



Water Quality Monitoring in the San Francisco Bay Area Network

Importance: *Water quality is a key indicator of the condition of ecologically significant aquatic resources and overall ecosystem health in the San Francisco Bay Area Network (SFAN).*



Park staff monitor water quality to learn about stream health, and because water quality affects so many other important park resources

Freshwater quality affects people’s enjoyment of park resources, and plays a direct role in the health of SFAN’s aquatic habitats. It also affects the plants and animals that depend on these habitats, including threatened and endangered species like alifornia freshwater shrimp (*Syncaris pacifica*), coho salmon (*Oncorhynchus kisutch*), steelhead trout (*Oncorhynchus mykiss*), and the California red-legged frog (*Rana aurora draytonii*).

Long-term water quality monitoring documents stream conditions, creating a baseline that can be used to detect changes over time, or assess the effects of specific instances of contamination or erosion. Park managers can then use these data to help determine the source of the problem and decide how to best protect important aquatic resources.

The Clean Water Act also requires that park streams meet minimum water quality objectives for the ‘beneficial uses’ set by Regional Water Quality Control Boards (RWQCBs). These include recreation, freshwater replenishment, fish spawning and migration, cold freshwater habitat, and other wildlife habitat requirements.

Monitoring Program: *Since 2006, the National Park Service has monitored important water quality parameters in five park units to determine their range, variability, trends, and comparison to federal and state standards.*

This long-term monitoring program alternates watersheds every two water years (WYs) (Fig. 1), to monitor more water bodies on a fixed budget. Unlike calendar years, WYs start and end during the driest parts of the year—in this case, October 1 to September 30—to capture the entirety of the wet season.

SFAN staff measure: temperature, dissolved oxygen, pH, specific conductance, turbidity, pathogenic indicator bacteria (total coliform and *E. coli*), and nutrients (total Kjeldahl nitrogen, nitrate [NO₃-N], and ammonia). Fecal coliform is also measured in Olema Creek as part of the Tomales Bay Pathogen Total Maximum Daily Load (TMDL) Program.

Stream	WY07-08	WY09-10
Olema Creek	M, S, W	M, S, W
Franklin Creek	M	
Pine Gulch	M	
Strentzel Creek	S	
Chalone Creek	M, S	
Rodeo Creek	M, S	
Tenn. Valley Creek	M, S	
Nyhan Creek	M, S	
Oakwood Creek	M, S	
West Union Creek		M
Lagunitas Creek		M, S
Redwood Creek		M, S

Figure 1. SFAN water quality monitoring schedule. (M=monthly, S=at least one storm event, W=five consecutive weeks in the winter and summer as required by RWQCB TMDL.)

Status and Trends: Most water quality results in WY 09–10 met criteria established by the San Francisco RWQCB and U.S. Environmental Protection Agency (EPA).

pH

Ninety seven percent of pH results from WY 09–10 were within the range needed to support aquatic life (6.5–8.5). The few failures occurred when pH levels fell below this objective range at the farthest upstream sites in Olema Creek, a tributary of Lagunitas Creek (Fig. 2).

Dissolved oxygen (DO)

High DO levels (at least 7 mg/L) are necessary to support healthy salmon and trout populations. During WY 09–10, the San Francisquito and Lagunitas Creek watersheds most often failed to meet this goal, while the Redwood Creek watershed only had a 6% failure rate (Fig. 2). The majority of the failures at all sites were during dry season intermittent or no-flow periods when lower DO levels are more common.

Nitrate

Concentrations of over 1.1 mg/L of nitrate (NO₃-N) can be toxic to fish and amphibian eggs. Only 1 percent of all SFAN samples collected during WY 09–10 were above this threshold (Fig. 2).

Pathogenic Indicator Bacteria

E. coli concentration is an indicator of wildlife and human health risk. The Lagunitas Creek watershed most often failed to meet *E. coli* standards (Fig. 2), usually during winter rains. Twenty four percent of all fecal coliform results from that same watershed also failed to meet water quality objectives. Year-round monitoring of these pathogenic indicator bacteria will continue through the Tomales Bay Pathogen TMDL Program.

Summary

Water quality monitoring in WY 09–10 showed many positive indications of watershed health, and also revealed where problems may exist. This program has begun to offer a glimpse into the water quality issues within SFAN; however, there is not enough data to analyze trends or draw conclusions yet. After WY 14, a data synthesis will be done that will provide a thorough analysis of patterns, trends, and correlations among monitored resources.

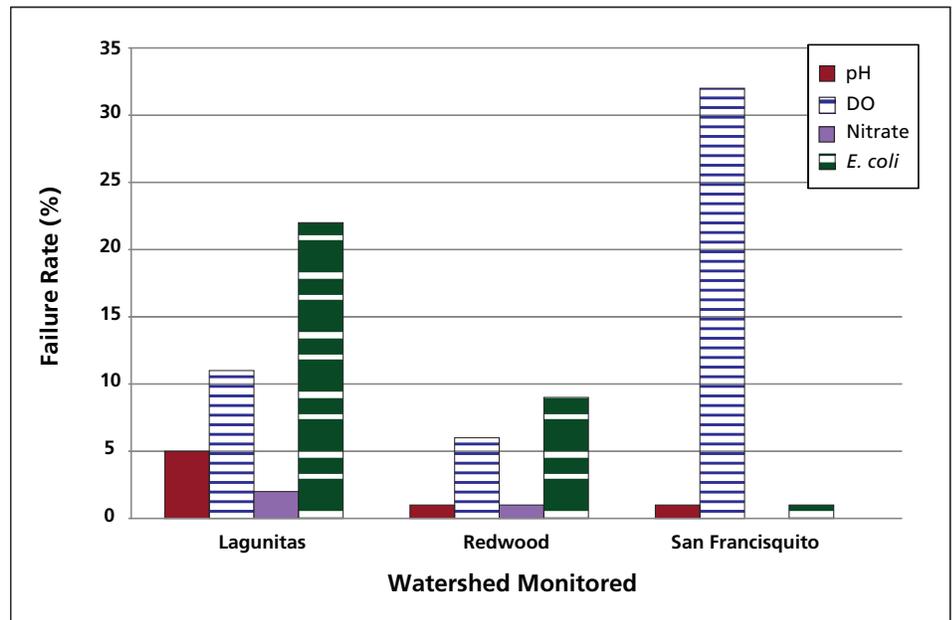


Figure 2. Percentages of monitoring results that failed to meet water quality objectives during WY 09–10, grouped by watershed



E. coli levels in the Lagunitas Creek watershed exceeded the EPA threshold during winter storms like the one pictured here

For More Information: See www.sfnps.org/water or contact Katie_Booth@nps.gov