SWAMP
Surface Water Ambient Monitoring Program

Monitoring Plan	2012

North Coast Regional Water Quality Control Board

Garcia River Watershed Condition Monitoring

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California Water Boards

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Introduction

The Porter-Cologne Water Quality Control Act and the federal Clean Water Act (CWA) direct that water quality protection programs be implemented to protect and restore the integrity of waters of the State. California Assembly Bill 982 (Water Code Section 13192; Statutes of 1999) requires the State Water Resources Control Board (SWRCB) to assess and report on the State's water quality monitoring programs.

AB 982 required the SWRCB to prepare a proposal for a comprehensive surface water quality monitoring program. The SWRCB report to the Legislature entitled, "Proposal for a Comprehensive Ambient Surface Water Quality Monitoring Program" (November 2000 Legislative Report) proposed to restructure existing water quality monitoring programs into a new program, the Surface Water Ambient Monitoring Program (SWAMP). The SWAMP was envisioned as an ambient monitoring program that would be independent of, yet coordinated with, other water quality regulatory programs, and serve as a measure of: (1) the overall status of the beneficial uses of the State's water resources, and (2) the overall effectiveness of the prevention, regulatory, and remedial actions taken by the State Water Board and the nine Regional Water Quality Control Boards (RWQCB). To implement this directive, funding for ambient surface water quality monitoring was allocated to the State Water Board (and thereby to the Regional Water Boards) beginning in State Fiscal Year 2000–2001.

Overview of the Surface Water Ambient Monitoring Program (SWAMP)

The SWAMP is a comprehensive environmental monitoring program focused on providing the information the SWRCB and RWQCBs need to effectively manage the State's water resources. The SWAMP is designed to integrate all existing water quality monitoring occurring at the SWRCB and RWQCBs and coordinates with monitoring programs at other agencies, permitted facilities, and citizens groups. The RWQCBs establish monitoring priorities for the water bodies within their jurisdictions, in coordination with the SWRCB. This monitoring is done in accordance with the protocols and methodologies laid out in the SWAMP program.

SWAMP Goals

SWAMP is intended to meet four goals:

1. Create an ambient monitoring program that addresses all hydrologic units of the State using consistent and objective monitoring, sampling and analytical methods; consistent data quality assurance protocols; and centralized data management. This will be an umbrella program that monitors and interprets those data for each hydrologic unit at least one time every five years.
2. Document ambient water quality conditions in potentially clean and polluted areas. The scale for these assessments ranges from the site-specific to statewide.
3. Identify specific water quality problems preventing the SWRCB, RWQCBs, and the public from realizing beneficial uses of water in targeted watersheds.
4. Provide the data to evaluate the overall effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the State.

As designed, the Surface Water Ambient Monitoring Program (SWAMP) is a combination of (1) regional monitoring to provide a picture of the status and trends in water quality and (2) site-

specific monitoring to better characterize problem and clean locations. This approach balances these two important monitoring needs of the SWRCB and serves as a unifying framework for the monitoring activities being conducted by the SWRCB and RWQCBs. The coordinated SWRCB and RWQCB involvement in study design and sampling is critical to providing comprehensive, effective monitoring (Report to the Legislature, November 30, 2000, Pg. iv).

Although the original intent was to develop a program with adequate and secure funding to meet these goals, sufficient funding was never secured to create and fully implement a complete and robust region-wide monitoring plan as well as site-specific studies as outlined in the original design. As a consequence, the North Coast Region's SWAMP monitoring efforts through FY2007-08 focused on the first component of the overall program design, "regional monitoring" of status and trends. The "regional monitoring" component of the SWAMP Program is responsive to the four stated goals of the SWAMP Program, but is most responsive to goals 1, 2, and 3. Beginning in CY2008, through a change in contracting and implementation of our monitoring efforts, the North Coast Region has been able to expand the scope of the Regional SWAMP program to include "site-specific" monitoring to more fully respond to goals 3 and 4.

The watershed evaluation process employed by the North Coast Region is responsive to the Watershed Management Initiative as called for in the State Water Resources Control Board Strategic Plan (updated in 2001). Implementation of the Watershed Management Initiative involves designating Watershed Management Areas (WMAs) and performing monitoring with the following objectives:

- Assessing water quality related issues on a watershed basis,
- Developing prioritized water quality goals for watersheds from the issues, and
- Addressing the issues with various programs.

North Coast Regional SWAMP Program Goals and Objectives

The North Coast's Regional SWAMP program now includes multiple active projects, and is also in the process of analyzing data and preparing reports for two past projects. All of these projects are intended to meet the above four stated goals of the SWAMP Program (see page 2):

Current Projects:

- Status and Trends in the North Coast Region (FY2000-01 – present)
    - Addresses Goals 1, 2 and 3
- Garcia River Watershed Condition Monitoring (CY 2008 – present)
    - Addresses Goals 3 and 4
- Augmentation of the statewide SWAMP Reference Condition Monitoring Program (RCMP) (CY 2010 – present)
    - Addresses Goals 3 and 4
- Russian River Freshwater Beaches Monitoring Program (CY 2011 – present)
    - Addresses Goals 2, 3 and 4

Past Projects:

- South Fork Eel Nutrient Study (CY 2010)
    - Addresses Goals 3 and 4
- Russian River Nutrient Study (CY 2011)
    - Addresses Goals 2, 3 and 4

This document only represents the monitoring plan for the North Coast Region's Garcia River Watershed Condition Monitoring Program for calendar year 2012, while the other projects listed above are addressed by separate monitoring plans which can be found on the State Water Board's SWAMP website:
http://www.waterboards.ca.gov/water_issues/programs/swamp/regionalreports.shtml

North Coast Region's Goals and Objectives for the Garcia River in 2012

2012 represents the sixth year of the North Coast Region's Garcia River Monitoring Program. The goal for the North Coast Region's SWAMP effort is to monitor and assess the effectiveness of management activities occurring within the Garcia River watershed, and determine to what extent water quality is improving. This monitoring program is designed to answer the following questions:

- What are (were) the current baseline water quality and physical habitat conditions in the Garcia River watershed? (initiated in 2007 - 2009)
- What is the inter-annual variability of water quality and physical habitat conditions in the Garcia River watershed? (investigated in 2008 – 2012)
- What is the temporal variability or trends in water quality and physical habitat in the Garcia River watershed? (investigation in 2012)

Garcia River – Description

Garcia River Watershed Sediment TMDL Action Plan

The Garcia River TMDL is a regulatory tool that seeks to address controllable human-caused sources of sediment and to improve land management activities across the landscape in order to prevent the creation of new sources of pollution. Currently, private landowners - who together own more than 2/3 of the watershed - are working with staff from Region 1 in an effort to comply with the Garcia TMDL and reduce the amount of sediment pollution entering the river and its tributaries.

As part of the Garcia TMDL Action Plan, a set of numeric water quality targets for the Garcia River were established by the North Coast Regional Water Quality Control Board (NCRWQCB). These numeric targets focus on the elimination of excess sediment as a pollutant, and provide measurable objectives for restoring the cold-water fishery habitat. The numeric targets represent the desired future condition of the watershed, and are intended to be consistent with existing water quality objectives and beneficial uses, but are not themselves enforceable. Additionally, the North Coast Regional Water Quality Control Board's report entitled "Desired Salmonid Freshwater Habitat Conditions for Sediment-Related Indices" describes habitat and water quality conditions necessary to support salmonids.

Environmental Setting

The Garcia River watershed is bounded by the Brush Creek watershed to the north, Navarro River watershed to the east, and Gualala River watershed to the south. The Garcia River watershed covers over 73,000 acres in southern Mendocino County and consists of 12

subwatersheds, representing all of the United States Geological Survey Hydrologic Unit Code 8 (HUC8) subwatersheds within the Garcia River watershed.. The mainstem is approximately 70 kilometers from headwaters to mouth, and the combined length of mainstem and mapped USGS blue line tributaries is approximately 170 kilometers.

The North Coast Regional Water Quality Control Board's Water Quality Control Plan (Basin Plan) includes describes the following existing beneficial uses of water within the Garcia River watershed: municipal waters supply; agricultural waters supply; industrial water supply; freshwater replenishment; navigation; water contact recreation; non-contact water recreation; commercial and/or sport fishing; cold freshwater habitat; wildlife habitat; rare, threatened, or endangered species; migration of aquatic organisms; spawning, reproduction, and/or early development; and estuarine habitat.

Monitoring History – 2007-2011

Beginning in 2007, the NCRWQCB partnered with The Nature Conservancy (TNC) to begin the implementation of a robust instream water quality, bioassessment, and physical habitat monitoring program within the single largest property in the watershed, a 23,000 acre tract of timberland owned by The Conservation Fund and known as the Garcia River Forest. In 2008 the NCRWQCB expanded that program into the rest of the watershed as other property owners provided access to monitoring reaches outside of the Garcia River Forest. Over the next four years, NCRWQCB and TNC continued to gather data across more than 80 separate monitoring reaches, multiple ownerships, and within each of the twelve subwatersheds, in order to establish baseline conditions and evaluate inter-annual variability throughout the basin.

2012 will mark the 6th year of this monitoring project, and in collaboration with TNC, will include monitoring all of the previous stations located throughout the watershed to assess water quality and stream habitat changes in both individual subwatersheds and the watershed as a whole.

Site Selection and Monitoring Activities

Site Selection

Site selection for the Garcia River Monitoring Program was produced utilizing a Generalized Random Tessellation Stratified (GRTS) probability-based sampling design. This approach allows statistical confidence levels to be placed on the estimates and provides the potential to detect changes and trends in condition with repeated sampling.

Using GIS, reach locations were selected from all perennial waterways by spatially balanced random sampling following USEPA EMAP guidelines. With the assistance of USEPA staff, an EMAP sample design was developed for the Garcia River watershed, based on the 1:24,000-scale National Hydrography Dataset (NHD) (USGS 2008) for all perennial and intermittent streams. The sample design used three Strahler stream order categories, 1st, 2nd and 3rd+, and 12 subwatershed categories.

The Nature Conservancy (TNC) has focused on those sites that fall within the Garcia River Forest boundary, while the NCRWQCB has focused our work on the sites outside of the Garcia River Forest boundary. Defined reaches serve as permanent monitoring sites allowing us to

establish baseline conditions throughout the watershed from which changes in conditions can be determined over time, and provides the framework within which monitoring and research efforts take place.

Protocols

This monitoring program is established to determine baseline conditions in the Garcia River watershed and to measure changes in conditions over time. Stream monitoring surveys are adapted from the United States Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program (EMAP) protocols (Kauffman et al. 2006) and incorporate protocols established by California's Surface Water Ambient Monitoring Program (SWAMP) (Ode 2007 and Fetscher et. al. 2009) to estimate the current status, extent, and changes in indicators of the condition of streams in the basin. This provides the basis for statistical summaries and interpretive reports on the ecological status and trends in the Garcia River watershed.

TNC is conducting all of their monitoring efforts utilizing the EMAP protocols, developing a long-term monitoring dataset, whereby the Garcia River can be used to help develop regional standards that inform management of other North Coast rivers.

To provide scientifically sound and comparable data relative to both TNC's efforts and those of other programs, NCRWQCB also is integrating EMAP protocols with the Surface Water Ambient Monitoring Program (SWAMP) protocols into this monitoring program. The SWAMP bioassessment procedures are close modifications of the EMAP protocols and differ substantively in only a few collection procedures. We have modified the procedures to accommodate several of these differences.

Sample Variables

Physical Habitat

Physical habitat measures will be collected using EMAP and SWAMP protocols along the defined sampling reach. These measurements include:

- Channel dimensions
- Channel gradient
- Channel substrate size and type
- Habitat complexity and cover
- Riparian vegetation cover and structure
- Anthropogenic alterations
- Channel-riparian interaction

Biology

Two biological variables will be monitored within the index reaches: benthic macroinvertebrates and periphyton.

- **Benthic Macroinvertebrates**

Samples for benthic macroinvertebrates will be collected using EMAP and SWAMP protocols at sampling points located on cross-sectional transects within the sampling reach. Samples collected at each transect as part of this reach-wide sample will be combined into a single composite sample for the stream reach.

Analysis and processing of BMI samples collected by TNC and the NCRWQCB will be conducted by Southwest Association of Freshwater Invertebrate Taxonomists (SAFIT) approved labs.

- **Periphyton**

Samples for periphyton will be collected using SWAMP protocols at sampling points located on cross-sectional transects within the sampling reach. Samples collected at each transect as part of this reach-wide sample will be combined into a single composite sample for the stream reach.

In accordance with the current SWAMP protocol, this reach-wide sample will be processed and divided into 4 different laboratory samples, including 2 ID/enumeration samples, 1 chlorophyll *a* sample, and 1 biomass sample.

Water Chemistry

In addition to the physical and biological components of this effort, the NCRWQCB will also collect standard field parameters, and grab samples for the analysis of conventional water chemistry constituents, and total metals concentrations (TNC does not collect these parameters).

Table 6. Analytes per Sample Category.

Field Measurements	
Dissolved Oxygen	**pH**
Specific Conductivity	**Temperature**
Conventional Water Chemistry	
Ash Free Dry Mass	**Chlorophyll-a**
Alkalinity as CaCO3	**Chloride**
Hardness as CaCO3	**Soluble Reactive Phosphorous**
Ammonia as N	**Phosphorous as P (total)**
Nitrate as N	**Suspended Sediment Concentration**
Nitrite as N	**Total Dissolved Solids**
Nitrogen, Total	**Dissolved Organic Carbon**
Sulfate	**Total Organic Carbon**
Total Metals	
Aluminum	**Silver**
Chromium	**Cadmium**
Manganese	**Lead**
Nickel	**Arsenic**
Copper	**Selenium**
Zinc	**Mercury**

Sample Collection

The field crew will collect the samples at sites where the geo-coordinates were previously recorded on the site reconnaissance form during past field work at these stations.

Sample collection and subsequent processing and testing will be performed according to protocols specified in the most recent version of the SWAMP Quality Assurance Program Plan (QAPrP) and region-specific QAPP's/SOP's.

Quality Assurance

This monitoring study will be consistent with the SWAMP Quality Assurance Management Plan (Puckett 2002).

Schedule and Reporting

Monitoring for this calendar year will begin in June 2012. Pending availability of data, data analysis will be performed during September-December 2013. A technical report on monitoring performed beginning 2007 through 2012 will be completed by December 31, 2014.

Data generated by this collaborative effort will enhance the State's ability to answer the general question: What is the status of California's surface water quality, and is it getting better or worse? Data generated through bioassessment can be used to comply with the Clean Water Act Sections 305(b) and 303(d) Integrated Report, which aims to assess all of California's waterbodies for impairment identification and protection. Data from this effort will also enhance Regional and statewide monitoring programs; aid in evaluating the success of TMDLs; and help

to develop and understand the relationships between human activities and stream pollution for NPS programs.

Technical reports summarizing the findings will be produced by R1 SWAMP staff. Reports will be made available on the Region's SWAMP website. All data will be reported and available to the public on the California Environmental Data Exchange Network (CEDEN) once all Quality Assurance has been completed.

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