Surface Water Ambient Monitoring Program (SWAMP) Workplan

Long-term 5-year Workplan and Annual 03-04 Workplan

San Francisco Bay Regional Water Quality Control Board

January 2004

I. **LONG-TERM (5-YEAR) WORKPLAN**

A. Goal and Objectives

Goal – The goal of the SWAMP funded program in the San Francisco Bay Region is to monitor and assess water quality in all of the watersheds in the region to determine whether beneficial uses are protected.

Objectives –
1. Measure environmental stressors (pollutants or other water quality parameters), biological effects (e.g., toxicity tests), and ecological indicators (e.g., benthic community analysis) to evaluate whether beneficial uses are being protected.
2. Use a design that allows for evaluation of spatial and temporal trends in the watersheds of the region.
3. Identify minimally disturbed reference conditions.
4. Determine if impacts are associated with specific land uses and/or water management.
5. Use standard sampling protocols, SWAMP QAPP procedures and the SWAMP database to provide statewide consistency and availability of data.
6. Evaluate monitoring tools in watersheds in order to develop a program that uses the best environmental indicators to achieve the goal of the program.
7. Generate data and associated information for the development of indices to evaluate ecological indicators (e.g., IBIs for macroinvertebrates).
8. Use a rotating watershed approach to collect data in each hydrologic unit at least once every 5 years.

B. Method to achieve objectives

Objective #1 – Our monitoring program includes measuring environmental stressors (pollutants and other water quality measurements such as temperature and dissolved oxygen), biological effects (EPA 3 species aquatic toxicity tests and Hyalella sediment toxicity tests), and ecological indicators (macrobenthic community analysis). These monitoring parameters are associated with the evaluation of specific beneficial uses. The beneficial uses we are concentrating on evaluating in this program relate to human health and aquatic life. To evaluate water contact (REC-1) we measure fecal coliforms and E. coli at places where there is water contact and/or there are potential sources of pathogens. To evaluate noncontact recreation we measure bacteriological indicators and also conduct trash assessments with a methodology that was developed in this region. To evaluate beneficial uses associated with aquatic life such as Cold Freshwater Habitat (COLD), Estuarine Habitat (EST), Marine Habitat (MAR), Fish Migration (MIGR), Preservation of Rare and Endangered Species (RARE), Fish Spawning (SPWN), Warm Freshwater Habitat (WARM) and Wildlife Habitat (WILD) we measure contaminant concentrations, nutrients, temperature, dissolved oxygen, conductivity and pH, conduct toxicity tests, evaluate macroinvertebrate communities and assess physical habitats. Some of these parameters, such as nutrients and conductivity, can also be used to evaluate Municipal and Domestic Supply (MUN)

although the utilities that supply water have extensive monitoring programs and data that can be used for assessments.

Objective #2 – To evaluate spatial trends we distribute sampling stations fairly evenly throughout a watershed and at all major confluences. We commonly use a paired watershed design to compare watersheds and use a rotating watershed approach to spatially cover the watersheds in the region. To evaluate intra-annual temporal variability we take contaminant, toxicity and nutrient samples during the wet, spring (declining hydrograph) and dry seasons. We measure temperature, pH, conductivity and dissolved oxygen with continuous monitoring probes over a week long period four times a year in each watershed, concentrating on the dry season. We evaluate trash four times a year to determine where the trash is coming from (runoff or dumping) and how much accumulates over a particular length of time. To evaluate inter-annual variability we use a rotating watershed approach, deploy HOBO temps for continuous monitoring of temperature in watersheds we have previously monitored and we work with local agencies and citizens groups to conduct follow up monitoring on watersheds we have monitored. From 1999 to 2002 we conducted a special study on inter-annual variability in Wildcat and San Leandro Creeks.

Objective #3 - Each year we identify and sample at stations that are minimally disturbed and can represent different ecoregions within our region. These reference sites are particularly important to evaluate benthic macroinvertebrate data and for the development of IBIs.

Objective #4 – Our sampling design is deterministic. We locate sampling stations above and below particular land uses such as agriculture, industrial areas, golf courses and areas of hydromodification to test hypotheses on the impact of these land uses on water quality.

Objective #5 - We use standard sampling protocols, SWAMP QAAP procedures and have data entered in to the SWAMP database to provide statewide consistency and availability of data. We also encourage monitoring partners (stormwater programs, volunteers) to use SWAMP methods, sampling design and QAPP so that this data can be incorporated in to the SWAMP database.

Objective #6 – The first monitoring protocol that we have developed is a methodology for trash assessment. We have developed a protocol that has been tested for variability and sensitivity using different assessment teams. This protocol is now considered part of the standard procedures in our region. We are encouraging stormwater agencies and community monitoring groups to use this protocol.

Objective #7 - We have sampled benthic macroinvertebrates at reference sites and at various ecoregions in our region for the development of IBIs. We are currently coordinating through the Bay Area Macrobenthic Invertebrate Network (BAMBI) to include other macroinvertebrate monitoring in our evaluations. These evaluations are

leading to draft indices based on ecoregion and land use. In the future we plan to develop objectives in our Basin Plan for biological integrity.

#8 – We are using a rotating watershed approach. Our plans for monitoring specific watersheds in various hydrologic units so that we collect data in each hydrologic unit at least once every 5 years is illustrated in the following table. The seven selection criteria for prioritizing watersheds include:

1. EXISTING LOCAL EFFORTS. Build on existing watershed monitoring and assessment efforts, including citizen monitoring.
2. SENSITIVE AQUATIC RESOURCES. Focus in areas with sensitive aquatic resources or species, such as habitat for the federally listed threatened species steelhead.
3. PRE-PROJECT INFORMATION. Collect pre-project ambient data in areas proposed for urbanization, stream restoration, or hydromodification.
4. WATERBODIES WITH LIMITED INFORMATION. Initiate monitoring in areas that have little or no current water quality and habitat information.
5. MONITOR IN ALL ECOREGIONS. Fill information gaps in certain ecoregions, for instance with stream bioassessment data to support biocriteria development or geomorphic data to support physical criteria development.
6. PAIRED WATERSHEDS. Monitor paired watersheds, with similar drainage area, land use, geology, vegetation, and climate for cross-comparison and testing of the ability to extrapolate findings from one watershed to another.
7. GEOGRAPHIC BALANCE. The prioritized list of watersheds should be balanced geographically and by ecoregion, in order to capture the full range of stream types in the region and to recognize watershed management efforts in all parts of the region.
8. HYDROLOGIC UNITS. Collect data in each hydrologic unit at least once every 5 years. There are 7 hydrologic units in this region.

The prioritization of these waterbodies may change if the information on which the prioritization was based changes. For instance, if a stormwater agency plans to monitor in a watershed that we planned to monitor we will encourage them to use SWAMP protocols and QAPP but will probably postpone monitoring that watershed. Many of the watersheds that are planned farther in the future have current monitoring programs or have recently had extensive monitoring. The number of watersheds that have been planned to be monitored each year is based on **current resources.**

PLANNING WATERSHEDS

PRIORITY LISTING AND ORDER OF ROTATING BASIN MONITORING STRATEGY

NO.	PLANNING WATERSHED	STATUS	COUNTY	HYDROLOGIC UNIT	POTENTIAL REFERENCE SITES?
1	Walker Creek	Completed 2000-01	Marin	201	Yes
2	Lagunitas Creek	Completed 2000-01	Marin	201	Yes
3	Suisun Creek	Completed 2000-01	Napa/ Solano	207	No
4	Arroyo de las Positas	Completed 2000-01	Alameda/ Contra Costa	204	No
5	Wildcat/San Pablo Creeks	Completed 2000-01	Contra Costa/ Alameda	206	Yes
6	San Leandro Creek	Completed 2000-01	Alameda/ Contra Costa	204	Yes
7	San Gregorio Creek	Completed 2001-02	San Mateo	202	Yes
8	Pescadero/ Butano Creeks	Completed 2001-02	San Mateo	202	Yes
9	Stevens/ Permanente Creeks	Completed 2001-02	Santa Clara	205	Yes
10	San Mateo Creek	Completed 2002-03	San Mateo	204	Yes
11	Petaluma River	Completed 2002-03	Sonoma/ Marin	206	No
12	Mt. Diablo/ Kirker Creeks	Completed 2002-03	Contra Costa	207	Yes
13	Oakland Creeks	Planned for 2003-04	Alameda	204	No
14	Berkeley/ Richmond/ San Francisco Creeks	Planned for 2003-04	Alameda/ Contra Costa/ San Francisco	203	No
15	Arroyo Mocho	Planned for 2003-04	Alameda	204	Yes
16	Laguna Creek	Planned for 2004-05	Alameda	205	No
17	Green Valley/ W. Suisun	Planned for 2004-05	Solano	207	Maybe
18	South Marin Coastal Creeks	Planned for 2004-05	Marin	201	Yes
19	Guadalupe River	Planned for 2005-06	Santa Clara	205	Maybe

NO.	PLANNING WATERSHED	STATUS	COUNTY	HYDROLOGIC UNIT	POTENTIAL REFERENCE SITES?
20	Los Gatos Creek	Planned for 2005-06	Santa Clara	205	Maybe
21	Pilarcitos Creek	Planned for 2005-06	San Mateo	202	Yes
22	Napa River	Planned for 2006-07	Napa	206	Yes
23	Napa River Estuary	Planned for 2006-07	Napa	206	Maybe
24	South Marin Bayside	Planned for 2006-07	Marin	203	Yes
25	Upper Walnut Creek	Planned for 2007-08	Contra Costa	207	Yes
26	Lower Walnut Creek	Planned for 2007-08	Contra Costa	207	No
27	Ledgewood/ Laurel Creeks	Planned for 2007-08	Solano	207	No
28	Point Reyes Coastal Creeks	Planned for 2008-09	Marin	201	Yes
29	Mid San Mateo Coastal Creeks	Planned for 2008-09	San Mateo	202	Yes
30	Palo Alto Creeks	Planned for 2008-09	Santa Clara	205	Yes
31	Arroyo del Valle	Planned for 2009-10	Alameda	204	Yes
32	San Tomas/ Calabazas Creeks	Planned for 2009-10	Santa Clara	205	Yes
33	North San Mateo Bayside	Planned for 2009-10	San Mateo	204	No
34	Lower Alameda Creek	Planned for 2010-11	Alameda	204	No
35	Upper Alameda Creek	Planned for 2010-11	Alameda/ Santa Clara	204	Yes
36	Arroyo de la Laguna	Planned for 2010-11	Alameda/ Contra Costa	204	Maybe
37	Northwest Contra Costa Creeks	Planned for 2011-12	Contra Costa	206	Yes
38	Sonoma Creek	Planned for 2011-12	Sonoma	206	Yes
39	San Francisquito Creek	Planned for 2011-12	Santa Clara/ San Mateo	205	Yes
40	Tomales Bay Creeks	Planned for 2012-13	Marin	201	Yes

NO.	PLANNING WATERSHED	STATUS	COUNTY	HYDROLOGIC UNIT	POTENTIAL REFERENCE SITES?
41	North San Mateo Coastal Creeks	Planned for 2012-13	San Mateo/ San Francisco	202	Yes
42	South San Mateo Bayside	Planned for 2012-13	San Mateo	204	No
43	San Lorenzo Creek	Planned for 2013-14	Alameda	204	Yes
44	Alhambra Creek	Planned for 2013-14	Contra Costa	207	Yes
45	North Marin Bayside	Planned for 2013-14	Marin	206	Yes
46	Upper Coyote Creek	Planned for 2014-15	Santa Clara	205	Yes
47	Lower Coyote Creek	Planned for 2014-15	Santa Clara	205	Maybe

C. Deliverables Due Date – Samples will be collected in the fiscal year listed in the table above (except for 2003-04, see annual plan). All samples will be collected within the 3 hydrologic cycles specified in the sampling design (see monitoring design). A field report will be due 1 month after sampling. Analytical data for metals and inorganics in water will be due 120 days after sampling. Analytical data for organics in water and all sediment and tissue data will be due 6 months after sampling. Draft toxicity test data will be due 30 days after sampling and final data will be due in 60 days. Bioassessment data will be due 9 months after sampling. All data collected under the Fish and Game contract will be incorporated in to the SWAMP database 1 month after final data is received. We plan to write an interpretive report every 2 years. The first report, which includes years 2000-2001 and 2001-2002 watersheds, is due in August 2004.

II. ANNUAL PLAN

A. Goals and Objectives - The goal and objectives for the annual plan are the same as for the 5-year plan except for objective #8 which only applies to long-term planning.

B. Method to Achieve Objectives – The methods to achieve the objectives are the same in the annual plan as the 5-year plan.

C. Monitoring Plan - Since the San Francisco Estuary Regional Monitoring Program performs ongoing monitoring of San Francisco Estuary water quality, the Regional Board has decided to concentrate on monitoring water quality in watersheds in the region using SWAMP funds. In previous years the Toxic Substances Monitoring Program funds have been used to measure contaminants in fish from reservoirs where people fish and consume the fish. Coastal Fish Contamination Program funds have been used to measure contaminants in fish that people consume in Tomales Bay and the ocean waters of the region. At this time the future and potential statewide objectives of these programs is

undetermined. The San Francisco Bay Region uses Fish and Game as our primary contractor through the state master contract. Regional Board staff conducts the research on watersheds, establishes partnerships within watersheds, conducts reconnaissance, develops the study design and establishes access. In addition, Regional Board staff conducts continuous monitoring, bacteriological monitoring and trash assessments. This data is managed in-house.

With 2003-2004 funds we will be monitoring waterbodies in Berkeley, El Cerrito and Oakland. These water bodies include: Baxter Creek, Cerrito Creek, Codornices Creek, Strawberry Creek, Aquatic Park, Temescal Creek, Lake Temescal, Glen Echo/Trestle Glen watershed, Lake Merritt, Peralta Creek, Sausal Creek, Lion Creek, Arroyo Viejo Creek and Arroyo Mocho Creek. For watershed monitoring a deterministic study design is used to select stations. Stations are selected that are at confluences (to determine the influence of a tributary), to identify potential reference conditions in areas of low impact land use, where there is previous data indicating a potential impact, to evaluate the potential impact of particular land uses and to determine if beneficial uses are being protected (i.e., water contact). Other reasons for station selection include locations of restoration projects and other monitoring efforts. Stations are also selected to create an even distribution of sampling locations throughout the watershed, so that data from adjacent stations can be compared to suggest future detailed monitoring to identify sources of water quality impact or improvement. In Aquatic Park, Lake Merritt and Lake Temescal stations will be selected based on previous data particularly relating to temperature and dissolved oxygen.

A Tier 1 assessment is conducted at all stations in creeks. Tier 1 assessments include conducting rapid bioassessments with concurrent measurement of basic water quality parameters and visual physical habitat assessments. Rapid bioassessments occur in the spring. Continuous monitoring devices measuring temperature, pH, conductivity, and dissolved oxygen are deployed throughout the watersheds for one week intervals about 4 times per year. Tier 1 is designed to obtain better spatial coverage in determining the basic water quality of the watershed, to identify reference sites and to complement the evaluation of tier 2 sites where potential impacts are being evaluated.

Tier 2 of the design was developed to answer basic questions concerning protection of beneficial uses and potential impacts of land use and water management. Tier 2 stations are a subset of the tier 1 stations. At tier 2 stations samples will be collected during three hydrologic cycles. The 3 hydrologic cycles are the wet season (January - March), decreasing hydrograph /spring (April - May) and the dry season (June - July). Regardless of calendar month, the prevailing seasonal conditions will determine monitoring events. Additional samples and parameters to be evaluated in Tier 2 will depend on the beneficial uses or land uses at or above a site or on previous data indicating a potential impact. In evaluating potential impacts on aquatic life a triad approach is used with water column chemistry, toxicity tests and tier 1 bioassessments. Toxicity/chemistry samples will be collected synoptically during all 3 hydrologic cycles. These samples will be collected during the wet, spring, and dry seasons at the same time

the conventional water quality samples are collected. Conventional water quality parameters include chlorophyll, ammonia, nitrate/nitrite, total nitrogen (by TKN), phosphate, alkalinity, hardness, total and dissolved organic carbon (TOC/DOC), total suspended solids (TSS), total dissolved solids (TDS-salinity) and major cations and anions. At the bottom of each watershed in the non-tidal area we establish one station, the integrator station, which will integrate the contaminant conditions in the waterbody and determine which contaminants from that waterbody flow into the receiving waters. At these stations, sediment samples will be collected for toxicity analysis, using *Hyalella*, grain size analysis and sediment chemistry. Sediment sampling will be concurrent with water sampling and occur in the dry season.

Regional Board staff will collect samples for fecal coliforms and E.coli at stations where there is water contact recreation and/or there are potential sewage inputs. These pathogen indicators require five samples within 30 days to compare to objectives listed in the Basin Plan. Local agencies measure bacteriological indicators in Aquatic Park, Lake Merritt and Lake Temescal. Monitoring in these waterbodies will concentrate on dissolved oxygen and temperature, although some additional sampling for nutrients may be conducted. Trash assessments are conducted by Regional Board staff 4 times a year, before and after the dry season and before and after the wet season. Assessments are conducted to determine how much trash and what kind of trash is in a watershed, whether trash accumulates due to runoff or dumping and how much trash accumulates over wet and dry time periods. HOBO temps will be placed in watersheds previously sampled to evaluate inter-annual variability.

D. Deliverable(s) due date - Due to the inability to get the Fish and Game Master Contract in place before July 2004, wet weather sampling will not begin in the 2003-2004 watersheds until January 2005. Spring sampling will take place in April/May 2005 and dry season sampling will take place in June/July 2005. Sampling dependant on Regional Board staff, which includes continuous monitoring, bacteriological monitoring and trash assessment will start the summer of 2004. Sampling of 2004-2005 watersheds will take place the same time as 2003-2004 watersheds except for sampling dependant on Regional Board staff. Continuous monitoring, bacteriological monitoring and trash assessments for 2004-2005 watersheds will start in the summer of 2005. Due dates for deliverables will be as described under the 5-year plan.

III. INTRA-AGENCY COORDINATION ACTIVITIES

TMDLs and Grants – SWAMP, TMDLs and the lead for Prop 13 and 50 grant projects reside in the Planning and TMDL Division at the Regional Board. We have monthly meetings to coordinate these activities. Since Prop 13 and 50 grant projects that involve monitoring must be consistent with the SWAMP QAPP, there has been a great deal of discussion and coordination to implement that requirement. Lake Merritt is on the 303(d) list for low dissolved oxygen. We will be conducting continuous monitoring at various depths and stations in the lake.

The Berkeley/ El Cerrito and Oakland Creeks that SWAMP will be monitoring in 2003-2004 are listed for diazinon toxicity. A TMDL for pesticide toxicity is now being prepared for those creeks. The toxicity and pesticide monitoring that SWAMP conducts is coordinated and the results communicated to the lead on that TMDL. Since TMDLs are also being prepared for mercury and PCBs in San Francisco Bay, high concentrations of these contaminants that are observed in SWAMP results and may contribute to Bay concentrations are communicated to the staff in charge of those TMDLs.

Nonpoint Source and Waivers - A summary of the SWAMP workplan was incorporated in to the WMI and in this context is coordinated with nonpoint source (NPS) activities. The main areas of the NPS program are agriculture (including dairies), urban runoff, forestry, hydromodification, marinas and boating, and wetlands/riparian habitat. A study is currently being conducted by the Bay Area Conservation and Development Commission (BCDC) to evaluate water quality in marinas. In order to coordinate with that study the manager of SWAMP in this region is on their Technical Advisory Committee. SWAMP monitors contaminants and toxicity during wet weather runoff in urban areas to evaluate this potential impact. SWAMP monitors fecal coliforms and E. coli downstream from dairies to evaluate this land use and determine if waivers are working. Information concerning hydromodification is discussed with the watershed managers to develop the study designs. Monitoring results are shared with appropriate staff.

Clean Water Team – The lead on the Clean Water Team in this region and the regional manager of SWAMP work together in this region on study design, QA and data management. Several creek groups would like to or are already monitoring water quality in the creeks we will be monitoring in 2003-2004. This year will be a good year to compare volunteer and standard SWAMP protocols. Several groups have asked to be trained by the Clean Water Team in order to follow up on SWAMP monitoring in the region. Monitoring by volunteers can help to add another temporal component to SWAMP monitoring.

IV. INTER-AGENCY COORDINATION ACTIVITIES –

A. Other Relevant Monitoring - The manager of SWAMP in this region serves on the TAC and many workgroups of the San Francisco Estuary Regional Monitoring Program (RMP) in order to coordinate RMP activities with SWAMP. The manager of SWAMP also attends meetings of the Bay Area Stormwater Management Agencies Association (BASMAA) Monitoring Committee to coordinate SWAMP with the monitoring being conducted by stormwater agencies and to encourage consistency with SWAMP protocols and QA. We consider the RMP and the stormwater agencies partners in this program. Efforts are now underway to incorporate or link both RMP and stormwater data in to the SWAMP database. In 2003-2004 we will be monitoring Berkeley/El Cerrito and Oakland Creeks. The following table lists the agencies, groups and individuals that were contacted to develop this study design. SWAMP monitoring will be coordinated with some of these groups and will serve to compare to data from other years or stations, to compare protocols or to provide baseline data for restoration activities.

Partners for 2003-2004 Monitoring

Creek	Individual or Group	Date of Study/ Activity	Study or Activity	Parameters Measured	Level of coordination
Arroyo Mocho	Zone 7, David Lunn	Ongoing	Zone 7 Livermore Aqueduct Groundwater Recharge	Temperature, conductivity, discharge rates from South Bay Aqueduct (SBA), stage and flow records, yearly mineral analysis	Coordinate monitoring, Zone 7 will measure flow and temperature at several of our stations
Arroyo Mocho	Friends of the Arroyos (FOTA)	2003-2004	Implementing a SEP behind Granada High School		Consideration in station selection, continued communication
Arroyo Mocho	Zone 7, David Lunn	Summer 2003	Confluence realignment of Arroyo Las Positas and Arroyo Mocho, subsequent streambank restoration, fish ladders built upstream in both creeks		Consideration in station selection, continued communication.
Arroyo Mocho	Alameda Creek Alliance and Friends of the Arroyos (FOTA)	Ongoing	Restoration of fish habitat, removal of fish migration barriers		Consideration in station selection, continued communication
Arroyo Mocho	Vulcan	Ongoing	Redirect SBA flow into gravel pits for groundwater recharge		Consideration in station selection, continued communication
Arroyo Mocho	Lawrence Livermore National Lab	Summer 2004	Bridge replacement		Consideration in station selection, continued communication
Baxter and Strawberry	Purcell, A., C. Friedrich, and Resh 2002.	1999	Post-Restoration Study--Visual habitat assessment; water quality assessment using biological indicators.	Benthic macroinvertebrate family, taxa, and EPT taxa richness; proportion EPT; family biotic index. Channel morphology.	Consideration in station selection, continued communication. We will compare data.

Creek	Individual or Group	Date of Study/ Activity	Study or Activity	Parameters Measured	Level of coordination
Baxter	City of Richmond, Friends of Baxter Creek and the Aquatic Outreach Institute	Planned for June of 2005	FOBC wants us to monitor at the North Gateway site where they plan a restoration.		We will do pre-restoration bioassessment. Continued communication with both entities.
Baxter	Friends of Baxter Creek	(1) 8/14/2001 (2) 7/2001-8/2001	(1) 8 water samples (2) 40 water samples from 7 sites.	(1)Diazinon (2)Total coliforms, *E. coli*	Consideration in study design. Will compare to our data.
Baxter	Friends of Baxter Creek and Urban Creeks Council	Ongoing	Riparian restoration in Booker T. Washington Park.		Post restoration bioassessment, continued communication.
Cerrito	Friends of Five Creeks, Urban Creeks Council	Ongoing	Native plant restoration at Pacific East Mall		Considered in site selection, continued communication.
Cerrito	City of El Cerrito, City of Albany, and Friends of Five Creeks	2003-2004	Creek bank restoration at El Cerrito Plaza.		Consideration in site selection, continued communication.
Cerrito and Codornices	Friends of Five Creeks (Fo5C)	Ongoing	Water quality monitoring	Continuous temperature, depth and conductivity; sporadic dissolved oxygen, pH, phosphates, turbidity, nitrates, ammonia, E. coli	Coordination of probe monitoring with Fo5C grab samples
Codornices	Bill Kier Associates	2003	Codornices Creek Watershed Restoration Action Plan (CCWRAP); Fish barriers removal up to, and in future, above Albina St.; study of erosion site at St Mary's High School	Fish habitat	Consideration in station selection, continued communication.
Codornices	California State DWR Urban Creeks Restoration Program	Beginning early 2004	Restoration of riparian vegetation, natural streambanks, meanders, remediation of two fish ladders		Consideration in station selection, continued communication.

Creek	Individual or Group	Date of Study/ Activity	Study or Activity	Parameters Measured	Level of coordination
Codornices	Hydroikos Associates. Bob Coats, Principle	Report issued July 15, 2003	Water Quality in Codornices Creek. Written for the Urban Creeks Council. Purpose: to measure and document some of the water quality parameters in Codornices Creek.	Diazinon, chlorpyrifos, metals, discharge, temperature, hardness, conductivity, toxicity, sewage, dissolved oxygen, pH, turbidity	Consideration in study design and station selection. We will compare data.
Codornices	City of Berkeley	Fall 2002 or earlier	Great deal of yellow foam observed every year after runoff events. Also, high coliforms at Live Oak Park, which is posted.		We will test foam to determine if it is due to natural or anthropogenic sources. We will also coordinate our coliform monitoring with theirs.
Codornices and Sausal	Alameda County Clean Water Program (ACCWP)	April 2003	Watershed Assessment and Monitoring multi-year plan: water quality	BMI (Benthic macroinvertebrates -500 sample); DO, pH, conductivity, temp	Compare data.
Strawberry	Vincent Resh, University of California	Fall 2005	Aquatic invertebrate class completes a Family Biotic Index analysis of macroinvertebrate tests every other year.	Aquatic invertebrates	Consideration in station selection. We will compare data.
Strawberry	Karl Hans, Surface Water Quality Program at UC Berkeley's Office of Environment, Health and Safety	Ongoing	15 years of water quality testing. Pathogens ongoing, coordinate with students for other studies	Regular coliform monitoring. Metal analyses.	We will coordinate monitoring and compare results.
Strawberry	Committee to minimize toxic waste	Monitoring for Tritium from LBL	Sample first flush		
Aquatic Park	City of Berkeley Environmental Health	Ongoing	Bacteriological monitoring	Coliforms	We will use data and continue communication.
Aquatic Park	Laurel Marcus and Associates, Hydrologic Systems, Hydroikos associates, Vallier Design Associates	2002-2003	Report for the City of Berkeley: Natural Resources Management Study (2003)	Water depths, bathymetry, tidal height, temperature, salinity	We will add continuous monitoring data for temperature, dissolved oxygen, pH and conductivity, especially in low flushing area.

Creek	Individual or Group	Date of Study/ Activity	Study or Activity	Parameters Measured	Level of coordination
Temescal	Applied Marine Sciences for Alameda County Public Works Agency; Report by Paul Salop and Mey Akashah	April-June, 2003	*2003 Bacteriological Sampling at the Temescal Pump Station*, June 2003. Sampling at Hardy Park	Fecal coliforms and *E. coli.*	Consideration in study design and station selection.
Temescal	Friends of Temescal Creek	(1) Water quality: 9/2003 and ongoing; (2) Bacteria: 9/2002 and ongoing	(1) Water quality monitoring: monthly in 2004 (2) Pathogen sampling: 5 weeks each season	(1) Nitrates, phosphates, pH, alkalinity, dissolved oxygen, turbidity, temperature; (2) Total coliforms and *E.coli.*	We will coordinate probe measurements with FoT grab samples. Compare data and methods between volunteers and SWAMP.
Lake Temescal	East Bay Regional Park District	Ongoing: March through October, every 6 days.	Pathogen sampling	Total and fecal coliforms, and *E. coli*.	We will use their data. Continue communication.
Glen Echo	Engineers without Frontiers: Lead student is Eugene Chou, UCB group of students	2004-2005	Student engineering project to develop nitrogen budget for Glen Echo creek and Lake Merritt.	(1) Secchi Depth, Temp, Dissolved Oxygen, Specific Conductivity, Nitrate (2) Nitrate and Flow	We will coordinate and enhance monitoring data.
Glen Echo	Piedmont Avenue Neighborhood Improvement League	Ongoing	Members of PANIL help clean up creek, plant native plants in restored areas, remove non-natives		Consideration in station selection.
Lake Merritt	Alameda County	Ongoing	Alameda county sponsors weekly bacteria sampling at Lake Merritt.		We will use their data.
Lake Merritt	Alameda County Flood Control District	1990 - 1995	Water quality monitoring	Temperature, dissolved oxygen	We will use data to locate stations.
Lake Merritt	Lake Merritt Institute, Dr. Dick Bailey	1997-2000	Trash removal	Quantified trash	Continued communication.
Sausal	Friends of Sausal Creek (FOSC)	3/99-10/99	2 rounds of testing at four sites along Sausal Creek.	2 5-week E. Coli tests.	Consideration in station selection, study design.
Sausal	Friends of Sausal Creek (FOSC)	Ongoing	(1) Conventional water quality monitoring (Grab) monthly since 1998 at 4 sites (2) Aquatic insect sampling ongoing monthly since 1998	(1) DO, pH, temp, conductivity. (2) Aquatic insect larvae	We will coordinate monitoring and compare volunteer and SWAMP methods. Two sites in both studies are the same as SWAMP sites.

Creek	Individual or Group	Date of Study/ Activity	Study or Activity	Parameters Measured	Level of coordination
			at 2 sites		
Sausal	Sara Laurin Ash/ Environmental Sciences Student at UC Berkeley.	2000	Student study, summer sampling	Total coliforms, *E. coli*, ammonia, DO, pH, conductivity, insect abundance, diversity, temperature, and flow rate.	Consideration in study design, station selection. We will compare data.
Sausal	Alameda County Clean Water Program (ACCWP)	8/20/2002	Trash Assessment	Trash	Compare data.
Peralta	City of Oakland, Urban Creeks Council	March 2004 and ongoing for five years, bimonthly monitoring	Cesar Chavez Park restoration site: post-restoration vegetation, water quality and insects bimonthly volunteer monitoring, led by city.	DO, pH, turbidity, temperature, total dissolved solids. Macroinvertebrate sampling. Vegetation monitoring.	We will coordinate monitoring and compare volunteer and SWAMP methods.
Lion	City of Oakland, Oakland Housing Authority, East Bay Asian League Development committee (EBALDC)	Looking for funding	Coliseum Gardens: restoration at bottom of watershed; post-monitoring expected, not yet planned.	Expected: DO, pH, turbidity, temperature, total dissolved solids. Macroinvertebrate sampling. Vegetation monitoring.	Consideration in station selection. Possible pre-restoration continuous monitoring.
Lion	Mills College (Paul Richards); Merritt College (Gary Scott)	Various	Sporadic water quality testing by students; creek inventory.		Communication. Good resources on Lion Creek
Lion	Thomas Butler	June 2003	*Aqueous Geochemistry of an Acid Mine Impaired Watershed*. Masters thesis investigating upper watershed.	Copper, zinc, manganese, iron speciation, sulfate, chloride, alkalinity, tritium, total dissolved cations, pH, temperature, conductivity.	Consideration in station selection and study design
Arroyo Viejo	City of Oakland, Alameda County Flood Control District, Coastal Conservancy, and local community groups	Restoration finished February 2002; monitoring for 5 subsequent years	Arroyo Viejo Recreation Center: bank revegetation. Semi-annual water quality monitoring by city	DO, pH, turbidity, temperature, total dissolved solids. Macroinvertebrate sampling. Vegetation monitoring.	Coordinate monitoring, compare methods.

Creek	Individual or Group	Date of Study/ Activity	Study or Activity	Parameters Measured	Level of coordination
Arroyo Viejo	Oakland Zoo, Environmental Education Center, Roots & Shoots Program; Anne Warner at Zoo, Ali Schwarz at Oakland City.	2004 -2005	Restoration planned for section of Creek near entrance to zoo, funded by the Coastal Conservancy. Plan monitoring	Not decided	We will conduct pre-restoration probe monitoring of temperature, dissolved oxygen, pH, and conductivity.
Arroyo Viejo	Holy Redeemer Center, Urban Creeks Council, City of Oakland, Dept. of Water Resources	Future (2004/2005/ 2006)	Daylighting of creek planned under field at Holy Redeemer site (850' reach) (below Golf Links Rd.).		Consideration in station selection.
Arroyo Viejo, Strawberry, Codornices, and Cerrito	Alameda County Clean Water Program (ACCWP)	Sep 2002, Jun 2003	Watershed Assessment and Monitoring multi-year plan: water quality	DO, temperature, pH, conductivity, turbidity, ammonia, chlorine, detergents, copper, zinc, diazinon	Compare data.

B. Level of Coordination – See table above.