

**MONTEREY BAY SANCTUARY CITIZEN
WATERSHED MONITORING NETWORK**

SNAPSHOT DAY
2000



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Snapshot Day 2000 was organized by:

The **Monterey Bay National Marine Sanctuary (MBNMS) Water Quality Protection Program** works to protect the watersheds of the largest of our nation's 13 marine sanctuaries. (831) 647-4201. www.bonita.mbnms.nos.noaa.gov.

The **Coastal Watershed Council** is a public education non-profit advocating the preservation and protection of coastal watersheds through establishment of community-based watershed stewardship programs. CWC works in partnerships with schools, community organizations, and local governments. (831) 426-9012. www.coastal-watershed.org.

The **Center for Marine Conservation** is the largest national nonprofit organization committed solely to protecting ocean environments and conserving the global abundance and diversity of marine life through science-based advocacy, research, and public education, as well as informed citizen participation. Headquartered in Washington, DC, CMC has regional offices in California, Florida, and Virginia and field offices in Alaska, Maine, Santa Barbara and Santa Cruz, CA, and the Florida Keys. (831) 425-1363. www.cmc-ocean.org.

Special thanks to the California Coastal Commission for assistance with data analysis and to CMC intern Nick Kidd and Coastal Commission intern Daniel Apt for mapping and data input.

Participating Agencies and Organizations

Big Creek Reserve
California Coastal Commission
California State Parks
California State University, Monterey Bay (CSUMB)
Center for Marine Conservation
City of Monterey
Coastal Watershed Council
Earth Systems Science and Policy Program (CSUMB)
Elkhorn Slough National Estuarine Research Reserve
Greenspace
United States Environmental Protection Agency
Land Conservancy of San Luis Obispo County
Monterey Bay Aquarium
Monterey Bay National Marine Sanctuary
Monterey Regional Water Pollution Control Agency
Central Coast Regional Water Quality Control Board
San Gregorio Environmental Resource Center
Santa Cruz County Environmental Health
State Water Resources Board
Surfrider Foundation
Watershed Institute, CSUMB

EXECUTIVE SUMMARY

On April 22, 2000, the Monterey Bay National Marine Sanctuary celebrated the 30th anniversary of Earth Day with “Snapshot Day 2000” - a one-day, Sanctuary-wide volunteer water quality monitoring event.

On Snapshot Day, 120 trained volunteers waded into creeks, streams, rivers, sloughs, estuaries, and beaches throughout San Mateo, Santa Cruz, Monterey, and San Luis Obispo counties to test water quality and take a “snapshot” of the condition of the Sanctuary’s watersheds.

Salinas River, Monterey County



Volunteers tested 122 separate locations on 89 waterways for water temperature, dissolved oxygen (DO), conductivity, turbidity, and acidity/alkalinity (pH). Selected sites were also tested for nitrates, phosphates, and fecal coliform. These water quality “parameters” help to identify the general health of a body of water, potential threats to fish and other aquatic organisms, whether the water is safe for human contact, and potential sources of water quality problems.

Snapshot Day 2000 was designed to increase public awareness of water quality issues affecting Sanctuary watersheds and to emphasize the importance of water quality monitoring and the key role volunteer monitors play in our area. The event was a huge success generating a tremendous response from volunteers, good media coverage, and strong support from local businesses.

The data collected on Snapshot Day 2000 reinforced previous findings that some of the Sanctuary’s watersheds face water quality problems. Lab results for several creeks in San Mateo County showed high fecal



According to volunteer Liese Shultz, Soledad Creek doesn't pass the sniff test.

coliform counts, suggesting waters unsafe for swimming. Many rivers, creeks and sloughs in Monterey County had high nutrient levels in both urban and rural areas. Some of these waterbodies may not have enough dissolved oxygen to support steelhead trout migration.

Coastal Commission staffer, Ross Clark with volunteers at Snapshot Day training.



The Snapshot Day 2000 results remind us that watersheds with water quality problems may require additional education and watershed management efforts to improve conditions. Where water quality is generally good, efforts should focus on insuring that clean waters stay clean.



Monterey County Snapshot Day volunteers at the Watershed Institute at CSUMB.

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WATER QUALITY MONITORING

Why Monitor Water Quality?

Water quality monitoring is a critical component of effective watershed stewardship, education, and management. Water quality monitoring can: (1) provide an overall view of the health of an individual waterbody or a watershed; (2) identify water quality problems and potential sources of pollution; (3) help prioritize water quality management decisions; (4) serve as a baseline for comparing future data and identifying trends over time; and (5) educate residents and help them to become better stewards of their watershed.



MBNMS staffer Susan Pufahl welcomes volunteers to Snapshot Day 2000.

The Monterey Bay National Marine Sanctuary Water Quality Protection Program

The Monterey Bay National Marine Sanctuary (MBNMS) is the largest of the nation's 13 marine sanctuaries, stretching from the Marin headlands in the north to Cambria in the south. The MBNMS encompasses more than 5300 square miles of water including many diverse ecosystems and nearly 500 different species of fish, seabirds, and marine mammals. Eleven major watershed areas, including over 7000 square miles of land, drain into the MBNMS.

Land use in the Sanctuary's watersheds includes urban and suburban development, extensive areas of irrigated croplands, managed timber lands, grazing lands, and other agricultural activities. Extensive public lands with diverse multiple uses are also present, including lands under the management of the federal, state, and local governments. As water passes over any of

the lands in the watershed, it can pick up a variety of potential pollutants such as sediments, oils and grease, nutrients, pesticides, and pathogens which can be transported to the region's rivers, wetlands, harbors, and nearshore waters.

Recognizing that human activities on land can affect Sanctuary waters and resources, the Monterey Bay National Marine Sanctuary developed a Water Quality Protection Program (WQPP) pursuant to a formal agreement made among federal, state and local agencies when the Sanctuary was founded. The WQPP is a partnership effort to enhance and protect the physical, chemical, and biological conditions in the Sanctuary and its adjacent watersheds. The ability to monitor water quality conditions comprehensively and accurately over time is critical to making effective management decisions. Accordingly, one goal of the WQPP is to provide comprehensive information regarding existing water quality conditions, long-term trends, and the success of pollution management efforts.

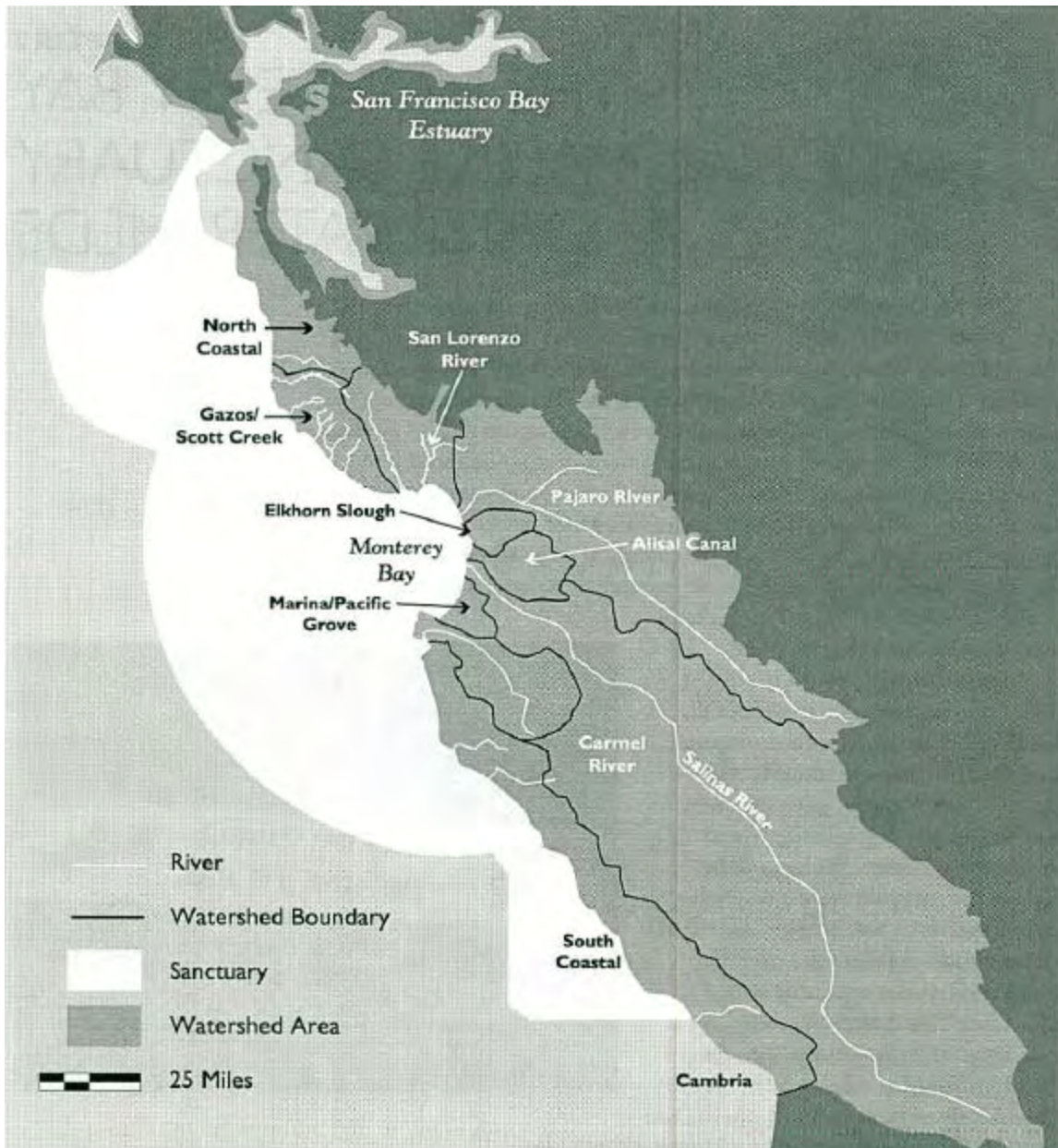
The Monterey Bay Sanctuary Citizen Watershed Monitoring Network

Faced with budget and staffing limitations, government agencies monitor less than 10% of California's rivers and streams, and funding for water quality testing has decreased dramatically over the past decade. Responding to this problem, citizen volunteers have begun filling the gaps in water quality data by testing local watersheds themselves.

According to a March 1999 survey, over 20 citizen groups actively monitor the watersheds of the MBNMS. Recognizing both the value and the increased potential for citizen watershed monitoring in the Sanctuary, the Coastal Watershed Council, the Center for Marine Conservation, and the Monterey Bay National Marine Sanctuary, founded the Monterey Bay Sanctuary Citizen Watershed Monitoring Network.

The overall goal of the Monterey Bay Sanctuary Citizen Watershed Monitoring Network is to help create integrated, long-term, volunteer-based water quality and watershed monitoring within the Monterey Bay National Marine Sanctuary and its watersheds and to make these citizen monitoring programs an integral component of watershed stewardship and Sanctuary education and management.

WATERSHEDS OF THE MONTEREY BAY SANCTUARY



The sanctuary and its eleven major watersheds

Snapshot Day 2000

Snapshot Day 2000 was sponsored by the Monterey Bay Sanctuary Citizen Watershed Monitoring Network. Although similar large-scale water quality monitoring events have been held in other areas of the nation, Snapshot Day 2000 was the single largest water quality monitoring event in California history. Testing occurred at 122 different sites on 89 waterbodies, spanning nearly 300 miles of California's coastline, including four counties, and ten of the Sanctuary's eleven major watersheds.

MONITORING RESULTS

Methods and Quality Control

Snapshot Day 2000 volunteers tested a range of physical and chemical parameters designed to generate baseline data. The parameters were selected based on their ability to serve as indicators of general waterbody health as well as ease of testing in the field with available equipment. All Snapshot Day 2000 volunteers were equipped with thermometers, dissolved oxygen meters, pH strips, and conductivity meters. Turbidity was assessed visually. All nitrate (converted to NO₃), phosphate (as PO₄), and fecal coliform analyses were performed in laboratories.

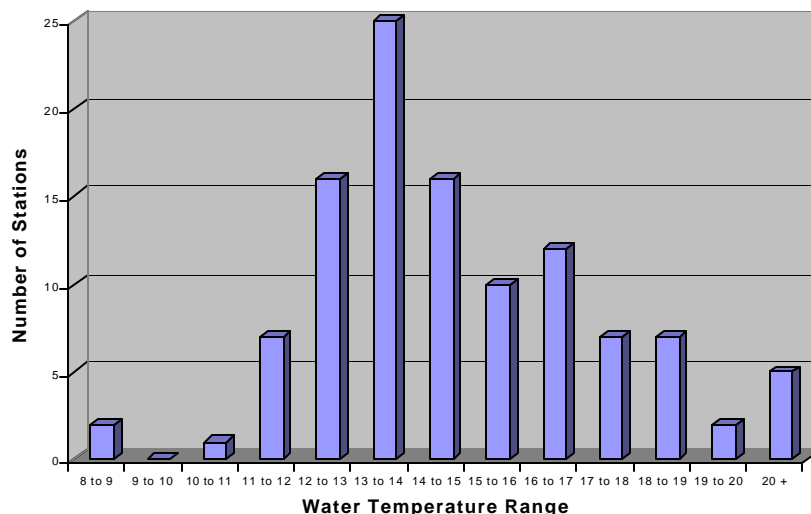
Quality assurance/quality control (QA/QC) was accomplished through a pre-monitoring training and equipment calibration session one week prior to Snapshot Day. Four regional training sessions occurred throughout the Monterey Bay Sanctuary on April 15, 2000 to familiarize all volunteer group leaders and coordinators with monitoring protocols, sampling equipment, datasheets and safety measures. State Water Resources Control Board staff, Revital Katznelson, provided information on technical oversight, QA/QC techniques and data collection strategies.

Action Levels

To determine whether test results indicated a potential water quality problem, Snapshot Day 2000 results were compared with action levels for each parameter (temperature, DO, pH, nutrients, and fecal coliform) that were established for the Central Coast Ambient Monitoring Program (CCAMP) by the Central Coast Regional Water Quality Control Board. The CCAMP “action levels” are intended to identify water quality conditions that warrant consideration of corrective measures, but do not necessarily imply violations of water quality regulations.

Water Temperature

Water temperature is an important environmental factor for fish and other aquatic life, as many species need specific temperatures to survive and reproduce. Temperature also



affects the concentration of dissolved oxygen in the water column and the rate of photosynthesis for aquatic plants. Human activities such as water diversions that decrease flows or removal of streamside vegetation that shades the water, can lead to elevated water temperatures.

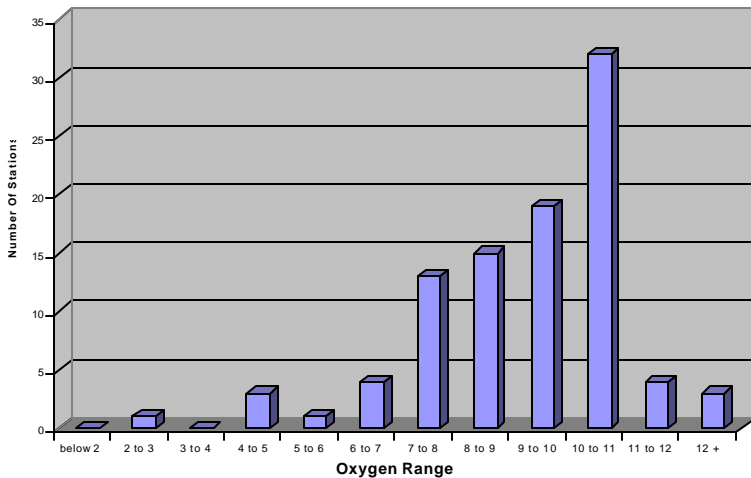
It is important to keep in mind that Snapshot Day 2000 took place on an overcast day in April and much of the data was collected in the morning hours, therefore water temperatures results likely do not reflect the maximum daily or annual temperature for the waterbody

The CCAMP action level for water temperature is 22 degrees Celsius. Temperatures above 22 degrees can be stressful for steelhead trout. The mean temperature for sites tested was 14.6 degrees Celsius. Five sites, all located in Monterey County, had water temperatures above 20 degrees. Two sites tested at or above the CCAMP action level for water temperature: Alisal Slough at 22 degrees and Moro Cojo Slough at 23.2 degrees.



Measuring the temperature of Soquel Creek, Santa Cruz County.

Oxygen Concentrations Among Stations



Dissolved Oxygen.

All aquatic animals require dissolved oxygen to breathe. The concentration of dissolved oxygen in the water column affects a wide range of behavior such as feeding, spawning, and incubation. Nutrients found in sewage, fertilizers, and manure provides a food source for algae and aquatic weeds, causing blooms and increased vegetation. This in turn depletes the amount of oxygen available in the water column.

The minimum CCAMP action level for dissolved oxygen is 7 milligrams/liter, based on the amount of dissolved oxygen needed by migrating steelhead trout. The mean dissolved oxygen level across testing sites was 9.1 mg/l. Sites with dissolved oxygen levels lower than the CCAMP action level included: Elkhorn Slough, Tembladero Slough, Alisal Slough, the Salinas River, Atascadero Creek, Rinconada Creek, Santa Margarita Creek and Trout Creek.

Dissolved oxygen levels are closely related to water temperature, dissolved oxygen levels decrease as water temperature increases. Accordingly, test results from a monitoring event on a cool and cloudy morning in April are unlikely to reflect yearly minimums.

Conductivity

Conductivity is a measure of the ability of water to conduct electrical current. Measuring conductivity gives an indication of the amount of total solids (such as salts, mineral, acids, and metals) dissolved in the water. Conductivity varies with water source and geographic

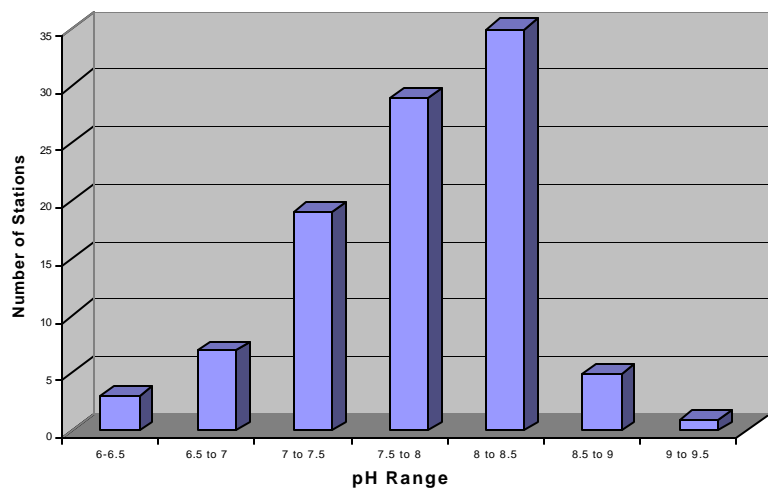
region; there is no action level for conductivity. However, once a baseline of conductivity values is established, variations may signal a change in the waterbody's composition. For example, a decline in conductivity may be caused by rainwater and an increase in conductivity may signal sources of pollution such as agricultural runoff or municipal wastewater. Snapshot Day volunteers measured conductivity to provide a baseline for comparison.

Alkalinity/Acidity (pH)

pH is a measure of the percent of hydrogen ions in a water column. Water with a pH value of 7 is neutral, above 9 is alkaline and below 5 is acidic.

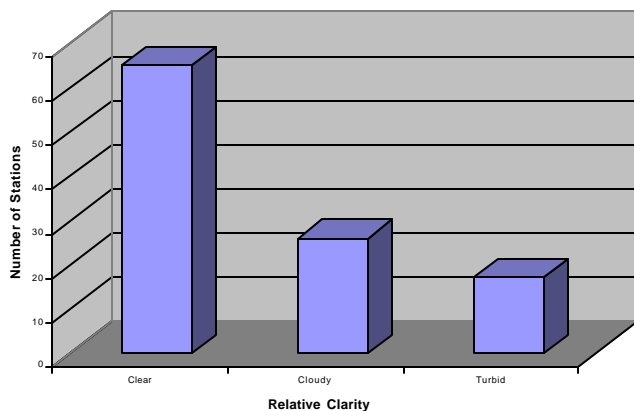
The CCAMP Action levels for pH are levels either above 8.5 or below 7.0. The mean pH level for all sites tested was 7.6. Sites testing above the CCAMP action level included: Corcoran lagoon in Santa Cruz County and Moro Cojo Slough and Willow Creek in Monterey County. Sites testing below the CCAMP action level for pH included: Arana and Soquel creeks in Santa Cruz County and Gabilan Creek and several sites on the Carmel River in Monterey County.

pH Range Among Stations



Volunteer testing water quality at Alisal Slough, Monterey County.

Water Clarity Among Stations



Turbidity

Turbidity is a measure of the amount of suspended particles in water and natural turbidity levels vary from stream to stream. Excessive turbidity may indicate erosion, nutrient loading, or artificial algae growth. Snapshot day volunteers assessed area waterbodies for turbidity through a visual analysis, classifying water clarity at a given site as: clear, cloudy, or turbid. Less than 15% of the sites tested were classified as turbid.

Nutrients

Nitrates and phosphates are nutrients that occur naturally in waterbodies and promote aquatic plant growth. Excessive nutrient levels can lead to algal blooms and extensive aquatic weed growth that in turn depletes the amount of oxygen available in the water column. Runoff containing fertilizers, manure, industrial waste, or sewage, contribute to elevated nutrient levels. Not all sites were tested for nutrients; 51 sites were tested for nitrates and 45 sites were tested for phosphates.

Four sites on Alisal and Tembladero sloughs tested above the state safe drinking water standard for nitrate of 45 mg/l. Six additional sites exceeded the CCAMP Action Level for nitrate of 10 mg/l. Six sites tested above the CCAMP Action level for phosphate, tentatively set at 0.5 mg/l: Lidell Creek in Santa Cruz, two sites each on Tembladero and Alisal Sloughs, and a creek in Pacific Grove at 13th and Central.

Fecal Coliform

Fecal coliform bacteria originate from the feces of warm-blooded animals and are an indicator for sewage contamination (see dissolved oxygen above) as well as feces-borne organisms that can cause diseases such as hepatitis A, bacterial

meningitis, and encephalitis. Excessive fecal coliform counts can thus indicate potential problems for both aquatic and human health.

Under California law, fecal coliform bacteria counts should not exceed 200 per 100 milliliters in swimming areas. As with nutrients, not all Snapshot Day 2000 sites were tested for fecal coliform. Of 57 sites tested for fecal coliform, 18 had counts above what is considered safe for bodily contact. The fecal coliform bacteria count at a site on Pilarcitos Creek in San Mateo County was nearly 60 times the level considered safe for swimming.

Photo Documentation

Taking photos of monitoring sites provides information about the type and extent of riparian vegetation, water level, and visible sources of pollution such as trash in the stream. Photos can also help future volunteers locate a particular site for testing. All Snapshot Day 2000 volunteers photographed the conditions at their test sites. Many of these photos are included in this report.

Conclusion

Data from one day of monitoring is not enough to assess the water quality of a sample site, a stream, or a watershed. Meaningful interpretation of data requires years of regular sampling and must take into account variables such as time of day, seasonal changes, and other factors. However, it is clear from existing monitoring efforts throughout the region is that urban runoff, agricultural runoff, wetland and riparian degradation and point source pollution are all impacting the Sanctuary's watersheds. It is equally clear that citizen volunteers will play an increasing role in tracking pollution and helping to ensure that water quality problems throughout the MBNMS are addressed.



Volunteers on the Carmel River, Monterey County.

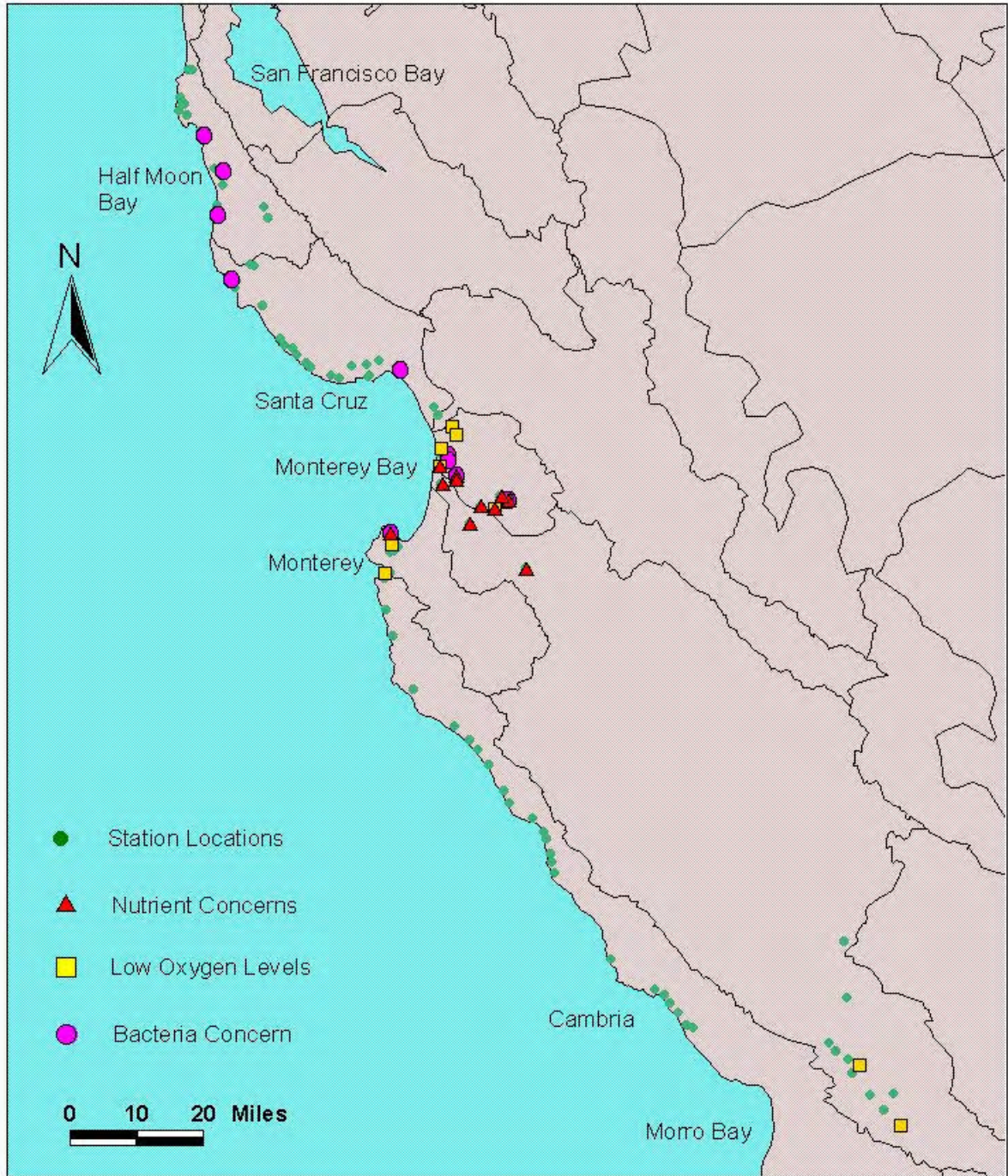


Fig. 1. Snapshot Day 2000 Station Locations. Locations of all Snapshot Day stations. Stations are depicted as a green dot (?) unless one or more water quality concerns were identified. Concerns are characterized by water quality values that exceed Nutrient (?) or Bacteria (?) screening levels (CCAMP action value) used by the Regional Water Quality Control Board or oxygen (⚡) concentrations below 7 mg/l.



Fig. 2. Snapshot Day Stations of Concern. Map of 5 Stations (★) where at least two of three water quality screening values were exceeded. Four of the Stations of Concern were found along the Tembladero Slough drainage.

WHERE DO WE GO FROM HERE?

The Future of the Citizen Monitoring Network

With funding from the Central Coast Regional Water Quality Control Board, the City of Pacific Grove, the MBNMS, and the California Coastal Commission, the Monterey Bay National Marine Sanctuary recently hired a Network Coordinator to manage citizen monitoring activities throughout the Sanctuary's watersheds.

With the assistance of the new Coordinator, the Network continues to work towards its goal of comprehensive monitoring by creating and supporting integrated, long-term, volunteer-based water quality and watershed monitoring programs within the Sanctuary and its adjacent watersheds.



Network Coordinator Bridget Hoover with Bonnie Van Hise.

Participants in the Network are working to refine citizen monitoring methods throughout the Monterey Bay Sanctuary watersheds, and to ensure a standard level of quality for regional citizen monitoring results. As it continues to develop and grow, the Network will provide a regional template for other regions throughout coastal California.

The Network Coordinator is involved in a variety of ongoing activities including: setting up a Network Listserve:

(mbnms_volmonet@ragged.mbnms.nos.noaa.gov), coordinating an annual First Flush monitoring event (which took place on October 11, 2000), creating a document which will establish criteria for categorizing data based on its quality and reliability,



establishing a Network website, and finally, preparing for the Second Annual Snapshot Day to take place on Earth Day 2001.

The Future of Snapshot Day

It is our hope that Snapshot Day will continue as an annual event, inspiring area citizens become more involved both in water quality monitoring and in watershed protection. Over time, Snapshot Day may provide useful information on water quality trends throughout the Sanctuary's watersheds. Snapshot Day data may also help agencies and decision-makers to identify water quality problems and

encourage them to focus resources and expertise on reducing sources of pollution in the Sanctuary's watersheds.

Ultimately, Snapshot Day and the Monterey Bay Sanctuary Citizen Watershed Monitoring Network share one goal: protection and enhancement of water quality throughout the Sanctuary and its watersheds.

Thank You to our Volunteers!

Snapshot Day was truly a community effort. Volunteers ranged from school children to County Supervisors, and included government agencies, community organizations, and concerned citizens. Local, State and Federal agencies loaned water quality monitoring equipment to the effort, and area businesses donated products and services from bagels to film developing.



Volunteer Mark Sullivan demonstrating the fun side of watershed monitoring. Soquel Creek, Santa Cruz County.

APPENDIX A

SNAPSHOT DAY 2000 VOLUNTEERS

Marin Aldrich, Half Moon Bay
Gary Allen, La Honda
Jeff Almquist, Santa Cruz
Adam Anderson, Seaside
Jean Andrews, Santa Cruz
Sue Angulo, Pacific Grove
Bill Arkfield, Atascadero
Gloria Avalos, Salinas
Cathie Bates, Cambria
Chris Bates, Cambria
Dianne Begbie, Monterey
Ralph Bermudez, Salinas
Paula Berthoin, Carmel
Isaias Betancourt, Salinas
Cristina Betancourt, Salinas
Shelly Bibbins, Marina
Christina Bibbins, Marina
Kim Bracchi, Santa Cruz
Claudia Bravo, Salinas
Jim Brownell, Cambria
Taylor Brutzman, Seaside
Kevin Burke, Greenfield
Bree Candiforo, Santa Cruz
Jaymee Castillo, Seaside
Mike Castleton, Marina
George Cattermole, San Gregorio
Jo Chamberland, Half Moon Bay
Araceli Ciscernos, Marina
Ross Clark, Santa Cruz
Bobby Jo Close, Atascadero
Elaine Cook, Aptos
John Cook, Aptos
Mary Cunov, Carmel Valley
Toni Danzig, Pescadero
Cathy DeCecco, Carmel
Tom Deetz, Watsonville
Martin Demare, Santa Cruz
Jen Diaz, Seaside
Angela Dickeson, Salinas
Johnny Estrada, Gonzales
Bronwyn Feikert, Marina

Maria Ferdin, Marina
DJ Funk, Paso Robles
Josh Gardiner, Seaside
Richard Gordon, Redwood City
Bob Harper, Half Moon Bay
John Haskins, Watsonville
Rick Hawley, Cambria
Walter Health, San Luis Obispo
C. Hood, Davis
Bridget Hoover, Marina
Michele Hoover, Salinas
Renee Hoyos, Davis
Annette Jackson, Davenport
Janice Jones, Marina
Craig Jung
Revital Katznelson, Oakland
Rosemary Kenner, Pacific Grove
Chuck Kozak, Montara
Merlin Larson, Burlingame
Chris Larson, San Gregorio
Laura Lee Lienk, Seaside
Mark Liu, Seaside
Katie Lovesy, Seaside
Tricia Lowe, Monterey
Tally Manouki, Marina
Vivian Matuk, San Francisco
Carl May, Montara
Rohana Mayer, Big Sur
Mamie Meyer, Seaside
Ray Middleton, Seaside
Kelly Miller, Monterey
Liz Mondragon, Seaside
Tricia Mynster, Marina
Maria Navarro, Salinas
Diann Neenan, Santa Cruz
Allison Neuman, Pacific Grove
David Norris, Carmel Valley
Micheal O'Neill, Spreckels
Kimberly Paglis, Watsonville
Christin Pastor

Jim Patterson, Atascadero
Robert Peck, Seaside

Roger Perkins, Fremont
Steve Peters, Santa Cruz
Anneliese Piazza, Pacific Grove
Jon Popper, Marina
Claire Porter, Seaside
Kathy Powers, Watsonville
Clark Reynolds, Ben Lomond
Richard Rollins, Menlo Park
Roxanne Rothafel, Santa Cruz
Jim Rourke, Pescadero
Linda Sheehan, Fremont
Liese Shultz, Seaside
Michelle Scott, Santa Cruz
Brad Seek, Cambria
Wendi Shafir, La Honda
Ben Sherman, Seaside
Maris Sidenstecker, Seaside
John Smiley, Big Sur
Scott Sokol, San Gregorio
Michael Stevenson, Salinas
Hope Stragnell, Atascadero
Keith Sugar, Santa Cruz
Kristen Sullivan, Santa Cruz
Mark Sullivan, Santa Cruz
Rob Trask, Cambria
Bonnie Hise, Pacific Grove
Barbara Vanderwerf, El Granada
Bill Vanderwerf, El Granada
Rachel Vizcarra, Seaside
Ruth Vreeland, Monterey
Susan Waldron, Ben Lomond
Catherine Walsh, Pescadero
Larry Walsh, Pescadero
Kelsey Walsh, Pescadero
Mariah Walsh, Pescadero
Shannon Walsh, Pescadero
Karen Worcester, San Luis Obispo
Laura Young, La Honda
Roger Zachary, Atascadero