NONPOINT SOURCE SUCCESS STORY

California

Watershed Restoration Efforts Reduce Cyanobacteria-Stimulating Nutrients in Pinto Lake

Waterbody Improved

Pinto Lake is a shallow, hypereutrophic lake within the Pajaro River watershed. Nutrient contamination of surface water and groundwater are primary resource concerns in the Pajaro River watershed. Harmful algal blooms in Pinto lake have occurred for many years and were responsible for 1- to 3-month-long lake closures in 2015 and 2016 to protect public health. The blooms are caused by biostimulation from high nutrient levels, particularly phosphorus. California awarded a Clean Water Act (CWA) section 319(h) Nonpoint Source Implementation Grant for the Pinto Lake Restoration Project to reduce harmful cyanobacteria-stimulating nutrients through implementation of phosphorus sequestration in Pinto Lake and sediment runoff capture in the surrounding watershed. As a result, Pinto Lake recorded only one 3-week-long closure in 2017 and no closures in 2018–2020.

Problem

Pinto Lake is a shallow, 103-acre lake in the lower Pajaro River watershed in the city of Watsonville in Santa Cruz County, California (Figure 1). It is bordered by two public parks and private agricultural land and residential properties. Land use in the lake's 1,470-acre catchment includes agricultural and ranch land, some suburban and rural residential areas, and businesses.

Removal of native vegetation during development activities increased erosion and allowed nutrient-rich sediment to enter the lake. Fertilizer applications and other human activities have increased loading of nutrients to the lake. As a result, since the 1970s Pinto Lake has experienced seasonal and persistent cyanobacteria algal blooms that adversely affect the lake's aquatic ecosystems and recreational uses. Pinto's cyanobacteria blooms have been implicated in fish kills, bird deaths and the death of numerous southern sea otters in Monterey Bay. Between 2007 and 2011, blooms often produced the toxin microcystin at average concentrations of 183 parts per billion (ppb). These levels are significantly above the World Health Organization's limit of 0.8 ppb and EPA's 2019 Human Health Recreational Ambient Water Quality Criteria for microcystins of 8 ppb. Pinto Lake is listed on the CWA section 303(d) list of impaired waterbodies due to impairments associated with harmful algal blooms, including elevated levels of microcystins (algal toxins), ammonia, pH, scum/floating material, chlorophyll *a*, and low dissolved oxygen. Algal blooms, resulting from nutrient-driven biostimulation, constitute a potential health risk and public nuisance to humans, pets and wildlife.

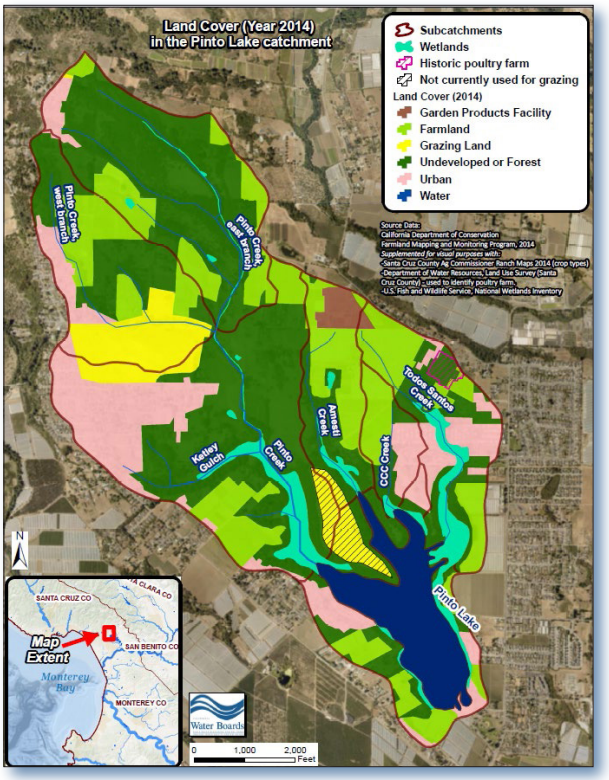

Figure 1. Pinto Lake watershed land cover.

Story Highlights

In 2010, the City of Watsonville received a CWA section 319(h) grant to identify management measures and practices to reduce nutrient loading. In 2014, the city was awarded another CWA section 319(h) grant for the Pinto Lake Restoration Project to implement strategies to reduce nutrient loading to the lake, including application of 118,000 gallons of aluminum sulfate and buffer to Pinto Lake over an 8-day period in early April 2017.

Through the Pinto Lake Restoration Project and other activities, the Resource Conservation District of Santa Cruz County (RCDSCC) has implemented sediment control practices to address nutrient rich runoff in the Pinto Lake watershed. Two sediment management practices were also implemented in the watershed, which resulted in a significant reduction of sediment loading to the lake from adjacent tributaries. A vegetated filter strip was implemented to minimize the nutrients and sediment that entered tributaries.

California also funded the construction of a sediment retention basin through a 2013 Proposition 84 Agricultural Water Quality Grant. This practice captures stormwater runoff from multiple farms and reduces sediment loading and delivery of sediment-bound nutrients to Pinto Lake. In 2017, basin-generated sediment loads to Pinto Lake were reduced by 47 cubic yards.

In July 2020, the Central Coast Regional Water Quality Control Board adopted a total maximum daily load (TMDL) addressing nutrients contributing to cyanobacterial blooms and biostimulation in the Pinto Lake watershed. This Pinto Lake TMDL supersedes prior nitrate (2005) and nutrient (2016) TMDLs for the Pajaro River watershed. The 2020 TMDL found nutrient loads were predominantly from in-lake sediments, with watershed runoff contributing 20%–25% percent of the total nutrient load. The TMDL implementation strategy describes how California's regulatory mechanisms and nonregulatory actions will continue to address nutrient loads from various sources, including fertilizer runoff and leaky septic systems, to attain water quality standards.

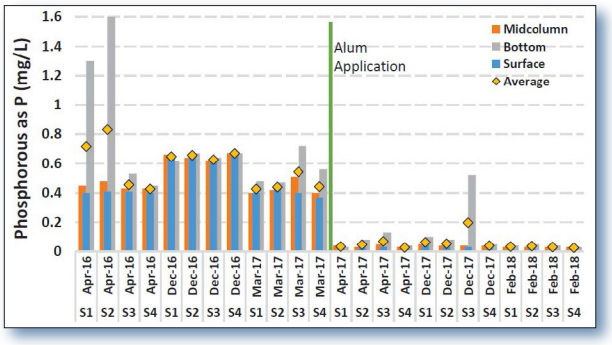

Figure 2. In-lake phosphorus levels dropped after alum application in Pinto Lake.

Results

Recent data show reduced phosphorus loading to the lake and a significant decrease in the duration and severity of algal blooms. Data collected after the alum treatment show dramatic decreases in lake phosphorus loading, as well as a significant decrease in the duration and severity of the spring and fall seasonal microcystin toxicity (Figure 2). Pinto Lake recorded only one 3-week-long closure in 2017 and no closures in 2018–2020, compared to 1- to 3-month-long closures that occurred in prior years. The City of Watsonville will continue regular monitoring for cyanotoxin concentrations and cyanobacteria composition.

Partners and Funding

The City of Watsonville was awarded $750,000 in CWA section 319(h) funds in 2014 to implement the Pinto Lake Restoration Project. This project was preceded by a $125,000 CWA section 319(h) planning and assessment grant awarded in 2010. Other funding included a 2013 California Proposition 84 Agricultural Water Quality Grant to construct a sediment retention basin.

Many partners have worked to improve local water quality, including the City of Watsonville, RCDSCC, Central Coast Regional Water Quality Control Board, Friends of Pinto Lake, Watsonville Wetlands Watch, California State University-Monterey Bay, and the U.S. Department of Agriculture's Natural Resource Conservation Service. Technical advisory members for the Pinto Lake Restoration Project included representatives from Santa Cruz County, University of California Santa Cruz, University California Davis, and RCDSCC.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-21-001MM
December 2021

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