



Water Quality Monitoring and Bioassessment in San Francisco Bay Region Watersheds at Select Reference Sites, 2007 - 2010

What is it?

Prior to 2006, the San Francisco Bay Regional Water Quality Control Board sampled a wide variety of streams and creeks for biological integrity, toxicity, and water chemistry across the nine Bay Area counties. One major finding of that sampling effort was that detailed information was lacking about conditions at minimally disturbed streams; information which is needed as a baseline for comparison with impacted streams. Thus, a study of minimally-disturbed, or reference, sites was undertaken to develop a better understanding of the biological, chemical, and physical condition of Bay Area streams and creeks.

Streams are considered minimally-disturbed reference sites when the watershed draining into the stream has low amounts of urbanization, agriculture, and roads, and the stream above the sample location is not affected by local stressors (e.g. dams, channelization). Rainfall patterns in California change substantially among years, which can affect the water quality and biological community within streams. Therefore, it is important to document how water quality conditions naturally change within a year (i.e. seasonal variability) and among years (i.e. interannual variability).

In particular, the reference study was designed to answer three questions:

1. What are appropriate expectations for biological, chemical, and physical conditions of streams and creeks that are minimally disturbed?
2. What is the natural variability of the biological community and nutrient levels within the same year and among years?
3. 3) How are stream conditions changing in the long-term?

We selected three perennial streams (streams that flow year-round) and three non-perennial streams (streams that dry up during summer months) to represent conditions throughout the Bay Area. Biological condition was assessed using benthic macroinvertebrates (aquatic insects, snails and crustaceans), soft-bodied algae, and diatoms (algae possessing a silica cell wall). We also

measured nutrients (e.g. nitrogen, phosphorous) and calculated a wide array of physical habitat parameters at the sites.

Why is it important to the State?

Characterizing reference conditions is a vital component of biological assessments because they are the yardstick used to evaluate potentially impacted streams. Mathematical tools to quantify and assess the biological community, such as the Northern Coastal California Index of Biotic Integrity, can only be developed with a clear understanding of conditions of minimally impacted biological communities.

Why is it important to me?

The reference study ensures that bioassessment tools developed to function across the entire state will be applicable to the unique natural conditions of the Bay Area. As a result, water quality managers will have better information to make decisions affecting the protection and restoration of the region's water resources.

How information used?

This project supports the Reference Condition Management Program (RCMP) – an initiative, established in response to an external peer review of the SWAMP bioassessment program, to maintain a network of reference sites for streams and rivers throughout California. It also informs the State Water Board's current efforts to develop statewide biological objectives. This information will also be useful for evaluating the numeric nutrient water quality standards, such as for the Nutrient Numeric Endpoint (NNE) being developed by the State Water Board. Additionally, the algae data from reference sites will help identify an appropriate index period for the Bay Area, during which algae should be sampled.

Besides using this information to assist in the development of nutrient and biological standards, the newly formed Regional Monitoring Coalition, which will monitor stream health in the Bay Area, will use this reference site data to place results from urban creek monitoring into perspective. As part of a coalition, every year starting in 2012, the San Francisco Bay Region's Surface Water Ambient Monitoring Program will monitor 14 reference sites throughout the region. Four of these sites will be targeted and 10 will be based on a random sampling design. Long-term monitoring of targeted reference sites will assist in identifying the effects of climate change on the water quality and biology of Bay Area creeks.