Assessing the Health of San Francisco Bay Area Creeks

Bay Area Stormwater Management Agencies Association

Findings from Baseline Monitoring (2012-2016) Conducted by the Bay Area's Regional Monitoring Coalition

A consortium of San Francisco Bay Area cities and counties joined together in 2010 to form the Regional Monitoring Coalition (RMC), a collaboration that coordinates and oversees the monitoring of water quality in local creeks and channels in the Bay Area. The RMC has a shared vision of generating high-quality data sets that evaluate the biological, chemical and phyiscal condition of local waterways, with the goal of informing stormwater management in the Bay Area.

Between 2012 and 2016, RMC participants conducted monitoring at 354 creek sites in five Bay Area counties (San Mateo, Santa Clara, Alameda, Contra Costa, and Solano) to establish baseline conditions. Monitoring was conducted in compliance with the regional stormwater permit, issued by the State of California.

Comparing future data to the baseline will help assess improvements in the health of Bay Area creeks over time. Baseline monitoring was mostly focused on urban segments of creeks, with approximately 80% of sites located in urbanized areas. The RMC's monitoring helps answer the following questions about the health of Bay Area creeks:

1) What is the biological condition of creeks in the region?

2) What stressors are associated with degraded biological conditions?

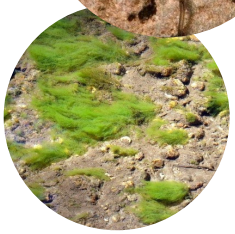
MONITORING METHODS

The RMC collected data on biological indicators, water chemistry, and physical habitat conditions in local creeks. Biological indicators are used to assess the overall biological condition and health of creeks in the region. Water quality and physical habitat data are collected concurrently with biological data and used to identify potential stressors that impact creek health.

Biological Indicators

Benthic (bottom-dwelling) Macroinvertebrates are organisms such as aquatic insects that live among the rocks and sediment in stream beds. Different types of macroinvertebrates respond differently to water chemistry and changes to physical habitat. The abundance and variety of macroinvertebrates in a creek can help paint a picture of its biological health.

Benthic Algae attach to submerged surfaces in creeks. Identifying the abundance and types of algae species help to inform our understanding of its biological health. Compared to macroinvertebrates, algae are more responsive to water chemistry, including excess nutrients.



Physical Habitat

Riparian habitats that support both terrestrial and in-stream wildlife are often degraded in urban areas by habitat alteration, upstream discharges, and hydrologic modification due to increased stormwater runoff and upstream reservoirs. Physical parameters such as the size and diversity of creek bed materials (e.g., gravels and sediments), the density of tree canopy and vegetation, and creek bank erosion are measured to identify whether degraded physical habitat may be impacting the biological health of local waterways.

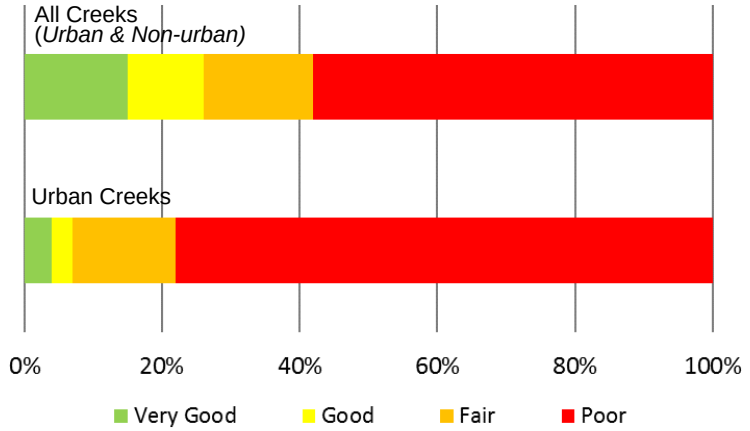
Water Quality

Water chemistry can adversely impact the biological condition of creeks. Adverse water quality conditions, such as low dissolved oxygen or elevated levels of pollutants, can cause lethal or sublethal effects to aquatic organisms. Water quality monitoring parameters measured by the RMC included dissolved oxygen, temperature, pH, conductivity, nutrients, pesticides, and toxicty (i.e., exposure of laboratory organisms to creek sediment or water).

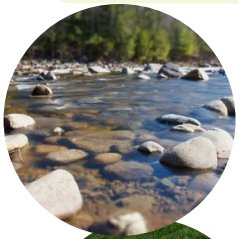
KEY FINDINGS

Biological Health of All Creeks and Urban Creek Segments

Based on Benthic Macroinvertebrates



Important Physical & Chemical Stressors



Impervious surfaces
(e.g., pavement and roofs) in the watershed

Alterations to natural riparian habitat
(e.g., erosion, bank hardening, channelization, and reduction in native trees)

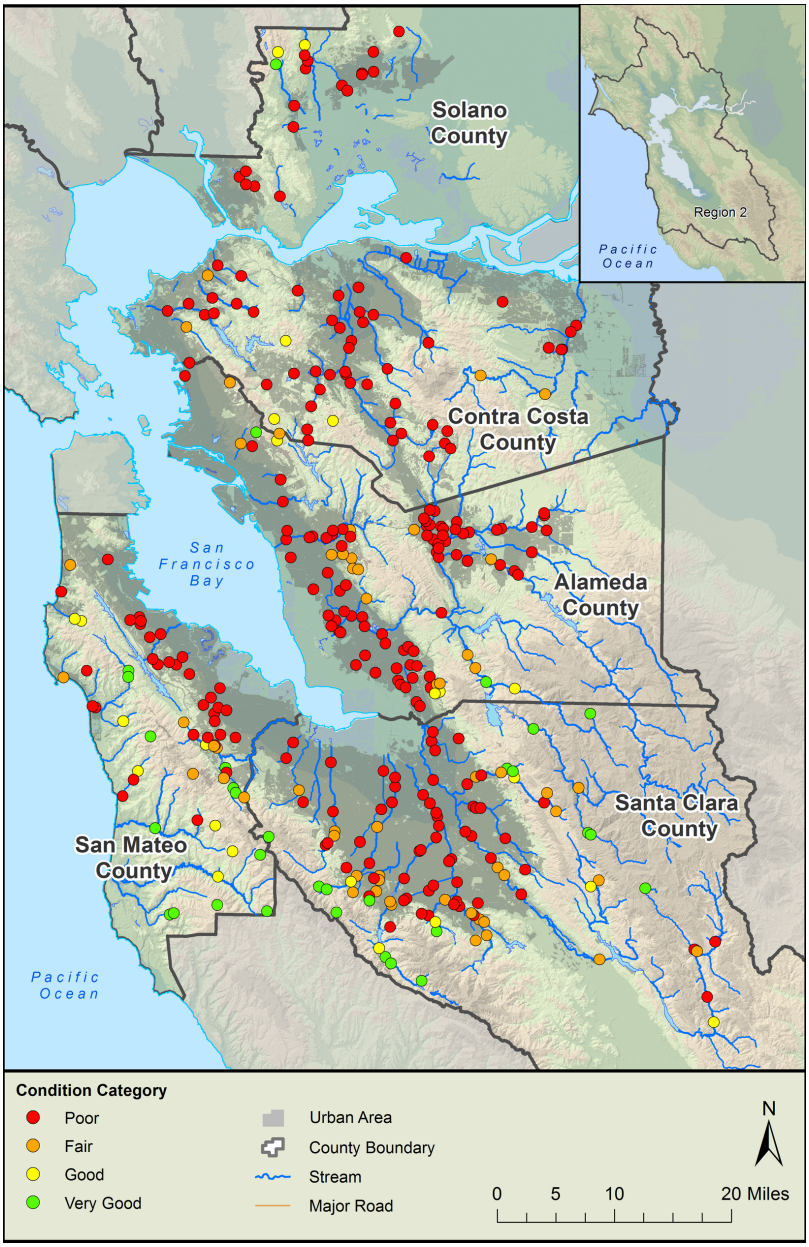
Increased levels of silt and sand
deposited in creeks

Excess nutrients (phosphorus)
from fertilizers and other sources

Toxicity from urban-use pesticides
observed in many urban segments of creeks

Biological Health of San Francisco Bay Area Creeks

Based on Benthic Macroinvertebrates (2012-2016)



Biological condition categories are based on California Stream Condition Index (CSCI) scores, which use benthic macroinvertebrate data. Marin, Sonoma and Napa counties have different monitoring requirements and are threfore not part of the RMC.

IMPROVING CREEK HEALTH THROUGH STORMWATER MANAGEMENT

Transforming Grey Infrastructure to Green

Historically, "grey" stormwater infrastructure (curb and gutters) was constructed to move rainwater from streets to creeks as quickly as possible without considering of the impacts of stormwater. "Green" (stormwater) Infrastructure (GI) has been shown to reduce pollutants in stormwater and minimize the impacts to the physical habitat of creeks caused by increased stormwater runoff from impervious surfaces.

GI uses vegetation, soils, and natural processes to manage stormwater runoff. Examples of GI include landscape-based "biotreatment" systems (see image above) that use engineered soils and plants, pervious paving systems, rainwater harvesting and other methods that capture and use stormwater as a resource. The implementation of GI in the Bay Area is expanding signficantly through the implementation of new plans developed cities and counties. GI is anticipated to improve health of Bay Area creeks and improve the water quality in SF Bay over time.

NEXT STEPS FOR BAY AREA CREEK MONITORING

Based on the results of the first five years of monitoring, the following next steps are planned by RMC participants:

- **Continue to monitor local creeks** in a regionally-coordinated manner
- **Adapt the RMC monitoring program to:**
  - **Evaluate trends in biological condition** to help assess and track improvements in creek health over time
  - **Monitor creek health and other parameters** to evaluate the effectiveness of stormwater management efforts (e.g., green infrastructure) in Bay Area watersheds, and
  - **Respond to evolving monitoring requirements** included in future iterations of the regional stormwater permit.

Bay Area Regional Monitoring Coalition Participants

Santa Clara Valley *Urban Runoff* Pollution Prevention Program

cleanwater PROGRAM Protecting Alameda County Creeks, Wetlands & the Bay

CONTRA COSTA CLEAN WATER PROGRAM

SAN MATEO COUNTYWIDE Water Pollution Prevention Program Clean Water. Healthy Community.

FAIRFIELD-SUISUN URBAN RUNOFF MANAGEMENT PROGRAM

City of VALLEJO

Vallejo Flood & Wastewater District

*Detailed results of the first five years of RMC monitoring can be found in the **RMC's Five-Year Bioassessment Report: Water Years 2012-2016**, which was funded by the Bay Area Stormwater Management Agencies Association (BASMAA). See www.basmaa.org to download the report.*

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