IMAP

Natural Resources
Inventory, Monitoring, & Assessment Program

Proposed Study Plan Outline

Topic: Stream Sampling for Macroinvertebrates

Unit: Wilder Ranch State Park

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I. Introduction

One of the goals of the California Department of Parks and Recreation is the preservation of natural biodiversity on State Park lands. In accordance with this the Inventory, Monitoring, and Assessment Program will attempt to gain a clear idea of the health and diversity of key natural resources in each park unit. Wilder Ranch State Park, located within the Santa Cruz District, will be one of the first units addressed and will subsequently be used as a paradigm for further related inventory and monitoring activities in the state. The District Staff in Santa Cruz identified several questions relating to riparian habitat and water quality in their Environmental Condition Assessment of Wilder Ranch State Park. Of primary concern is a possible decrease in the quality of native riparian and aquatic habitat. Possible stressors have been identified as run-off from commercial operations and residences located outside park boundaries as well as erosion of trails and roads within the Wilder Ranch State Park boundaries. The watersheds of this unit are home to several sensitive species, including the red-legged frog, tide-water goby, coho salmon, and a not yet fully understood array of benthic macroinvertebrate species.

Macroinvertebrate bioassessment involves collecting insects from randomly selected areas along streambeds, identifying the insects to genus, and determining their density by counting or weighing. The use of these samples as one indicator of stream health is an established procedure and has proven to compliment previously accepted methods of water quality assessment such as chemical analysis. We will adhere to all U.S. Environmental Protection Agency and California Department of Fish and Game protocols regarding the use of macroinvertebrates in stream bioassessment.

II. Sampling Objective

The goal of the macroinvertebrate sampling is to establish baseline data with which to assess the condition of riparian and aquatic habitat within the park. The data will be expanded upon for comparison in years to follow, and will be contributed to the Region 3 database of the State Water Quality Control Board's CCAMP (Central Coast Ambient Monitoring Project). Finally this initial data will be used to pinpoint possible areas of concern within each of the sampled watersheds.

III. Study Sites

Two or three reaches, depending on the seasonal variability of flowing water, will be sampled from Majors, Baldwin, Lombardi, Peasley, Dairy, and Wilder watersheds. The reaches will be selected based upon elevation, vegetation type, and accessibility. The riffles to be sampled within each reach will be chosen randomly. At the completion of each sample, photo documentation and GPS points (when possible) will be taken. Locations of the sampling sites have been loosely determined as follows:

Majors Creek Watershed (0 – 1000 ft):

Low: Scaroni road, bridge past private campground. Ralph Edwards=owner of campground.

Mid: faded green gate off of Highway 1- use the round key. About .5 miles past the old barn at Baldwin and 3 miles from the Wilder Ranch entrance.

High: Sample off of confluence from Brian's road. Access from bridge and follow streambed roughly west to the confluence. Note: A small feeder of Majors crossed Woodcutters trail as well as the small footpath that runs along woodcutters to the south.

Baldwin Creek Watershed (0 –1000 ft):

Low: Park by old barn, access from Eagle trail.

Mid: Access from Enchanted Loop Trail.

High: We drove and hiked the labyinth on Brian's property and alas there are no high access points with enough water to sample!!

Lombardi Creek Watershed (0 – 400 ft):

Low: Restoration site north of three mile beach.

Mid/High: The mid portion of this watershed is on private property. The high reaches are in a very steep and inaccessable canyon.

Peasley Creek Watershed (0 –900 ft):

Low: Peasley flows underground beyond the Wagon Wheel Trail.

Mid: Wagon Wheel trail (low enough to include main Peasley, "pig wallow", and third tributary).

High: Off of the E fork of Eucalyptus trail about .25 miles or less is an area closed sign with the closed faded. The trail goes down to Peasley. The flow is rather low here, and we may or may not sample.

Wilder Creek Watershed: (0-1000 ft):

Low: Access E through prairie adjacent to Cowboy Loop. The reach is near the restoration site.

Mid: Sample at the confluence of Cave Gulch and Wilder (below the confluence of both forks of Wilder. It is possible to park at the UCSC gate off of Empire grade and follow the road in to the confluence. In addition, a closed trail leaving E from the lime kilns accesses the confluence directly and is a slightly shorter walk than from the gate. Turn right and head down at the fork.

High: The confluence of the two Wilder forks is accessible by the trail leaving E from the lime kilns. Take the left fork up and over the ridge. The Confluence is dry (ie flowing underground). We will not sample high on Wilder.

IV. Methodology

We will directly follow the methodologies established by the California Department of Fish and game for a non point source rapid bioassessment within each watershed. Each invertebrate sample will also include a chemical and physical habitat assessment that includes the following parameters:

GPS coordinates
Elevation
Ecoregion
Water temperature
Specific Conductance
pH
Dissolved Oxygen
Reach Length
Riffle Length
Avg Riffle Depth
Avg Riffle Width
Riffle Velocity
Percent canopy cover
Percent Gradient
Substrate Composition and Complexity
Embeddedness
Physical Habitat Quality Score (uses a nationally standardized method to characterize a stream reach as excellent to poor based on a known reference condition)

Field Methodology for Stream Sampling

1. At the start of the sample day inspect all equipment and fluids and divide between field crew to carry into the field. Calibrate the water quality meter using the calibration solution. This should be done in the office or hotel. Designate one person as the recorder. Label the sample jars and begin the data sheets.

2. From the access point walk the stream and determine the reach. A reach is defined as any section of stream that includes two or more flow regimes i.e pool, riffle, glide, cascade, or falls. For our stream sampling purposes, it is best to include, if possible, five riffle/pool sequences in each reach. A riffle is defined as shallow fast moving water, whereas the water in a pool is comparatively deep and slow moving. Three riffles will be sampled randomly from the five included in the reach. When walking downstream from the access point, count the riffles backwards to five to determine the reach in order to reduce confusion. Riffle one should always be the farthest downstream. You will work upstream from here. Take a GPS point at the start and the end of the reach. If a GPS reading is not possible due to canopy or steep canyon walls, estimate as best as possible the UTM's using a USGS topographic quad. Take four digital photos (N,E,S,W) at the start and the end of the reach.

3. Use the random #'s function on the calculator or a random #'s table to determine which of the riffles to sample. Use the first digit only and throw out #'s that are not applicable (i.e >5). If your reach has only three riffles, all of them will be sampled and this step can be eliminated.

4. Measure the length of the entire reach. Try to follow the meanders as best as possible. Look around as you walk and measure the reach, notice physical character of the reach itself, surrounding banks and vegetation. Before starting a sample, fill out the physical habitat quality datasheet and record the numeric score of the reach on the main datasheet. The scores are subjectively based on professional judgement. It is best to discuss the scoring with all field members present to ensure consistent results.

5. Use the water quality meter to determine the chemical parameters of the water. Sample at any point within the reach (usually in a riffle) that is deep enough for the meter. Clean the meter with distilled water before returning it to its case. The meter should be stored overnight in distilled water or tap water if distilled water is not available.

6. Proceed to the first of the three randomly selected riffles to be sampled (the farthest downstream). Measure the length of the riffle and determine the top 1/3. Select a random # to determine the starting point of a transect across which three kicknet collections will be collected for each sample. The imaginary transects running across the top 1/3 of the riffle should be separated by one meter. For example, if the riffle is 15 M long, the top 1/3 includes 5 possible transects within the top 5M on the upstream end of the riffle. Randomly pick a number one through 5. If the number is 3, the sample would be taken 3 M from the top of the riffle. This is noted as the transect location on the data sheet. Note: Always round off the length of the riffle to the nearest whole #.

7. Set the kicknet down, with the mouth of the net facing upstream, three times across the chosen transect. The thalweg (deepest part of the stream) should always be included; as well as any areas close to fallen woody debris. If the transect is not wide enough for three collections, compensate using the other transects, while remembering to work upstream. The net should not be cleaned out between each of these collections. An area roughly the mirror image of the net itself in size should be disturbed in front of the net. Pick up and clean off all rocks and gravel in this area and channel the debris into the net. It is ok to dig up to six inches into the substrate or move large rocks (if possible) in order to dislodge insects. Do not stand directly in front of the net. Once all three of the components are collected, empty the net into a pan or sieve as best as possible by turning the net inside out. It helps to detach the net from the pole for balance. Pick out any large debris and replace into stream AFTER inspecting carefully for clinging organisms. The sample should be carefully transferred (we use a sieve followed by a tray) into a jar

filled with ½ to 2/3 of 95% ethanol. The main idea is to minimize damage to the insects in transfer. Use a wash bottle of ethanol to wash the smaller particles into the sample jar. Do not use water as this will dilute the ethanol in the sample jar. Label the sample jar inside and out using write in the rain labels.

8. After the sample is complete, or if there is a third person, refer to the datasheet for riffle characteristics to be determined. Use the tape measure to determine average width and depth to the nearest cm. We measure width and depth randomly once for every three meters of the reach, and average these numbers. Use the flow meter to determine velocity. Use the densiometer to determine overstory canopy cover. Refer to the physical habitat quality data sheet #'s 1 and 2 to determine substrate complexity and embeddedness respectively. This is for the individual riffle NOT the entire reach. Use the Jacob staff and clinometer to determine gradient of the riffle. Remember the tape on the Jacob staff is at Krista's eye height. It will need to be adjusted if someone else is reading slope!

9. Repeat steps 6, 7, and 8 for the next two riffles, working upstream. Ensure that all data is collected and equipment (and SAMPLE) is gathered before leaving a riffle.

10. A chain of custody form will be kept and updated with each sample. Use a new chain of custody form for each field week. Chain of custody forms will always be kept with the stream samples. These forms will accompany samples to the contract laboratory for indentification of the macroinvertebrates.

11. Completed data sheets at the end of a reach are to be kept in Krista's blue folder and copied when returned to the office. Originals will be kept in a master file in Roy Woodward's office; and copies will be filed at the district office and in Krista's desk at headquarters. Data will be entered from the copies at Krista's desk, and the person entering will initial and date each sheet entered.

V. Data Analysis

The invertebrate samples will be subsampled and identified by a contracted lab (most likely Richard Botoroff) that is familiar with common metrics associated with stream bioassessment. QA/QC will be conducted by California Department of Fish and Game. Voucher specimens will be stored at HQ. Data will be manipulated into indexes such as the EPT (Ephemeroptera, Plecoptera, and Trichoptera) which is indicative of sediment level. Data will be stored both raw

and processed in an excel database based on the State Regional Water Quality Control Board's CCAMP database (Central Coast Ambient Monitoring Project).

VI. Materials Needed

GPS
Camera
Compass
50M tape measure
25ft tape measure
D shaped KickNet
Sample Jars
Alcohol proof lids
Ethanol (95%)
Horiba U10 Water Quality Meter
Flow meter
Data Sheets on WintheR
Labels for Jars on WintheR
Physical Habitat Analysis Parameters
Plastic Bags
Cardboard Boxes with dividers (wine boxes work here)
Chain of Custody forms (again on WintheR)
Wash bottles
Funnel
Empty Water Bottles
Pencils and Sharpies
Rubber Boots/Hip waders
Tape
Clinometer
Densiometer
Calculator
Clipboard
Random#'s Table
Counter

VII. Estimated Field Time and Staffing

Once trial runs are completed, I estimate that three people will be needed for eleven **full** field days to complete the sampling and associated activities. If three people are not available, the fieldwork can be done with two people; however, additional field days will be required. Following this I will arrange taxonomic ID and data analysis and storage.
** note: upon completion of the first round of sampling the final count was two people for eleven full field days.