

**California State Parks
Inventory, Monitoring, and Assessment Program**

Topic: Water Quality Monitoring- Chemical Constituents of Streams

Unit: Wilder Ranch State Park

Prepared by: Craig Swolgaard
Environmental Services Intern
Inventory, Monitoring, and Assessment Program Team
916/ 653-6656

Date: May 2001

I. Introduction

One of the missions of the California Department of Parks and Recreation is to preserve the natural biodiversity of parklands. In keeping with this mission, the goal of the Inventory, Monitoring, and Assessment Program (IMAP) is to have a clear idea of the natural resources contained in each state park and to monitor them regularly. As part of a comprehensive program to inventory and monitor these natural resources, it is very important to adopt an ecosystem approach and to view the whole in terms of the relationships between its parts. Each stream has its own inherent water chemistry, influenced by variables such as local geology, water flow and benthic conditions. Since human activities appear to have the most severe effect on the viability of ecosystems, part of this monitoring should include these potential influences on the park resources. Streams passing through parklands, especially those adjoining public land uses, are susceptible to these influences and thus to disturbances in the aquatic ecosystem. There can be a variety of tolerances among organisms to physical and chemical ranges, so knowing the baseline abiotic conditions in streams will serve as a standard for comparison when monitoring for ecosystem stability. Being selective in which chemical or physical parameters are used in monitoring streams will help to clarify the source of resulting problems among the stream biota.

Wilder Ranch State Park is notable because it encloses two other properties: the Santa Cruz City Landfill and Granite Rock Sand Quarry. Agriculture is practiced year round on most of the park land between Highway 1 and the Pacific Ocean. The surface water of the park includes three permanent streams and three intermittent streams. Two permanent streams, Wilder Creek and Majors Creek, both flow along the boundaries of the park. Wilder Creek has a large tributary, Peasley Gulch, which is enclosed within the park. Baldwin Creek, another permanent stream within the park, flows through an area of intensive agricultural

use. One of the intermittent watersheds includes Sandy Flat Gulch and Dairy Gulch. They are partially enclosed by the property of Granite Rock Company. Intermittent Lombardi Creek flows next to the city of Santa Cruz landfill. The potential for negative impact on the aquatic ecosystem is apparent for all streams. The goal of regular water quality sampling of these streams is to be vigilant for any trends in water chemistry that might adversely effect the ecosystem over time.

II. Sampling Objective:

The objective is to establish baseline data for water quality parameters in the permanent streams of Wilder Ranch State Park. This data will be used as a standard of measure for aquatic ecosystem functioning and as a basis of comparison for future water quality monitoring. The data will also be used to compare levels of ecologically pertinent analytes between agricultural and recreational land uses in the park.

III. Study Site(s)

Sampling points will be chosen in conjunction with the stream invertebrate study being done concurrently.

Wilder Creek will be sampled at one point near sea level, where accessible. The second sampling point will be approximately 100 meters downstream from the confluence of Wilder & Peasley creeks.

Lombardi Creek, though dry upstream at the time of sampling, forms an estuary at sea level. A sample will be taken there.

Baldwin Creek will be sampled at one point, near sea level, downstream from the small pond and below the confluence of a tributary to the east. The second sampling point will be upstream from Hwy 1, where Baldwin Loop trail passes the creek about 100 meters up from an old barn.

Majors Creek will be sampled at one location, since it passes through private land south of Hwy 1. The sampling point will be located about 200 meters north of Hwy 1, where the access road crosses the creek.

IV. Methodology

Methodologies are restricted to those used by State Parks participating in the Central Coast Ambient Monitoring Project (CCAMP), which are in accordance with U.S. Environmental Protection Agency and State Water Resources Control Board standards. These will include sampling, quality assurance, and field analysis protocols. Both lab and field measured parameters will be taken in June of 2001. After that, field measurements will be taken monthly, from June to December of 2001. Both sampling and analysis for pesticides and metals will be done once in late fall, after the first substantial rainstorm.

Before measuring or sampling stream water, both stream flow and air temperature will be measured and recorded with the pertinent water quality data. Stream conditions will be recorded as % algal cover, % vegetation cover, % canopy cover (using a densiometer), water transparency, water color and notable observations (fauna, recent disturbances, etc.). In sampling for laboratory measured parameters recommended glass, polyethylene or HPDE containers of the appropriate volume for each analysis method will be used. Required preservatives will be added to the water samples as needed, after the sample is taken in the field. Attached is a list (Table 1) of the parameters taken for laboratory analysis, with sample bottles and preservatives needed for associated EPA methodologies. The samples will be taken from the water column, about 3 cm below the surface. Before the samples are taken, each sample bottle will be rinsed thoroughly 2-3 times with the stream water. Field blanks and/or duplicates will accompany the sampler in the field when appropriate. Also, a chain of custody form will be carried and filled out by the sampler, not to be relinquished until the samples are dropped off at the lab. Laboratory analysis will be performed by the Santa Cruz County Water Quality Lab for all parameters except pesticides and metals. Methods used include the following:

<u>Method</u>	<u>Parameter</u>
EPA method 150.1	pH
Standard method 10200 H (1,2)	Chlorophyll a
EPA method 300	Anions
Dionex Corp. Ion Chromatography	Cations
EPA method 160.5	Total dissolved solids
EPA method 160.3	Total suspended solids
EPA method 310.1	Alkalinity
EPA method 350.3	Ammonia
EPA method 351.4	Total Kjeldahl Nitrogen
Standard method 9222 D (1,2)	Fecal Coliform

Lab results will be mailed within a week of sample collection and data will be stored along with field results in a designated folder at the Natural Resources Division IMAP office.

For field measurements, a Horiba U-10 water quality meter will be used to analyze stream water for temperature, pH, dissolved oxygen, specific conductance, turbidity and salinity. From the dissolved oxygen and the temperature, % oxygen saturation will be calculated. The measurements will be taken at the creekside, at the same time the lab measured samples are taken. Beginning in July, nitrate-nitrogen, ammonia-nitrogen, and total phosphate will also be measured in the field, using LaMotte test kits. Unionized ammonia will be calculated from the NH₃-N reading. Methods of analysis will be followed from the product instructions.

To use the Horiba U-10 water quality meter, it must be calibrated first, using the one-point auto-calibration solution provided. Instructions for calibration and use

of the meter can be found in Horiba's Instruction Manual. Care must be taken in handling the probe while taking measurements. It will be held in the water column, in deep enough water to not touch the bottom. Stand downstream from the probe to avoid stirring up sediment and getting a false turbidity reading. The specifications for this probe are found in Table 2.

All sample locations will be flagged and coordinates taken, using the Trimble GPS unit, with detailed descriptions of how to find them. A form (Table 3) will be used to record all data taken in the field. Photographs will be taken from each sample point of the view upstream, downstream, and at a 90° angle from each stream side. Digital versions of the images will be stored on the Natural Resources Division-IMAP shared drive.

V. Data Analysis and Archiving

Raw data will be transferred to a computer-based Excel database system, formatted in coordination with the Regional Water Quality Control Board, Central Coast Ambient Monitoring Project database. This will standardize the results in a format that will be accessible to a large number of interested parties or projects throughout the State.

The measurement results of each analyte will be viewed in context of their set RWQCB basin plan limits for surface water, as well as tolerance ranges for biological indicators. Data from the monthly measurements of streams in the field (temperature, pH, conductivity, dissolved oxygen, turbidity, salinity, PO₄, NO₃, & NH₃) will be graphed as well as analyzed for mean and standard deviation, for each independent variable in a given year.

VI. Materials Needed

- 1.) Horiba U-10 Water Quality Meter
- 2.) Auto-calibration standard solution
- 3.) Sample bottles
- 4.) Preservative solutions, if needed
- 5.) DI water in squirt bottle for rinsing probes
- 6.) Empty plastic bottle for waste storage
- 7.) Ice chests with blue ice
- 8.) Data forms/ clipboard
- 9.) Chain of custody forms
- 10.) Trimble GPS unit
- 11.) Compass
- 12.) Flow Meter
- 13.) Camera
- 14.) Densimeter (for % plant cover)

VII. Estimated Field Time and Staffing

Sampling the four streams for the lab and field measured parameters will take a full day. Subsequent sampling for all streams, using the water quality meter and LaMotte test kits will also take about a day. The work will require only one person, trained in the proper methods of water sampling.