

Tahoe Science Advisory Council

Water Quality Work Group

Summary notes – 8.12.24

Goals for meeting

- Collect comments and questions regarding the Tahoe Science Advisory Council review of Lake Tahoe monitoring
- Continue discussions on management priorities and actions related to Lake Tahoe's clarity

General notes on the summary report (version July 9, 2024)

- The report summarizes the key themes based on responses by 5 external reviewers plus input by the TSAC subgroup.
- The financial implications of current or proposed monitoring actions were not evaluated.
- Current monitoring efforts remain a top priority:
 - Costs continue to rise and some current monitoring does not have adequate fundingThere remains a lack of integrated, accessible data management for all monitoring
More group dialogue is needed to advance the specific recommendations in the report.

Specific monitoring topics:

- Measurement locations
 - There are two main sites used to measure pelagic clarity and related variables
 - Reviewers suggest a study to determine whether and how many additional sites in pelagic waters are needed to characterize the spatial and temporal variability of the variables. This would require multiple years of monitoring.
 - More information is needed on spatial and temporal variation in nutrient and particle loading, ecology, and resultant effects on clarity
- Secchi disc measurement
 - This is an established method with a long record
- Nearshore monitoring
 - There is much more heterogeneity in littoral water clarity with different types of monitoring in nearshore environments. This issue is the topic of an on-going TSAC-coordinated review.

- Zooplankton
 - Monitoring of zooplankton is recommended.
 - Current project by UNR has sampled and identified zooplankton, including rotifers, at multiple stations for one year.
 - Hydroacoustic scanning may provide useful data on spatial variability and movement of Mysids, particularly at night. UCD's use of biosonic measurements continues, though not as funded monitoring.
 - Hydroacoustic monitoring is only useful for larger sizes of Mysids, and may not capture data on all life stages and feeding on finer plankton.
 - A cost/benefit analysis should be performed to estimate how much can be gained from monitoring smaller zooplankton, including at the water/sediment interface at the bottom of the lake.
- Atmospheric deposition
 - Additional research on the effects of atmospheric deposition on clarity and ecology was addressed by only one external review, but does deserve further consideration.
- Data availability
 - There is currently no integrated data management that allows for broad access to, and review of, limnological data in Tahoe. This is a high priority item.
 - Lessons from USGS monitoring in the Sacramento-San Joaquin Delta demonstrate the dedicated staff and financing for maintaining instruments, managing and analyzing data. USGS work in the Delta can offer lessons for Tahoe in data management. Note the "AAA" model – Analyze, Audit, Approve
- Remote sensing
 - Remote sensing methods used in oceanography may be applicable to Lake Tahoe, but was not addressed by the external reviewers.
 - Tahoe does many *In Situ* monitoring locations which provide direct measurements
 - Some remote sensing techniques that may be useful for Tahoe include:
 - LANDSAT – which may not have adequate sensitivity
 - MODIS – which can have adequate sensitivity but not a long data record
 - SMASH – monitoring for harmful algal blooms
 - SFEI – a new CyanoHAB monitoring tool (Tahoe may be too oligotrophic for this model)
 - Temperature monitoring
- Microbial activity
 - The reviewers mentioned the need for monitoring of microbial activity, but more study is needed to understand the potential value of what, why and where to monitor microbial activity directly.
- High frequency sensors:
 - Can these be afforded and are they cost effective?

- Some hi frequency monitoring occurs with current or near-future monitoring including the 4 NASA buoys, gliders, wirewalkers, ADCP.
- Microplastics
 - Questions researchers are hearing include if other organisms are adhering to microplastics
 - All current data on microplastics is for 330 microns and greater, where the majority of the plastics are likely in the 1–5-micron size
- Optical properties and light beam transmission
 - Agency staff believe more information is needed on the scattering and absorption of different particles and organisms
 - In the near term, more research is needed to do a cost/benefit estimation of understanding the optical effects of different particles and organisms.

Next steps

- Council WQ team and partners should refine priorities for monitoring and research, and develop associated estimates of funding and resource needs.
- Next meeting will build on the clarity discussion by evaluating recent statistical analyses.

Water quality research as it relates to nutrient and sediment management

- It is not clear how well the clarity model used for the TMDL represents current conditions in the lake
- Recent attention in the press, and in discussions among resource managers, run the risk of broadcasting oversimplified messages such as “the TMDL isn’t working” to protect water clarity
- It may be that the TMDL model is “good enough” for a general picture of the effect of nutrient and sediment loading on clarity.
- The effects of zooplankton on clarity are not well understood or reflected in the TMDL work. Also, populations of zooplankton have changed in composition and abundance in the last 15 years.
- It is very difficult to parse reductions due to management activities from natural stream loading. Basin wide, average annual loading are not measured directly and thus depends on modeled estimates.
- It is important that managers and researchers clearly describe the complexity of clarity tracking. For example, it is important to highlight the changing ecology in the lake, including with algae, in the last 15-20 years.
- Research and modeling priorities include a better representation of biological systems for clarity.

In Attendance

- Bob Larsen
- Chris Fritsen
- Phoebe Song

- John Melack
- Joe Domalgalski
- Dan Segan
- Alex Forrest
- Melissa Thaw
- Sudeep Chandra