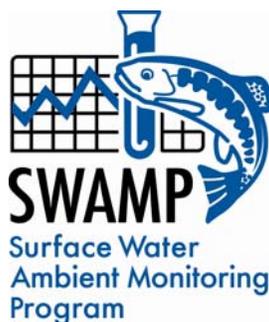


Surface Water Ambient Monitoring Program (SWAMP) Monitoring Plan for Region 9

Fiscal Year 2006/2007



February 7, 2007
Revised May 21, 2007

Prepared by:
Lilian Busse, Environmental Scientist
Southern Watershed Protection Unit

And

Lesley Dobalian, Environmental Scientist, SWAMP Coordinator
Water Quality Standards Unit

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

9174 Sky Park Court, Suite 100, San Diego, California 92123-4340
Phone (858) 467-2953 • Fax (858) 571-6972

<http://www.waterboards.ca.gov/sandiego/>.

Table of Contents

1	Summary Sheet.....	3
2	Background.....	4
2.1	Introduction.....	4
2.2	Past SWAMP Monitoring	4
2.3	Other Past Bioassessment Monitoring.....	5
2.4	Proposed SWAMP Bioassessment Sampling for 2007 and 2008.....	6
2.5	Objectives and Monitoring Questions	7
3	Study Methods.....	8
3.1	Monitoring Design.....	8
3.1.1	Site Selection	8
3.1.2	Site Reconnaissance.....	9
3.1.3	Field location of sample collection sites.....	9
3.2	Selected parameters	9
3.2.1	Conventional Water Chemistry	10
3.2.2	Bioassessment and Physical Habitat Assessment	10
3.2.3	Sampling and Lab Analyses	11
3.3	Data.....	11
3.3.1	Data Quality Evaluation and Data Reporting	11
3.3.2	Data Analysis	12
3.3.3	Data Management.....	12
4	Collaborations.....	12
5	Deliverable Products/Reporting	12
6	Project Schedule.....	13
7	References	13

1 Summary Sheet

Beneficial Uses

This proposed monitoring plan for the Surface Water Ambient Monitoring Program (SWAMP) addresses the aquatic life beneficial use for wadeable streams in the San Diego Region.

Assessment Questions

The following assessment questions will be addressed by the California Regional Water Quality Control Board, San Diego Region (Regional Board) for the proposed monitoring plan:

What is the status of the aquatic life beneficial use for wadeable streams in the San Diego Region?

We will use bioassessment to calculate a benthic macroinvertebrate index of biotic integrity (IBI). The IBI is a tool to measure the health of the aquatic life beneficial use for wadeable streams (Ode and Rehn 2000). Locations with IBI scores of poor or very poor are considered biologically impacted, and the aquatic life beneficial use is not protected at those locations. Locations with IBI scores of fair or good are less likely to be impacted and the aquatic life beneficial use is assumed to be protected.

- a. What are the locations of biologically impacted water bodies? What are the conditions at the impacted sites?
- b. What are the locations of Reference sites? What are the conditions at the Reference sites?
- c. When comparing present bioassessment data to past bioassessment data, are the biological conditions increasing or declining?

Link to Statewide Monitoring Framework

The bioassessment conducted under this monitoring plan for streams in the San Diego watersheds will support the statewide aquatic life use assessment study on perennial streams. The statewide assessment will be based primarily on a probabilistic design, but targeted sites will also be included in the assessment. Results from this monitoring plan will deliver data on targeted sites in the San Diego Region to complement the statewide assessment.

Clean Water Act Sections 305(b)/303(d)

The data produced by this monitoring plan will be used to assist in future assessments required under Clean Water Act (CWA) sections 305(b) and 303(d).

2 Background

2.1 *Introduction*

Past data collected in the San Diego Region by the Regional Board and other agencies indicate adverse impacts to the aquatic life beneficial use for wadeable streams. Under this monitoring plan for Fiscal Year 2006-2007 (with monitoring occurring over the 2007 through 2008 calendar year), we propose to collect data in the San Diego Region from areas sampled under Surface Water Ambient Monitoring Program (SWAMP) and other programs in the past that were determined to be biologically impacted, based on IBI scores. We will compare the new data to past data to detect possible trends or changes to the aquatic life beneficial use. We will also sample at new sites to identify other potential areas not meeting the aquatic life beneficial use. In addition, we will sample Reference (or minimally impacted) sites, since very few Reference sites were sampled in the past, and not much is known about Reference conditions in the San Diego Region.

2.2 *Past SWAMP Monitoring*

There are eleven hydrologic units in the San Diego Region. The Regional Board focused SWAMP monitoring efforts on two hydrologic units in each of four fiscal years and three hydrologic units in the fifth fiscal year. This approach ensured that SWAMP monitoring was conducted in each hydrologic unit in the Region over a five-year period. The five-year cycle was completed in the Fiscal Year 2004-05. Given the anticipated limited funding allocations for the San Diego Region, a probability-based, regional approach for selecting monitoring sites was not considered feasible. Consequently, the Regional Board planned a targeted, site-specific approach with “pre-selected” monitoring sites. The following measurements were taken at most of the sites: conventional water chemistry, water chemistry for heavy metals and pesticides, sediment and water toxicity, fish tissue (not all sites), benthic macroinvertebrates (not all sites), and physical habitat assessment (not all sites).

Table 1 – San Diego Region SWAMP five-year rotation study

HU #	Hydrologic Unit Name	Year 1	Year 2	Year 3	Year 4	Year 5
901	San Juan	X	9 sites	X	X	X
902	Santa Margarita	X	X	5 sites	X	X
903	San Luis Rey	X	X	X	6 sites	X
904	Carlsbad	9 sites	X	X	X	X
905	San Dieguito	X	X	5 sites	X	X
906	Penasquitos	6 sites	X	X	X	X
907	San Diego	X	X	X	9 sites	X
908	Pueblo San Diego	X	X	X	X	2 sites
909	Sweetwater	X	X	X	X	3 sites
910	Otay	X	2 sites	X	X	X
911	Tijuana	X	X	X	X	4 sites
	Totals	15	11	10	15	9

Note: Number of sites represents actual sites sampled; X = not sampled that year.

The monitoring design and results from this five-year rotation study will be summarized in watershed reports, prepared by the Southern California Coastal Water Research Project (SCCWRP), under contract with the Regional Board. During the five-year rotation study, bioassessment samples were only taken at 13 sites between 2003 and 2005, in the following watersheds: (1) Santa Margarita, (2) San Luis Rey, (3) San Dieguito, and (4) San Diego. Preliminary data analysis showed that out of 13 sites, only 16% (2 sites) were in good or fair conditions, and 84% of the sites (11 sites) indicated poor or very poor conditions.

2.3 Other Past Bioassessment Monitoring

Between 1996 and 2006, bioassessment samples were taken in the San Diego Region under various programs and by different organizations, including the San Diego Stream Team and the Regional Board. Data from these sampling events were collected in all 11 hydrologic units for a total of 467 samples (sampling occurred during multiple years, various sites were sampled more than once). The results show that 74% of the samples (or 344 samples) indicated poor or very poor conditions, and 26% of the samples (or 123 samples) were in good or fair conditions.

Since 2001, the National Pollutant Discharge Elimination System (NPDES) program in the San Diego Region also required sampling of benthic macroinvertebrates at 23 bioassessment stations. Data from 2005 through 2006 showed that 87% of the sites are in poor and very poor conditions, based on IBI scores. Only the three Reference sites sampled under NPDES program indicate fair or good conditions.

2.4 Proposed SWAMP Bioassessment Sampling for 2007 and 2008

Based on the SWAMP bioassessment data, and the past bioassessment data from various studies over 1996-2006, the aquatic life beneficial use may not be protected in wadeable streams in the San Diego Region. Under the NPDES program, bioassessment samples are taken mostly in highly urbanized sites in the San Diego Region. During the proposed SWAMP sampling in 2007 and 2008, we will target biologically impacted sites that are not sampled under the NPDES program but were sampled before under various Regional Board programs. By comparing the new data to old data from these sites, trends in biological conditions can be evaluated. We will also sample sites that were not sampled before to identify additional biological impacts in wadeable streams in the San Diego Region.

In addition, we will sample Reference sites (minimally impacted sites) during the proposed study. It is important to collect data at Reference sites to establish baseline conditions for comparison against other sites either known or suspected of being impacted.

In summary, bioassessment is an important tool to assess the quality of stream conditions for the following reasons:

- (1) Bioassessment provides data to determine the status of the aquatic life beneficial use;
- (2) Bioassessment integrates variation over time and constituents;
- (3) Bioassessment will provide data used to evaluate the ecological health of streams; and
- (4) Past bioassessment data are available in the San Diego Region.

Results of bioassessment can be used to determine if a waterbody is biologically impacted. In most cases, the cause(s) of the impact is unknown. Before appropriate management action can be taken, the stressor of the biological impact must be determined. Potential stressors may be identified through additional field sampling and measurements, such as for water chemistry and physical habitat assessment. Therefore, conventional water chemistry and physical habitat assessment will be measured at all sites under this project. We are planning to use the EPA's stressor identification tool CADDIS (Causal Analysis/Diagnosis Decision Information System) to try to determine the cause of the degraded biological communities.

The bioassessment conducted under this monitoring plan for streams in the San Diego watersheds will support the statewide study on aquatic life use assessment for perennial streams. In addition, this monitoring will enhance a bioassessment study coordinated by the Southern California Stormwater Monitoring Coalition within southern California. Both of these studies will be based primarily on a probabilistic design, but targeted sites will also be included in the design. Results from this study will deliver data on targeted sites in the San Diego Region.

The following audiences will be interested in the results of this monitoring: general public, stakeholder groups of the San Diego watersheds, the Southern California Stormwater Monitoring Coalition, and the SWAMP program of the State Water Resource Control Board.

Results from this study will provide evidence to identify which areas show biological impacts. We will also try to identify potential stressors at the sites. This type of information will assist managers in planning management strategies to address impacted/affected area.

2.5 Objectives and Monitoring Questions

The following objectives have been defined for the proposed study:

- (1) To address the status of aquatic life beneficial use for wadeable streams in the San Diego region;
- (2) To compare two new bioassessment sampling methods, and to recommend one method for future monitoring;
- (3) To recommend management strategies based on the bioassessment sampling results and potential stressor identification;
- (4) To support the SWAMP state-wide study (“Perennial Streams Aquatic Life Use Assessment”) on aquatic life beneficial use by adding additional sites in the San Diego Region;
- (5) To compare bioassessment data from past studies to data from this study and detect trends in biological impacts over time.

The purpose of this study is to collect data to answer the following monitoring questions:

What is the status of the aquatic life beneficial use for wadeable streams in the San Diego Region?

- a. What are the locations of biologically impacted water bodies? What are the conditions at the impacted sites?
- b. What are the locations of Reference sites? What are the conditions at the Reference sites?
- c. When comparing data to past bioassessment data, are the number of sites with biological impacts increasing or declining?

3 Study Methods

3.1 *Monitoring Design*

3.1.1 Site Selection

Due to constraints in funding, monitoring sites will be selected for the SWAMP monitoring for Fiscal Year 2006-07 based on a targeted approach. Sites will be selected from the following hydrologic units: (1) 901 San Juan; (2) 902 Santa Margarita; (3) 903 San Luis Rey; (4) 904 Carlsbad; (5) San Dieguito; (6) 906 Penasquitos; (7) 907 San Diego; (8) 908 Pueblo; (9) 909 Sweetwater; (10) 910 Otay; and (11) 911 Tijuana. For the proposed study, we will include both new sites as well as sites that were sampled in the past.

We will sample biologically impacted sites and Reference sites for the proposed study. We plan to sample around 40 sites: approximately half of the sites will be biologically impacted sites, and the other half of the sites will be Reference sites. New site selection will combine the use of geographic information system data (GIS) with ground-truthing.

Sites selection will be based on the following criteria:

- (1) Sites will be located in main stem rivers and streams and major tributaries, as follows:
 - a. Main stems rivers and streams, just above tidal influence;
 - b. Main stem rivers and streams, just above the confluence with major tributaries; and
 - c. Major tributaries, just above the confluence with the main stem rivers and streams;
- (2) Sites will be selected based on the presence of flow; and
- (3) At sites previously sampled, data for bioassessment should be available.

Locations of monitoring sites are subject to revision. It is possible that sites that usually show consistent flow may not have adequate flow at the time of sampling, such as during dry years. Alternate sites will be identified and will be sampled in order to ensure a full complement of samples is collected throughout the hydrologic unit. The alternate sites will be selected using the same criteria discussed above.

Site selection will be coordinated with SCCWRP, which has been awarded two grants under the Consolidated Grants Program: (1) Ensuring biological integrity of Non-Perennial Streams; and (2) Development of Multimetric Tools for Setting Numeric Nutrient Targets including a Periphyton Index. In addition, the Regional Board will conduct a thorough analysis of bioassessment data that have been collected in the past in the San Diego Region (under SWAMP and various other programs) before the proposed sampling will start. The analysis will include attempting to detect trends of biological impact over the past at sites that were sampled before. Based on the results of this analysis, the Regional Board will

decide which sites will be selected for the bioassessment sampling or which areas need additional sites.

3.1.2 Site Reconnaissance

Site reconnaissance will be used to determine site selection, including alternate sites.

Site reconnaissance is an important tool in effective assessment of ambient water quality monitoring programs. The Regional Board will conduct sample site reconnaissance that will:

- a. Document local watershed characteristics and features;
- b. Document in-stream habitat conditions;
- c. Document near stream habitat conditions;
- d. Measure and characterize flow regime;
- e. Identify land ownership and access issues;
- f. Establish a reach for the Multihabitat and the Targeted Riffle methods;
- g. Perform a Physical Habitat Assessment;
- h. Determine if the site meets reference site criteria for bioassessment;
- i. Provide photo-documentation of the site;
- j. Record on the ground GPS coordinates (WGS 84, decimal degrees) for the site;
- k. Map the site on both a watershed and reach scale; and
- l. Identify and prioritize nearby alternate sites for contingency or follow-up monitoring.

3.1.3 Field location of sample collection sites

The field crew will collect samples at sites where the latitude and longitude (GPS coordinates) were previously recorded during reconnaissance of these stations. If a new station is being sampled, GPS coordinates and cross-referenced photographs will be provided for future reference. Any confusion about site location or prioritization of alternate sites will be resolved in consultation with a Regional Board staff member present in the field or via phone.

3.2 Selected parameters

Monitoring sites will be sampled only once a year in spring/summer for the following parameters:

1. Conventional Water Chemistry;
2. Benthic Macroinvertebrates for Bioassessment; and
3. Physical Habitat Assessment.

3.2.1 Conventional Water Chemistry

Samples for conventional water chemistry analyses will be collected at each monitoring site. Conventional water chemistry samples will be collected simultaneously with the bioassessment samples. This will provide information to assess possible causes or nature of any biotic effects observed in the bioassessment sampling. The following parameters will be tested:

1. Ortho-Phosphate;
2. Total Phosphorus;
3. Nitrate;
4. Nitrite;
5. Ammonia;
6. Total Nitrogen;
7. Sulfate;
8. Alkalinity; and
9. Total Suspended Solids.

In addition, the following parameters will be measured in-situ in the field at each site:

1. Dissolved oxygen;
2. Temperature;
3. Conductivity;
4. pH; and
5. Turbidity

3.2.2 Bioassessment and Physical Habitat Assessment

In FY 2006-07, the Regional Board will focus on bioassessment and will use the new protocol developed by the California Department for Fish and Game (CDFG), Aquatic Bioassessment Lab (ABL) (Ode 2007). This protocol is approved by the internal SWAMP review (SWAMP Bioassessment Committee, ABL, and the Sierra Nevada Aquatic Research Lab (SNARL)), and by the SWAMP Quality Assurance Officer.

The new protocol includes two new bioassessment methods, including a more extensive physical habitat assessment. Both the multihabitat and the targeted riffle approach methods will be used for SWAMP monitoring for Fiscal Year 2006-2007 at most of the sampling sites. The targeted riffle method is the method most comparable to the California Stream Bioassessment Protocol (CSBP), which was used in prior years. Based on data from the ABL and SNARL, the targeted riffle method and the CSBP produce equivalent results. By using the targeted riffle method, we are able to compare the new results to our old data. The multihabitat method can be applied in reaches with no riffles, and is therefore the method of choice for low gradient streams which usually have no

riffles. This method provides a consistent method for sampling across a range of habitats.

Because it is not known at this point if the targeted riffle method and the multihabitat method produce similar results, we propose to use both methods at most of the sites. Using both methods allows for comparisons with data collected in the past. In addition, the multihabitat method can be used in both high and low gradient streams. If the data analysis of the two methods shows equivalent results, then only one method will be used in the future.

The new protocols developed by CDFG for physical habitat assessment for wadeable streams in California is more detailed than the ones used in the past. The new protocols use a more objective method to measure physical habitat assessment. In addition, physical habitat assessment will be measured at 11 transects at each stream reach. The use of these methods should provide a detailed, objective picture of in-stream and riparian habitats at the sampling sites.

3.2.3 Sampling and Lab Analyses

Staff from the ABL of the CDFG will collect all bioassessment samples and conduct the analyses. Staff from the ABL of the CDFG will also conduct the extensive physical habitat assessment at all sites where bioassessment samples were taken. Bioassessment samples will have a Quality Assurance/Quality Control (QA/QC) performed at a frequency of ten percent (10%). Replicate samples will be taken at 10% of the sites to assure QA/QC for field sampling.

All San Diego Region SWAMP sampling and analyses (bioassessment/physical habitat assessment and conventional water chemistry) will be performed under the State Board statewide master contract with the CDFG. This arrangement will make use of the monitoring expertise of the CDFG and avoid the need for Regional Board staff to manage a region-specific contract. Sample collection and subsequent processing and testing will be performed according to the most recent version of the SWAMP QAPP. Laboratory analyses will be conducted in accordance with standard methods specified in the State Board statewide master contract with the CDFG.

3.3 **Data**

3.3.1 Data Quality Evaluation and Data Reporting

Data quality evaluation and data reporting will be as specified in the SWAMP QAPP. Quality control will include a 5% field duplicate level for all parameters. We do not anticipate needing additional special data quality evaluation or data reporting procedures.

3.3.2 Data Analysis

For bioassessment data, the benthic macroinvertebrate Index of Biologic Integrity (IBI) for southern California will be applied. The IBI scores will be calculated for every bioassessment sampling site. Based on the IBI scores, the Regional Board will identify and determine the location of biologically impacted and Reference sites. By comparing the IBI scores from this monitoring with past IBI scores, we will be able to look for trends in biological impacts and Reference conditions. We will run correlations between the results from physical habitat assessment (in-stream and riparian habitat) and conventional water chemistry and the IBI scores to help explain patterns in the biological data. We will also apply, if possible, the stressor identification tool, CADDIS, developed by EPA. With this tool it may be possible to identify potential stressor at locations with biological impact.

Data will be compared to applicable water quality objectives and other relevant thresholds. Currently, there are no biocriteria available for California. We will compare IBI scores from Reference sites and IBI scores from impacted sites.

3.3.3 Data Management

Data will be stored in the SWAMP database. The data produced by this monitoring plan will be used for a future cycle water quality assessments under the Clean Water Act (CWA), sections 305(b) and 303(d).

4 Collaborations

The Regional Board will collaborate with other agencies, non-governmental organizations, non-profit organizations (e.g. San Diego Stream Team), and/or Tribal Nations to expand the planned monitoring in the watersheds.

We will coordinate and integrate SWAMP monitoring with other monitoring efforts. These non-SWAMP monitoring efforts include:

- a. Monitoring conducted in accordance with State Board/Regional Board regulatory requirements (e.g., receiving water monitoring required by municipal storm water permits);
- b. Monitoring conducted in accordance with regulatory requirements of other agencies;
- c. Monitoring conducted independently of regulatory requirements; and
- d. Monitoring conducted as part of State grant projects.

5 Deliverable Products/Reporting

The deliverable product will be a technical report that presents the findings of the bioassessment of the proposed study. The report should be available to the public on the Regional Board website in March 2009.

6 Project Schedule

The sampling for the proposed monitoring plan will start in spring/summer of 2007, and will continue through spring/summer of 2008. Laboratory analysis will start in spring 2007 and will continue until the beginning of 2009. Data analysis and results will start in fall of 2007 and will continue until all data are available. The final technical report will be available in March 2009.

7 References

Ode, P. R, A. C. Rehn, J. T. May. 2005. A Quantitative Tool for Assessing the Integrity of Southern Coastal California Streams. Environmental Management Vol. 35, No. 4, pp. 493-504.

Ode, P. R.B. 2007. Standard Operating Procedures for Collecting Benthic Macroinvertebrate Samples and Associated physical and Chemical Data for Ambient Bioassessments in California. California State Water Resources Control Board Surface Water Ambient Monitoring Program (SWAMP). Bioassessment SOP 001.