streamline annual stormwater reporting requirements; and increase transparency and accountability for the use of EIP funds. Funding for this effort is being provided by the Nevada Division of State Lands through a Lake Tahoe License Plate Grant, the Lahontan Water Board and NDEP.

A Round 12 Southern Nevada Public Lands Management Act capital grant was also secured to complete priority improvements to the stormwater tools. A primary objective of the Stormwater Tools Improvement Project will be to provide enhanced functionality to the Pollutant Load Reduction Model; the model will be updated to: align with the Road RAM, report pollutant generation by land use, incorporate recent characteristic runoff concentration data, include a climate change dataset scenario, incorporate road cut algorithms and increase program stability. Some technical improvements to the Road and/or BMP RAM may also be accomplished. The Integrated Stormwater Tool will be updated based on the technical improvements accomplished. Finally, the project seeks to build off the TMDL Activity Tracking System and Public Reporting System being developed through the TMDL Management System project, to link them to a web-based map viewer with expanded functionalities that enable stormwater managers to perform their jobs more efficiently and effectively.

Because urban stormwater is the main source and represents the greatest opportunity to resolve the Lake clarity problem, NDEP and the Lahontan Water Board guided development of a crediting program through the Environmental Protection Agency (EPA) Targeted Watershed Initiative Grant. The Lake Clarity Crediting Program (Crediting Program) establishes the framework that connects on-the-ground actions taken by local governments and state transportation agencies to the goal of restoring Lake Tahoe clarity.

It defines a comprehensive and consistent accounting, tracking and reporting system administered by the Lahontan Water Board and NDEP using Lake Clarity Credits. Because it will be used to evaluate compliance with load reduction milestones contained in permits and MOA, the Crediting Program aligns policies with ongoing implementation in order to drive accountability and motivate effective action to improve Lake Tahoe clarity.

The Crediting Program is the framework that connects on-the-ground actions taken by local governments and state transportation agencies to the goal of restoring Lake Tahoe clarity. It defines a comprehensive and consistent system to quantify, track and report load reduction actions. In order to maximize review efficiency and consistency and comparability of results Crediting Program specifies the use of standardized protocols for this purpose. Although the Handbook lays out the requirements necessary to

consider the utilization of other methods and tools, the Crediting Program encourages the use of the following approved tools:

- The Pollutant Load Reduction Model is the standard load reduction estimation tool, which integrates load reductions achieved through combinations of source control practices and treatment BMPs in a catchment. The beta-version of the PLRM is now available on TIIMS.
- The Best Management Practice Maintenance Rapid Assessment Methodology (BMP RAM) is the standardized rapid inspection protocol to assess and report the functional condition of treatment BMPs. Results will inform jurisdictions when treatment BMPs are in need of maintenance.
- The Road Rapid Assessment Methodology (Road RAM) is the standardized rapid inspection protocol to assess and report on the pollutant potential of roadways. Results can be used to inform a number of water quality management questions, including the implementation of actions and strategies to control pollutants from roadways and protect downslope water quality; relative effectiveness of roadway operations practices, and relative maintenance needs of jurisdictions. Please contact Jason Kuchnicki to request access to the database.
- The TMDL Accounting and Tracking Tool (A&T Tool) is the central credit accounting system. It stores information related to catchment schedules and inspection results and generates reports showing the credits awarded each year for specific catchments and urban jurisdictions. The A&T Tool also tracks and reports load reductions at all scales from specific catchments to the overall basin. The A&T Tool is available for use by urban stormwater jurisdiction staff. Please contact Jason Kuchnicki for instructions and to request access.

NDEP and the Lahontan Water Board initiated the Crediting Program Support Services project, through which local governments and transportation agencies tested and trained the protocols, tools and methods described in the Handbook on a non-regulatory basis.

Nevada Division of Environmental Protection
Best Management Practice Maintenance / Rapid Assessment Methodology (BMP RAM)
http://lands.nv.gov/docs/LTLPreports/Stormwater%20Best%20Management%20Practices/Stormwater%20System%20Operation%20and%20Maintenance%20Handbook.pdf

The BMP RAM is a simple, repeatable field observation and data management tool that can assist Lake Tahoe natural resource managers in determining the relative condition of urban stormwater treatment BMPs. The primary purpose of the BMP RAM is to inform the user of the relative urgency of water quality maintenance for Treatment BMPs. The BMP RAM evaluations, therefore, do not specifically address or consider the quality of the design of a particular Treatment BMP relative to others. Rather, the BMP RAM provides a practical, consistent and reliable tool to track the condition of a particular Treatment BMP relative to its observed condition at the time of installation or immediately following complete maintenance.

Three items are available for download on the website. The Technical Document contains background information describing how the tool works and the rationale for tool development choices. The User Manual describes the specific protocols to create a Treatment BMP Inventory, conduct field observations, and interact with the database. The Database is the tool used to house and manage data and calculate RAM scores. Microsoft Access and familiarity with the Technical Document and User Manual are required to operate the database.

Nevada Division of State Lands (NDSL)
Nevada State Lands permits buoy, piers, breakwalls and other and structures within Lake Tahoe, itself, and in the near shore. TWSA receives copies of permit applications (new and renewal) for water provider comments relative to these structures and uses.

The Nevada Division of State Lands operates the Nevada Land Bank, which performs several functions on the Nevada side of the Lake Tahoe Basin. It receives fund distributions from the Tahoe Regional Planning Agency ('TRPA") from fees TRPA collects for excess land coverage on developed land parcels in the Tahoe Basin, in accordance with TRPA's regulations. Land coverage consists of impervious or disturbed soils, on lands of various classes of environmental sensitivity, that can have a detrimental affect on the Tahoe Basin environment and Lake Tahoe water quality. The fees received are used by the Land Bank to purchase, restore and permanently retire coverage, thus preserving land in its natural state.

Nevada Tahoe License Plate Program
http://www.tahoefund.org/ways-to-give/buy-a-tahoe-license-plate
The State of Nevada collects fees for special Lake Tahoe license plates. The fees go into a dedicated Lake Tahoe fund, which is administered by the Division of State Lands. These funds are used for projects and programs to preserve or restore the natural environment of the Lake Tahoe Basin. This program is completely separate from the Tahoe Science Program and SNPLMA funding. However, both programs use a competitive review process and help to fulfill the mission of restoring Lake Tahoe through the EIP. Since the first license plate was purchased in 1998, this program has generated more than 3.8 million dollars. A total of 48 projects have been funded to 2012.

California Tahoe Conservancy
http://tahoe.ca.gov
The California Tahoe Conservancy was created in 1984 to restore and sustain a balance between the natural and the human environment and between public and private uses at Lake Tahoe. Successful partnerships are integral to protecting Lake Tahoe's unique environment. The Conservancy participates in and supports a range of partnerships with Federal, State, regional, local non-profit and academic agencies and organizations. The mission of the California Tahoe Conservancy is to lead California's efforts to restore and enhance the extraordinary natural and recreational resources of the Lake Tahoe Basin.

Major restoration projects are planned on CTC and partner land holdingsin the South Lake Tahoe area 2016-2020.

California License Plate Program
http://www.tahoefund.org/ways-to-give/buy-a-tahoe-license-plate/
The California Tahoe Conservancy administers Tahoe projects with funding generated by California's Lake Tahoe license plate program.

League to Save Lake Tahoe
http://www.keeptahoeblue.org/our-work/
The League's core focus is to protect Lake Tahoe's inspiring water clarity. Efforts include researching development plans and projects to ensure these projects comply with rules to protect Lake Tahoe. The League also works to secure funding for river and watershed restoration and conduct outreach about the environmental challenges facing Lake Tahoe. The League has three primary program areas: Advocacy & Monitoring, Legislative Advocacy and Outreach & Education.

Eyes on the Lake is the League's newest volunteer program helping to prevent the spread of aquatic invasive plants in Tahoe's waters. If you are a water lover at Tahoe (SCUBA diver, paddler, swimmer, beachgoer, or boater) and want to help ensure Tahoe's waters stay clear and pristine, then Eyes on the Lake is for you. Volunteers learn how to identify plants in the classroom and in the field. Help protect the Lake while you play. As of fall 2014, more than 100 people have been trained.

Pipe Keepers is a volunteer-based water quality monitoring program that examines the turbidity (clarity) of the water being released from storm drains into Lake Tahoe and its tributaries. Since the program's launch in October 2012, a dedicated group of volunteers have braved the elements to collect water samples, take photos, and raise awareness about neighborhood storm drains impacts on lake and river waters.

Volunteer Beach Cleanups are one of the newest League community engagement activities. They are organizing several litter cleanups and graffiti removal events annually.

Tahoe Science Consortium (TSC)
http://tahoescience.org
The EPA helped to establish and is currently supporting the activities of a consortium of Lake Tahoe Basin scientists. The Tahoe Science Consortium promotes integration among the many current and future scientific projects in the basin, prioritizing future research informed by a comprehensive science plan, creating an environment that promotes the contributions of the best available science, and emphasizing close cooperation with land and resource managers to facilitate the transfer of information in an effective manner.

TSC Key accomplishments:

- Conceptual plan for a Regional Stormwater Monitoring Program (RSWMP)
- Drafting of a Tahoe Science Plan, published in August 2009.

Highlights of the Tahoe Science Program

1. Diverse science projects.
2. Multi-institutional effort: Members of the Tahoe Science Consortium (USGS; University of California, Davis; University of Nevada, Reno; Desert Research Institute; and PSW) work together to guide program activities.
3. Collaborative planning: To promote strategic plans to address environmental issues in the Tahoe Basin, the TSC has collaborated with an array of institutions to create a science plan for the Lake Tahoe basin, conduct topical science workshops, and develop a regional stormwater monitoring plan (RSWMP).
4. Competitive peer-reviewed process: Proposals for science at Lake Tahoe using SNPMLA funds compete through a peer-review process that evaluates technical merit and management relevancy.
5. Management orientation: Themes are selected based upon management needs in the basin. The proposal review process is done in collaboration with the management community in the basin.
6. Securing long-term knowledge systems: Annual funding from SNPLMA has provided continuous support for the TSC in delivering science synthesis to management agencies. The

program has allowed several projects to conduct multiyear research by building upon work conducted in previous rounds.

The Lake Tahoe Science Consortium served to guide, peer review, and consult on science problems in the Basin, and has developed a Science Plan to guide future research, which EPA has peer reviewed.

ARkStorm@Tahoe Project
http://tahoescience.org/arkstorm-project
In 2018, TWSA staff served on an "*Arkstorm – Lessons Learned"* panel at the Nevada Water Resources Association, Fall Symposium. Organizers discussed the winter of 206-17 as a 'light version' test period for emergency preparations and response during future ArkStorms. An *ArkStorm @ Tahoe Preparedness Workshop* was held at the September 12, 2013 TWSA Board meeting. The TWSA members and other agency representatives spent 3 hours to discuss the operations of water and sewer supply systems during a potential long-term storm event. The exercise is designed to address potential social and ecological impacts of extreme winter storm events in the Lake Tahoe region. What is an ARkStorm? Atmospheric rivers (ARs) are large flows of water vapor that typically occur in fall and winter, bringing huge amounts of moisture over the Pacific to the U.S. West Coast. Landfalling ARs are storm events with the potential to deliver extreme amounts of precipitation to the West Coast, including California and Nevada, over a just a few days. The name "ARkStorm" was coined to describe large AR storm sequences, which, for instance, can produce precipitation in California that in places can exceed totals experienced only once every several hundred to 1,000 years. Scientists with the U.S. Geological Survey (USGS) Multi Hazards Demonstration Project (MHDP) designed a scientifically-plausible winter ARkStorm scenario for California emergency managers, stitching together historical AR storms from 1969 and 1986, separated by only 4 days. This hypothetical ARkStorm would rival but not exceed the intense California winter storms of 1861 and 1862 that left the Central Valley of California flooded and the state's economy destroyed. It was designed to exceed any single storm in the 20th Century. On March 14, 2014, a Tabletop Exercise (TTX)was held at the Regional Emergency Operations Center (REOC), Reno, NV

Integrated Science Plan for the Lake Tahoe Basin: Conceptual Framework and Research Strategies
http://www.tahoescience.org/wp-content/uploads/2010/11/Science-Plan-Intro1.pdf
edited by Zachary P. Hymanson and Michael W. Collopy

An integrated science plan was developed to identify and refine contemporary science information needs for the Lake Tahoe basin ecosystem. The research priorities are reviewed and revised regularly to ensure they reflect the changing information needs and evolving priorities of agencies charged with the welfare of the Lake Tahoe basin.

The main objectives were to describe a conceptual framework for an integrated science program, and to develop research strategies addressing key uncertainties and information gaps that challenge government agencies in the theme areas of:

(1) air quality,
(2) water quality,
(3) soil conservation,
(4) ecology and biodiversity, and
(5) social sciences.

This document presents the results of science community efforts to organize and describe the initial elements of an integrated science plan for the Lake Tahoe basin: a conceptual framework for completing science to inform adaptive management, and focused research strategies covering topic areas of relevance to Tahoe basin management and conservation. Separate, agency-led efforts are underway to develop other essential elements of an integrated science plan including programs for status and trends and

effectiveness monitoring, new data applications aimed at converting data into information and knowledge, and the integration of monitoring and applied research efforts.

This science plan was developed to identify and refine science information needs for the Lake Tahoe basin. The main purpose of this effort was to develop a set of research strategies addressing key uncertainties and information gaps that challenge resource management and regulatory agencies. The research needs identified in these strategies are based on assessments of the issues and information needs that currently confront government agencies and stakeholders working in the basin.

This science plan comprises seven chapters. Excerpts related to water quality are listed below.

Water Quality:

- Initiate long-term status and trend monitoring of watershed hydrology and pollutant loads entering Lake Tahoe to:
  (1) inform Lake Tahoe total maximum daily load (TMDL) land use and lake clarity models, and other water quality-related management models;
  (2) evaluate progress in meeting TMDL allocation requirements and other regulatory obligations; and
  (3) evaluate snowpack and snowmelt trends as they pertain to lake clarity.

The **Lake Tahoe Interagency Monitoring Program** (LTIMP) partially meets these monitoring needs, but this program has eroded over the last decade owing to funding restrictions. The LTIMP does not include some key pollutant sources (i.e., urban stormwater and road runoff), and it does not include some key water quality constituents that directly affect lake clarity (i.e., particle number and particle size distribution).

- Develop a regional stormwater quality/best management practices retrofit monitoring program to assess the effects and effectiveness of capital investment projects at the project, watershed, and basinwide scales.

Lake Tahoe is the most-studied feature of the Tahoe basin ecosystem with regard to water quality. Although a substantial amount of research and monitoring has been accomplished, knowledge gaps and uncertainties still exist, particularly in understanding how watershed restoration efforts influence the long-term water quality of Lake Tahoe.

Because water quality restoration efforts in the Tahoe basin are expected to exceed $1billion, it is critical that we continue to collect and deliver information in an organized fashion. The water quality research strategy in chapter 4 is intended to serve as a road map for discussions with resource managers. The chapter identifies those science projects necessary to help guide water quality restoration efforts and understand related ecosystem processes.

Near-term water quality research priorities include pollutant loading and treatment within the urban landscape:

- Develop a process-based understanding of sources, transport and loading of fine sediment particles (<20 μm) from different urbanized land uses in the Tahoe basin. Although this includes all features of the urban landscape, roadways appear to be particularly important and deserve focused attention.

- Quantify the effectiveness of best management practices (BMPs) and other watershed restoration activities on the control of fine sediment particle and nutrient loading to Lake Tahoe. Major load

reduction approaches include hydrologic source control (HSC), pollutant source control (PSC) and stormwater treatment (SWT). Although some data have been collected on BMP and restoration effectiveness in removing nutrients and fine sediment, these efforts have been for specific projects and have not provided basinwide-process based evaluations.

- A comprehensive basinwide watershed-scale evaluation of BMP and erosion control project effectiveness is needed, especially for the Lake Tahoe TMDL program.

- Conduct focused studies to understand the influence altered urban hydrology has on pollutant pathways and determine how alternative hydrologic designs can enhance load reduction.

- Investigate longer-term impacts from infiltration of stormwater runoff around the Tahoe basin, particularly as it relates to different soils, land uses, and groundwater quality.

- Continue efforts to establish a Regional Storm Water Monitoring Program.
  Key elements of this program include
  (1) pollutant source monitoring;
  (2) pollutant reduction monitoring;
  (3) BMP design, operation, and maintenance monitoring; and
  (4) data management, analysis, and dissemination.

Although this is not research *per se*, data collected under this program will be used to support research on BMPs and pollutant load reduction.

- Validate pollutant reduction crediting tools that are currently being developed to track progress in implementing the Lake Tahoe TMDL. At the same time, develop a science-based adaptive management program to guide pollutant load reduction activities.

Near-shore Water Quality and Aquatic Ecology:
Additional research is recommended to determine near-shore processes at various temporal and spatial scales. This research will contribute to an integrated database that can be used to determine trends and patterns for integrated, process-driven models.

- From this information, construct a predictive model to help guide ongoing and future management strategies. Ideally, this model would include features such as nutrient loading, turbidity, localized and lakewide circulation patterns, wave resuspension, periphyton and macrophyte populations, introduced and native species, and recreational uses and activities within the near shore.

- Develop an aquatic invasive species research program with direct ties to water quality (e.g., threat of invasive species impacts on:
  (1) native species composition and aquatic food webs,
  (2) in-lake sources of drinking water, or
  (3) water quality and stimulation of benthic algal growth in the near-shore.

- Develop analytical approaches for establishing quantitative and realistic water quality standards and environmental thresholds for the near-shore region.

Erosion and Pollutant Transport/Reduction within the Vegetated Landscape:
Collaboration between researchers and agency representatives is recommended to evaluate fine sediment and nutrient loads resulting from forest fuels reduction activities. A major effort would include quantifying BMP effectiveness for controlling fine sediment and nutrient releases from wildfire, as well as from forest biomass management practices, such as prescribed fire and mechanical treatment.

- Fully evaluate the benefits and risks from using large areas of the natural landscape (e.g., forests, meadows, flood-plains, wetlands) for treatment of urban runoff.

Water Quality Modeling:
Water quality management in the Tahoe basin has embarked on a pathway that will use science-based models to help guide management into the future. The models will:

- Develop appropriate linkages between the landscape, climate, and atmospheric and water quality models to provide more comprehensive assessment of primary and secondary drivers whose effects propagate through the ecosystem.

- Build decision-support modules for the linked ecosystem models that will support evaluation of effects from larger spatial scales.

Climate change:
Continue to document the affects of climate change on existing and future water quality conditions.

- Apply predictive scenario testing for evaluating potential effects from climate change within the new and developing management models used for water quality in the Tahoe basin. In particular, models could be used to evaluate basinwide BMP effectiveness and load reduction strategies based on the expected changes to temperature, precipitation, and hydrology.

- Limnological processes in Lake Tahoe such as stratification, depth of mixing, particle distribution and aggregation, species succession, aquatic habitat based on water temperature, and meteorology are all recommended for reevaluation in light of climate change and possible management response to the impacts of climate change.

Southern Nevada Public Land Management Act (SNPLMA) (Public Law 105-263)
http://www.blm.gov/nv/st/en/snplma.html

The Southern Nevada Public Land Management Act (SNPLMA) became law in October 1998. It allows the Bureau of Land Management to sell public land within a specific boundary around Las Vegas, Nevada. The revenue derived from land sales is split between the State of Nevada General Education Fund (5%), the Southern Nevada Water Authority (10%), and a special account available to the Secretary of the Interior for:

- Parks, Trails, and Natural Areas
- Capital Improvements
- Conservation Initiatives
- Multi-Species Habitat Conservation Plan (MSHCP)
- Environmentally Sensitive Land Acquisitions
- Hazardous Fuels Reduction and Wildfire Prevention
- Eastern Nevada Landscape Restoration Project
- Lake Tahoe Restoration Projects

A searchable database of projects funded is available at:
http://www.blm.gov/nv/st/en/snplma/snplma_prephase_1.html

Lake Tahoe Restoration Projects are nominated, reviewed, and ranked from a list of projects recommended by the Tahoe Regional Executive Committee (TREX). Recommendations are submitted to the SNPLMA Executive Committee for review and consideration for inclusion in the SNPLMA Final Recommendation for each round.

The SNPLMA Program at thee 14th Round of funding had more than $8,000,000 allocated in November 2013 towards approved projects.
http://www.blm.gov/pgdata/etc/medialib/blm/nv/field_offices/las_vegas_field_office/snplma/pdf/round_14.Par.55803.File.dat/SNPLMA%20Round%2014%20Decision%20Document.pdf

Tahoe Science Projects supported by SNPLMA
The US Forest Service Pacific Southwest Research Station (PSW) receives funding through the Southern Nevada Public Lands Management Act (SNPLMA) to conduct science to inform efforts to restore Lake Tahoe and its watershed, as authorized in the Lake Tahoe Restoration Act. PSW assumed responsibility of SNPLMA for sponsoring science projects. The PSW Station established a competitive grant award program with a rigorous peer review process coordinated by the Tahoe Science Consortium, a collection of universities and agencies with active research programs at Lake Tahoe.

A database of the many projects funded at Tahoe is available at:
https://www.fs.fed.us/psw/partnerships/tahoescience/browse_projects.shtml

Lake Tahoe Interagency Monitoring Program (LTIMP)
http://www.tiims.org/TIIMS-Sub-Sites/LTIMP.aspx
The formation of this program resulted from a series of meetings, beginning in 1978, initiated by the University of CA, including state and federal agencies. It was apparent that a strong environmental monitoring program was necessary to accommodate the needs of the various agencies concerned with land-use planning and regulation. The University's basic research program alone could not provide the expanded water quality data requirements in the Tahoe basin. As a result of these discussions LTIMP was formally established in 1979 to collect water/air quality information necessary to support the extensive regulatory/research activities in the basin.

This program was consolidated into the TRPA EIP program database.

USDA / US Forest Service
Lake Tahoe Basin Management Unit Monitoring Program Reports
The USDA / US Forest Service Lake Tahoe Basin Management Unit (LTBMU) provides multi-year, extensive reporting on forest land projects.

For an overview of ongoing projects and reports please visit:
http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gjAwhwtDDw9_AI8zPyhQoY6BdkOyoCAGixyPg!/?ss=110519&navtype=BROWSEBYSUBJECT&cid=FSM9_046480&navid=360000000000000&position=Feature&ttype=detail&pname=Lake%20Tahoe%20Basin%20Mgt%20Unit-%20Maps%20&%20Publications*

Examples are below:

Lake Tahoe Basin Management Unit Monitoring Reports

2017

- Heavenly SEZ Demonstration Project Monitoring Report - Dec. 2017
  (PDF 3,375 KB)
- Vegetation Structure Response to Channel Restoration Blackwood Creek - Dec. 2017
  (PDF 5,517 KB)

2016

- LTBMU Annual Soil and Water BMP Monitoring Report for FY15 - October 2016
  (PDF 338 KB)
- LTBMU Rare Botanical Species 2015 Monitoring Report - May 1, 2016
  (PDF 870 KB)
- Lake Tahoe Federal Grants Program Status Report 1984 - 2015
  (PDF 1,325 KB)

2015

- LTBMU Invasive Plant Management Report - 2015
  (PDF 596 KB)
- Upper Truckee River Lahontan Cutthroat Trout Restoration Project Annual Report - 2015
  (PDF 1,089 KB)
- FY15 LTBMU Soil and Water BMP Monitoring Report - Nov. 24, 2015
  (PDF 170 KB)

- LTBMU Rare Botanical Species 2013-2014 Monitoring Report - September 1, 2015
(PDF 860 KB)
- Invasive Plant Management 2013-2014 Annual Report - May 11, 2015
(PDF 637 KB)
- 2008-2012 Wildlife Survey Program, Five-Year Summary Report - Sep. 30, 2015
(PDF 5,840 KB)
- Upper Truckee River Allotment Aquatic Trend Analysis - August 2015
(PDF 2,938 KB)
- LTBMU Riverine Restoration Program- An Overview - March 2015
(PDF 8,928 KB)
- Cold Creek High Meadows Restoration 2nd Year Effectiveness Monitoring Report - Feb. 2015
(PDF 4,293 KB)

2014

- 2014 LTBMU Best Management Practices Monitoring Report - Jan. 2015
(PDF 802 KB)
- Multi-Jurisdictional Fuel Reduction and Wildfire Prevention Strategy - August 2014
(PDF 5,475 KB)
- Five Year Summary Monitoring Report 2008-2012 - June 25, 2014
(PDF 14,393 KB)
- Estimated FSP Load Reductions in the Upper Truckee River Watershed - March 2014

- **Blackwood Creek Restoration Reach 6 Effectiveness Monitoring Report - Jan. 2014**
    - Final Report
    (PDF 3,567 KB)
    - Appendices
    (PDF 9,095 KB)
    - Peer Review
    (PDF 1,726 KB)

Lake Tahoe Geographic Response Plan (LTGRP) 2014 Update
http://www.epaosc.org/site/doc_list.aspx?site_id=2261

This plan details interagency protocol and instruction for site response in the event of a major spill at Lake Tahoe.

http://ndep.nv.gov/bca/response_plan/ltgrp_summary_0308.pdf
Incidences with unreported spills in the Edgewood, Burke, and McFaul watersheds led to a discussion with Nevada Bureau of Corrective Actions regarding the spill notification process in August of 2004. As a result, TWSA participated with the US Environmental Protection Agency and other Lake Tahoe Basin agencies in the development of the Lake Tahoe Geographic Response Plan. The Plan defines spill reporting and spill response procedures. In September 2007, the report was issued. In 2014, the plan was updated.

The TWSA participates in the ongoing development of the Lake Tahoe Geographic Response Plan (LTGRP), which establishes the policies, responsibilities, and procedures required to protect life, environment, and property from the effects of hazardous materials incidents. This plan establishes the emergency response organization for hazardous materials incidents occurring within the Lake Tahoe watershed. The plan is generally intended to be used for oil spills or chemical releases that impact or could potentially impact drainages entering Lake Tahoe, Lake Tahoe itself, and its outflow at the Truckee River. Plan coverage is for El Dorado, Placer Counties, California; Douglas, Washoe Counties, and Carson City, Nevada. The LTGRP is the principal guide for agencies within the Lake Tahoe watershed,

its incorporated cities, and other local government entities in mitigating hazardous materials emergencies. This plan is consistent with federal, state, and local laws and is intended to facilitate multi-agency and multi- jurisdictional coordination, particularly among local, state, and federal agencies, in hazardous materials emergencies.

Lake Tahoe Wastewater Infrastructure Partnership (LTWIP)
Presently inactive, 2007 saw the formation of a parallel organization to the TWSA, the Lake Tahoe Wastewater Infrastructure Partnership (LTWIP). The groups' purpose is to develop, implement and maintain effective operation, maintenance and capital replacement programs to meet state-of-the-art industry standards, satisfy State and Federal requirements, and advocate for the protection of Lake Tahoe as an outstanding National water body.

Members include Douglas County Sewer Improvement District No. 1 (DCSID), Incline Village General Improvement District (IVGID), Kingsbury General Improvement District (KGID), North Tahoe Public Utility District (NTPUD), Round Hill General Improvement District (RHGID), South Tahoe Public Utility District (STPUD), Tahoe Douglas District (TDD) and Tahoe City Public Utility District (TCPUD).

Each of the Parties owns and operates a public sewer collection and/or treatment system within the Lake Tahoe Basin. These sewer systems could negatively impact the surface waters of Lake Tahoe upon failure or spillage. The Parties recognize the environmental sensitivity of the Lake Tahoe Basin, and the extraordinary responsibilities placed on their organizations as a result of their operation and maintenance of these sewage systems. Common standards and practices, and project prioritization are key steps to meeting those responsibilities.

The US Army Corp of Engineers (USACOE) had executed a Project Management Plan for Technical Assistance – Lake Tahoe Watershed Restoration with LTWIP, which included technical assistance related to the identification of sewer system defects, project identification, project prioritization, and application of consistent engineering standards for the execution of a wastewater capital replacement program within the Lake Tahoe Basin. This scope of work was completed and an additional task was added to assist the agencies with the preparation and completion of Sewer System Management Plans to meet California State Water Resources Control Board requirements under the Sanitary Sewer Overflow Reduction Plan.

This new California regulation required all sewer agencies in California to develop and implement a sewer system management plan (SSMP). The SSMP documents the agency's program to properly operate and maintain its sanitary sewer system. Each SSMP is required to address the following elements: Goals, Organization, Legal Authority, Operation and Maintenance Program, Design and Performance Provisions, Overflow Emergency Response Plan, Fats, Oils, and Grease (FOG) Control Program, System Evaluation and Capacity Assurance Plan, Monitoring, Measurement, and Program Modifications, SSMP Program Audits, and Communication Program.

The TRPA is adopting a similar requirement for a SSMP in the update of the Regional Plan. The plans completed as described above will meet this new requirement. The language included in the TRPA Regional Plan Update approved in 2012 is as follows:

60.1.6. Spill Control
All persons handling, transporting, using, or storing toxic or hazardous substances shall comply with the applicable requirements of state and federal law regarding spill prevention, reporting, recovery, and clean-up. Sewage collection, conveyance, and treatment districts shall have sewage spill contingency, prevention, and detection plans approved by the state agency of appropriate jurisdiction and submitted to TRPA for review and approval within three years of the effective date of the Regional Plan.

A. Cooperative Sewage Spill Plans
Sewage collection, conveyance, and treatment districts may join together to develop cooperative plans, provided that the plans clearly identify those agencies covered by the plan, are agreed to by each agency, and are consistent with applicable state and federal laws.

B. Sewage Spill Plan Criteria
Sewage spill contingency, prevention, and detection plans shall comply with the criteria set forth by the state agencies of appropriate jurisdiction and TRPA. Such plans shall include provisions for detecting and eliminating sewage exfiltration and stormwater infiltration from sewer lines and facilities.

The Public Utility member agencies of the LTWIP and of TWSA have completed a new standardized Memorandum of Understanding (MOU) with the TRPA that regulates routine activities in the Lake Tahoe Basin. The existing MOU's were outdated and inconsistent among the Public Utilities. These were adopted in March 2012.

The new MOU lists the activities that are exempt or qualified exempt from obtaining a TRPA permit which are broader than the list in the TRPA Code of Ordinances. The new MOU includes performance-based standards for exempt and qualified exempt activities rather than prescriptive standards, where possible. This listing of activities allows the agencies to complete a wide range of projects and daily operations and maintenance activities without having to pull special permits. It still requires the agencies to follow all Best Management Practices, Land Coverage program rules, and other requirements such as seasonal restrictions.

A future task is that the special districts should be able to electronically report their activities to TRPA on-line, through the TRPA website, with a password unique to their organization. They should also be able to attach PDFs with their reporting forms for construction drawings and related information. An alternative to the current TRPA "QE stamp" will be developed for the special districts to use as evidence to building departments, etc. Reporting is currently done by the agency and is available for review by TRPA upon request.

To assure reliable sewer operations and avoid significant economic and environmental costs associated with inadequate operation and maintenance of these systems, the Parties desire to improve their practices and standards, implement state of the art asset management concepts, and comply with additional requirements.

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Table and Figure List:

[1] UC Davis Tahoe Environmental Research Center, State of the Lake 2018, http://tahoe.ucdavis.edu/stateofthelake/sotl-reports/2018/SOTL_complete.pdd, page 8.3