



Appendix A: Source Water Protection Measures - Harmful Algal Blooms

The Lake County Watershed Protection District (herein “the District”) is committed to protecting Clear Lake. Through coordination with local surface water agencies, the Department plans to develop and implement best management practices (BMPs) to further protect surface water supplies and to advance the communication efforts with surface water purveyors in Lake County. The BMPs for harmful algal blooms include the State of the Lake report, urban and rural storm water management, green infrastructure, lake and lakebed management, local ordinances, and education and outreach. The BMPs are in varying stages of development and implementation; some are completed and implemented while others require expansion, enhancements, implementation, and/or effectiveness evaluation.

State of the Lake Report

The District, in conjunction with the California Rural Water Association (CRWA), is developing a “State of the Lake” report that outlines the major activities and projects within the District. The purpose of the document is to provide water systems with information about the status of lake-wide and county-wide projects that can directly and indirectly affect drinking water. The report will be updated on an annual basis or as needed by the District to reflect planned, current, and completed projects and milestones. This report serves to further communication efforts between the District, the surface water purveyors in Lake County, and the public. There is a need for collaboration and cooperation between the agencies in Lake County so that future projects include the needs and outcomes of drinking water systems. When the agencies and drinking water systems work together, they have the potential to improve the lake water quality, which can help to improve treatment system performance and efficiency therefore decreasing drinking water rates and improve the quality of life in the lakeside communities.

Storm Water Management

The County of Lake, the City of Lakeport, and the City of Clearlake (herein “co-permittees”) are subject to the National Pollution Discharge Elimination System (NPDES) Phase II General Permit for Waste Discharge Requirements (WDRs) for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). The permit requires an Urban Stormwater Management Plan (SWMP) that covers several topics including a water quality monitoring section that satisfies nutrient total maximum daily load (TMDL) sediment phosphorus requirements (SWRCB-NPDES, 2020). Due to various staff changes and the lack of available funding, the co-permittees have not satisfied all of the requirements under the Phase II MS4 permit (RWQCB, 2019). A time schedule order (TSO) was placed to ensure compliance with the TMDL in MS4 areas and a separate Order from the Regional Water Quality Control



Board (RWQCB) was issued for County-managed and owned parcels that fall outside of the MS4 areas. All benchmarks outlined in the order are scheduled to be completed by specified deadlines. The co-permittees developed a stormwater monitoring plan in April 2021, but additional work must be completed by the co-permittees, including the County of Lake, to satisfy the NPDES General Permit requirements for the TMDL, both for the MS4 incorporated areas of the County and Cities and the unincorporated areas within the watershed. Funds provided by Cannabis Tax Revenues were utilized by the County in 2020-2021 to satisfy several requirements of the TMDL TSO and Order.

The Regional Water Quality Control Board passed Resolution No. R5-2017-0057 that mandates baseline discharge and receiving water body monitoring for pyrethroids. Pyrethroids are a group of man-made pesticides commonly used in residential and commercial landscaping. The purpose of the order is to determine if pyrethroids are entering the lake through storm drains. Funding for the planning and execution of the order in Lake County was provided by both Cannabis Tax Funds and Cost-Share agreements between the co-permittees. The co-permittees are on schedule to complete the actions required under the resolution. Finally, the County of Lake plans to implement a stormwater assessment and priority upgrade plan. The plan will identify which storm drains are contributing the most sediment into the lake and where storm water upgrades can have the biggest impact. Funding for this project was approved for allocation by the Blue Ribbon Committee in September 2021 with full funding agreements expected to be initiated in 2022.

Green Infrastructure

Green infrastructure, such as permeable roads, stormwater wetlands, and bioretention systems decrease stormwater runoff that typically brings high levels of nitrates, nitrites, and phosphorus into water bodies (Corona Environmental Consulting, 2017). Eligibility for grant money under Proposition 1 (Integrated Regional Water Management [IRWM] funding), which covers funds for green infrastructure investments, rests on the development and implementation of a stormwater resources plan. A stormwater resources plan is different from the stormwater management plan required under the NPDES MS4 Phase II General Permit. Unlike the NPDES MS4 stormwater management plan, the Stormwater Resources plan is County wide and not restricted to urban or community growth boundaries. The storm water resources plan was introduced by the State Water Resources Control Board to, "...encourage the use of storm water and dry weather runoff as a resource to maximize water supply, water quality, flood management, environmental, and other community benefits within the watershed" (SWRCB, 2021). Lake County co-permittees have not developed a stormwater resources plan and are therefore ineligible for funding under Proposition 1, and perhaps future bond –sourced stormwater infrastructure funds. The District is working on attaining contract services for the development of a stormwater resources plan with cost-share commitment from the two cities, Lakeport and Clearlake.



Lake and Lakebed Management

Lake and lakebed management strategies may be considered by local governance to control the costs associated with freshwater cyanobacterial harmful algal bloom (FCHAB) treatment. However, the cost of lake and lakebed management should be weighed carefully to determine the return on investment. Lake management practices can be implemented throughout the lake or at a localized spots near intakes to mitigate cyanobacterial blooms in source water. For localized installations such as aeration near an intake, the responsibility for implementation is on the water purveyor. However, the responsibility for implementing a large-scale lake management strategy that covers the entire lake will be on the District and other community organizations.

Some surface water systems have localized aeration near their intake. The Big Valley Band of Pomo Indians environmental department has reported success with an aeration system in their marina at Konocti Vista Casino to reduce FCHABs abundance and increased dissolved oxygen. The city of Clearlake is in the planning and development phase of utilizing a bubble curtain for the purpose of destratification in the recreational areas and to prevent FCHAB formation in lagoons and coves within the city limits. Given the size of Clear Lake, a mechanism used in the entire lake may not prove to be effective, but more research is needed to determine the viability of this option. Research by UC Davis Tahoe Environmental Research Center (TERC) with funding from the Blue Ribbon Committee, is investigating using an in-lake model to determine if oxygen injected into targeted areas of the hypolimnetic zone will help reduce bloom occurrence, with the goal that natural currents and flows will help to distribute the oxygen and prevent internal loading of sediment-bound phosphorus. This research is still preliminary however promising. However, to date localized installations of reservoir management practices are a viable option for water utilities in Clear Lake.

Due to climate change, California residents are faced with more extreme weather patterns and more frequent natural disasters. If the water system and/or participating steering committee members are affected by a natural or manmade disaster that impacts their ability to carry out BMPs, the timeline and/or scope of the BMP will be adjusted accordingly during the annual review of this plan. Water purveyors affected by a natural or manmade disaster should refer to their Risk and Resilience Assessment (RRA) and Emergency Response Plan (ERP) required under the America's Water Infrastructure Act (AWIA) section 2013. In addition, use of the source water protection contingency plan is recommended for emergency contamination and water shortage events. Table 1 outlines the recommendations for lake and lakebed management strategies.



Table 1: Recommendations for Reservoir Management Strategies (from Kennard [2021])

Method	Recommendation	Justification
Algicides	Not Recommended	Although algicides are effective for mitigating algal blooms, its use is limited to reservoirs solely dedicated as drinking water reservoirs. Algicides should not be used in natural lakes with diverse ecological habitats.
Destratification: Physical Mixers	Not Recommended	Physical mixers should be used in deep lakes that are solely dedicated drinking water reservoirs. The mixing equipment may pose dangers to recreationalists.
Destratification: Bubble Plumes/Bubble Curtains	Not Recommended	Bubble plums and bubble curtains work well to destratify deep lakes that undergo long periods of thermal stratification. Clear Lake does not fit these criteria, but the City of Clearlake is implementing a project using this technology. Results have yet to be evaluated.
Destratification: Side-stream super-saturation (SSS) hypolimnetic oxygenation system	Recommended	The SSS system has shown to work in shallow warm polymictic lakes with a larger surface area to depth ratio due to its ability to oxygenate the hypolimnion without disrupting thermal stratification causing turnover.

Local Ordinances

Water use ordinances in residential areas can help to mitigate herbicide, pesticide, or chemical runoff from over irrigating, car washing, or careless water use. Lake County currently does not have any ordinances specific to water use. However, section 23-12.- Water Quality details ordinances for construction, littering, pollution, and erosion control and are broad enough to provide protections from residential sediment and pesticide runoff. Establishing and enforcing permanent outdoor water use ordinances may help to further mitigate sediment runoff and erosion from lawns. Runoff travels through the drain inlet conveyance structures, which all terminate in Clear Lake. Equipping all outdoor hoses with an automatic shutoff device or prohibiting water from running adjacent to the property line are measures that can help to mitigate unnecessary stormwater flow and excess sedimentation. The ordinance can extend to car washing as well; discharging soapy water into storm drains contributes to contamination in the watershed. Many lakeside communities prohibit manual car washing in areas that can discharge water into a drain inlet. Instead, car washing stations or drive thru car washes are used. County and the city co-permittees have outreach materials targeted at smart car washing, but there currently are no materials focused on wise-water use and runoff prevention.

The County of Lake Public Works Department has a road grading ordinance that requires staff to grade roads twice per calendar year. Road grading processes restore road conditions and improve drainage, which helps mitigate threats to water quality from roads. However, the department does not have a storm drain cleaning ordinance despite the MS4 requirement to track



California

Rural Water Association

storm drain cleanings. Currently, storm drains are only cleaned if they cause localized flooding. Additionally, the placement of rocks directly up- and downstream of culverts slows the flow and mitigates channel erosion, further protecting the waterway. A storm drain cleaning and erosion control ordinance can help keep storm drains clear of sediment build-up and mitigate nutrient input into Clear Lake. It is estimated that sedimentation from neglected storm drains are a major contributor to the lake's condition.

Outreach

Developing outreach materials for storm water management, water use and conservation, shoreline ordinances, and construction permitting is an effective way to inform the public of their responsibility to protect the Clear Lake watershed. Some outreach materials have been developed by the County of Lake Water Resources Department, but more are needed, and specific education and stewardship outreach materials and training resources would provide more comprehensive resources for the community. During 2021, the County of Lake Water Resources Department recruited a CivicSpark Fellow to create a shoreline stewardship program which will include the development of education and outreach materials and a strategy for engaging shoreline property owners in the development of natural shorelines and using shorelines to reduce the runoff of pollutants.



Harmful Algal Bloom BMP Summary & Signature(s)

Table 2 outlines the BMPs for harmful algal blooms.

Table 2: BMPs for Harmful Algal Blooms

Description of BMP	Implemented By:	Anticipated Completion	Implemented (date)
Develop State of the Lake Report	Angela D. & Rachel K.	06/30/2022	
Update State of the Lake Report as needed	Angela D.	Ongoing	Ongoing
Send State of the Lake Report to surface water systems annually	Angela D.	Ongoing	Ongoing
Adopt stormwater monitoring plan	Angela D. & Rachel K.	12/31/2021	4/8/2021
Comply with time schedule order for MS4 permit	Angela D.	12/31/2022	
Implement pyrethroid monitoring plan per Regional Water Quality Control Board Resolution No. R5-2017-0057	Angela D.	01/1/2022	
Develop budget for stormwater assessment and priority upgrades plan	Angela D.	9/26/2021	9/26/2021
Facilitate the development and implementation of the stormwater assessment and priority upgrades plan	Angela D.	12/31/2023	
Facilitate the development of a storm water resources plan	Angela D.	12/31/2023	
Apply for grant funding for green infrastructure projects	Angela D.	12/31/2025	
Investigate the possibility of lake-wide management strategy	Angela D.	12/31/2030	
Determine if permanent water use ordinances are warranted in Lake County	Angela D.	12/31/2023	
Develop applicable outreach materials	Angela D.	12/31/2021	



California

Rural Water Association

The signature(s) below indicate that the voluntary source water protection measures outlined in this document are adopted by the Steering Committee member(s). The Steering Committee will revisit this plan annually to determine the progress of applicable BMP's and to adjust the plan as needed.

A handwritten signature in blue ink, appearing to read "Angela DePalma-Dow".

Angela DePalma-Dow
Invasive Species Coordinator,
Lake County Department of Water Resources

Nov 16, 2021

Date

A handwritten signature in black ink, appearing to read "Rachel Kennard".

Rachel Kennard
Source Water Protection Specialist
California Rural Water Association

11/15/2021

Date