WATER QUALITY MONITORING PROGRAM

INVENTORY AND ASSESSMENT

Working Draft

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1. Introduction

1.1 Background

In an effort to better understand issues related to restoration of the Salton Sea, the Salton Sea Science Office (Science Office) has been asked to provide an evaluation of water quality supported by existing scientific data. In addition, the Science Office plans to develop baselines for a monitoring program that will support evaluation of long-term restoration management practices. Such a monitoring program will involve the development of integrated models of the Salton Sea ecosystem and identification of multi-purpose water quality indicators. To date, these activities have not yet been carried out. Nevertheless, water quality is a parameter that will be included within future modeling efforts.

There is a substantial number of historic and current water quality monitoring activities within the Salton Sea watershed. These activities represent a wide variety of interests from research activities to environmental compliance, as well as various data collection techniques, testing and analysis, and data recording and storage. The Science Office has recognized that increased collaboration and sharing of water quality data within the basin can increase the availability and quality of information needed to support scientific exploration. At the same time, this information can support the better resource management, environmental protection, human health and welfare, and other objectives of all the WQTC members. Specific benefits could include increased access to information, efficiencies in data collection and dissemination, reduced redundancy, and increased inter-agency communication and collaboration.

1.2 Objectives

In July 2000, Dr. Milton Friend initiated the formation of the Salton Sea Water Quality Technical Committee (WQTC), to serve as an external advisory committee to the Science Office.

The primary objectives for the WQTC were defined as follows:

- Enhance collaboration regarding water quality data sharing, storage, and distribution;
- Develop common methods for water quality sampling and analytical work wherever feasible to facilitate data compatibility;
- Conduct collective, ongoing technical evaluation of water quality information for monitoring changes in the Salton Sea; and

- Develop technical evaluations in response to water quality issues associated with the restoration project.

While there are and have been a wide variety of water quality monitoring efforts underway in the Salton Sea basin, it is generally recognized that the level of coordination among agencies, institutions and other stakeholders is not as high as it could be, and that significant mutual benefit and synergy might be achieved if it were. The WQTC members decided that a good first step towards understanding the situation would be to create an inventory and characterization of existing water quality monitoring efforts, and to assess the opportunities and constraints to more coordination and information sharing.

1.3 Role of the Salton Sea Database Program (SSDP)

The Salton Sea Database Program (SSDP) is supporting the WQTC to undertake a first step in developing a preliminary inventory of existing water quality data collection activities within the Salton Sea watershed, in collaboration with the Regional Water Quality Control Board (RWQCB).

Over the past three years, the SSDP has served as a clearinghouse of information concerning the Salton Sea and its environs. In addition to serving as a data repository and dissemination body, the SSDP has assisted various agencies and stakeholder groups in the effective application of Geographic Information System (GIS) and related information technologies through a variety of applications, including requirements analysis, technology research, systems design, spatial analysis, visualization and other activities. The SSDP has also worked with several agencies and stakeholder groups to apply geographic and information science principles and practices to enhance information collection, management, application and dissemination.

The primary focus of the SSDP is development of a decision support "infrastructure" of data, and information management and analysis tools to support multi-disciplinary and coordinated decision-making across all the professional and scientific teams and stakeholders involved in the Salton Sea restoration project. Included in this development is the promotion and support of regional information sharing and collaboration. The WQTC represents an important water quality "domain" that can benefit from this approach.

Coordination across many organizations, institutions and agencies typically requires an independent support and facilitation function. As expected, administrative mandates, topical and geographic jurisdictions, research and monitoring interests, purposes, and priorities vary from one organization to another, and some of these may presently conflict. The SSDP, as an independent and un-biased participant, can play an important role in helping to collect and synthesize information to help the members of the WQTC focus on common interests and benefits, while minimizing constraints or conflicts.

This report documents an initial effort to inventory the wide scope of water quality monitoring activities within the Salton basin, and to synthesize certain information that

may help in identifying the potential for increased coordination and data sharing among the stakeholders. The report provides:

1) an overview of the methods used to collect and synthesize information concerning water quality monitoring activities in the Salton basin;
2) a summary of the organizations and agencies involved in water quality monitoring;
3) a summary of the water quality monitoring programs or activities carried out by each organization;
4) a listing and description of water quality information collected as a part of each program;
5) a summary of various opportunities or obstacles to more effective cooperation and data sharing, as expressed by agency representatives.

2. Water Quality Monitoring Inventory

An initial Water Quality Monitoring Inventory was conducted as the first step in exploring the potential for collaboration and data sharing within the Salton basin. This inventory was designed to identify the organizations most active in water quality monitoring in the area, locate and characterize their major programs in a standard form, synthesize the information from the interviews, and review the inventory and synthesis results with the WQTC in a workshop format. The inventory involved 17 organizations who have conducted, are conducting, or plan to conduct 78 separate water quality monitoring programs or activities within the basin.

The sections following summarize the methods used to conduct this inventory, and presents a list of the participants.

2.1 Methodology

The Regional Water Control Board (RWQCB) and the Salton Sea Database Program (SSDP) collaborated in conducting the inventory and related activities. This included the following general steps:

- Prepare inventory form;
- Conduct interviews;
- Synthesize interview information;
- Conduct review workshop.

Step 1 - Prepare Inventory Form

In a first step, the RWQCB and the SSDP compiled a form for recording existing water quality data collection activities within the Salton Sea watershed. As part of this effort, the SSDP explored several national and regional water quality monitoring projects in which certain content and structure standards for data topics have already been identified,

representing a basic framework for this type of monitoring inventory. For example, the National Water Quality Monitoring Council (NWQCMC) and the Methods and Data Comparability Board (MDCB) provide a framework for comparing, evaluating, and promoting monitoring approaches that can be implemented in all appropriate water quality monitoring programs nationwide. This type of program allows organizations to compare methods based on several factors including data collection, data analysis, and data quality.

Further programs and projects dealing with similar approaches for water quality monitoring databases that were referenced during this effort are listed as follows (see bibliography for a more detailed description of references):

- *Florida Keys Ecosystem Integration Project: Establishing NOS Priorities*
  National Ocean Service / NOS Florida Keys Ecosystem Integration Team

- *Regional Water Management Planning Series – Planning System Database Design*
  Washoe County Department of Comprehensive Planning

- *Changing California - From Wastesheds to Healthy Watersheds: A Characterization of California Watershed Organizations and Activities*
  Michael Vincent McGinnis; John Turner Wooley / University of California, Santa Barbara

- *Methods and Data Comparability Board*
  National Water Quality Monitoring Council (NWQMC)

- *National Irrigation Water Quality Program*
  U.S. Department of the Interior

- *National Water-Quality Assessment (NAWQA) Program – Nutrients National Synthesis*
  U.S. Geological Survey

The documents listed above have provided insight as to how the water quality monitoring programs within the Salton basin can be described and classified in a form that can be easily analyzed to identify areas of common need and benefit. The more appropriate of these standards were synthesized to a combined set by SSDP and RWQCB staff.

Step 2 - Conduct Interviews

In September 2000, SSDP staff began conducting interviews with the different members of agencies and organizations engaged in water quality monitoring activities. An interview checklist (see **Appendix A**) was put together to provide a basic framework for discussion, and to allow consistent information assessment across various scientific teams, agencies, and organizations. The interview checklist is composed of several water

quality data elements derived and based upon the MDCB core data element suggestions. Information from interviews was compiled to a common form, and provided back to interviewees for review and refinement. The interview process was finalized at the end of January 2001.

The following basic information needs were addressed in the interviews and are evaluated in this document:

WHO — is/was doing sampling and/or has water quality data?

WHAT — is/was the nature of their sampling/composition of their data sets?
— what are the findings?

WHEN — are/were the samples taken and what is the longevity of the data set?

WHERE — are/were the samples taken (geographic) and from what substrates?

WHY — are/were the samples taken (purpose)?

HOW — are/were the samples taken (methods, frequency, etc.) and what is the validity of the findings?

The product developed is a concise visual display of who is doing *what*, *when*, *where*, *why*, and *how*. The product is supplemented by written and tabular information as is needed to clarify common needs and opportunities for future coordination and efficiencies, and to identify the opportunities/constraints to more collaboration and data sharing. The full interview documentation is included in **Appendix D**.

Step 3 - Synthesize interview information

The third step involved evaluation and synthesis of all the information collected during the interviews. This included a number of assessments that are all described later in this document, including:

- Organization assessment.
- Program assessment.
- Data assessment

The synthesis also included the compilation of a "metadata" database describing each monitoring program. A GIS database was also compiled indicating monitoring locations geographically, and this information was "linked" with the metadata database. Several matrices were developed to highlight key issues, such as the number of organizations collecting similar information, and other such insights.

Step 4 - Conduct review workshop.

A workshop is to be conducted to review the results of the Inventory with the WQTC and identify what steps should be taken next. This workshop is to be conducted February 14, 2001.

2.2 List of Participants

In-person interviews were conducted with the following individuals (listed in chronological order):

- Agua Caliente Band of Cahuilla Indians (Sean Milanovich, Palm Springs, CA);
- Twenty-Nine Palms Band of Mission Indians (Marshall Cheung, Coachella Valley, CA);
- Imperial County Department of Public Health Services (Mark Johnston, El Centro, CA);
- Imperial Irrigation District (Stephen Charlton, Imperial, CA);
- International Boundary and Water Commission (Charles Fisher, San Diego, CA);
- UC Davis (Gerald Orlob, Davis, CA);
- U.S. Bureau of Reclamation (Jim Setmire, Temecula, CA);
- U.S. Geological Survey (Roy Schroeder, San Diego, CA);
- San Diego State University (Stuart Hurlbert/Joan Dainer, San Diego, CA);
- Regional Water Quality Control Board, Region 7 (Danny McClure, Palm Desert, CA); and
- UC Riverside (Michael Anderson, Riverside, CA).

Each interview was documented in a narrative write-up that describes the administrative context of each organization, identifies and describes each water quality monitoring program or activity, and articulates the opportunities and constraints to cooperative data sharing, from the perspective of each interviewee. The initial interview write-ups were provided to interviewees for review, confirmation, correction, and approval.

The following organizations and institutions provided answers to the interview checklist via e-mail or facsimile, or referenced documents and reports containing their program information:

- Coachella Valley Water District (Tom Levy, Coachella, CA);
- U.S. Fish and Wildlife Service (Carol Roberts, Carlsbad, CA);
- California Department of Water Resources (Gary Gilbreath, Glendale, CA);
- Bureau of Reclamation (Chris Holdren, Denver, CO);
- Environmental Health Department of Riverside (Don Park, Riverside, CA);
- Wright University (Wayne Carmichael, Dayton, OH); and
- California Department of Pesticide Regulation (Nan Singhasemanon, Sacramento, CA).

3. Synthesis of Inventory Results

3.1 Introduction

While the inventory of information about individual water quality monitoring activities and programs is useful; synthesizing this information should illuminate opportunities for agencies to share in the collection, storage, and management of water quality data. The following discussion focuses on the those commonalities, duplicative efforts, and apparent joint needs that agencies expressed about the various water quality monitoring efforts in the Salton Sea basin. Also, the discussion includes those organizations or types of agencies that may have limits or constraints to collaborative water quality monitoring efforts.

3.2 Methodology

Information for the analyses was culled from the interviews, various reports and documents, and data samples provided by the different organizations (see bibliography for a detailed list of references). Extracting and summarizing the information in Excel spreadsheets resulted in a series of tabular and comparative analyses to see which organizations share the same program types, objectives, monitoring locations, monitoring timeframes, and data constituents. The following assessment of this data is divided into three separate assessments; *organizational, program/activity, and data constituents.* The assessments included characterization by assigning descriptive terms to assist in evaluating the inventory. These terms, which are presented in this chapter, are defined more completely in **Appendix B**. Also, large data charts and matrices, which are summarized in this report, can be viewed on the SSDP web site at the following URL's:

http://cem.uor.edu/pub/huynen/wq/matrix.pdf

http://cem.uor.edu/pub/huynen/wq/constituent.pdf

http://cem.uor.edu/pub/huynen/wq/organization.pdf

The inventory data was organized by agency followed by the program or activities these agencies conducted which had some aspect of water quality monitoring. These programs or activities were either past, present, or planned water quality monitoring efforts. The *organizational assessment* had the following information:

- Organization
- Program
- Brief Program or Activity Description

This is then followed by the *program assessment* that characterized and provided descriptive information about each program as follows (and are defined in later sections):

- Program Description
- Program Objective/Purpose
- Program Status (Historical/Current/Future/Unknown)
- Funding Source
- Name of Monitoring Site
- Type of Sampling Medium
- Number of Sampling Sites
- Sampling Frequency
- References Cited

This study attempted to collect information on a variety of other program/activity characteristics is listed. However, not enough information was collected on these characteristics to report findings at this time (however, many of these characteristics will be established in a future data analysis phase). It is the study team's hope that agencies and organizations reviewing the findings to date will be able supplement missing data. These characteristics include:

- Sampling Method
- Data Format
- Update Frequency
- Data Access
- User Constraints
- Analysis Method
- Agency Cooperation

Following the program assessment, an inventory of the data constituents is presented and characterized for each water quality monitoring program or activity. Sixty-nine different data constituents were tabulated. These constituents were classified in three major categories by sampling medium:

- ***Water Extracts***
- ***Sediments***
- ***Organism Tissue***

The bulk of data constituents are extracted from water samples. Thus, ***water extracts*** were further broken down into seven categories as follows:

- ***Water Extracts***
  - General Physical/Chemical
  - Nutrients
  - Bacterial
  - Biological
  - Pesticides
  - Hydrological
  - Metals

Much of the synthesis presented in the following *data assessment* were organized by these constituent categories. The complete list of data constituents is given in **Appendix B**.

3.3 Organization Assessment

The 17 organizations and agencies interviewed as part of this study varied widely in terms of their mandate, jurisdiction, and functional activities. It is important to understand the characteristics and relevant issues associated with different types of agencies to help recognize their capacity and motivation for participating in data sharing or collaborative monitoring and data sharing initiatives. Primary considerations include:

Organizational Mandates. Legal, chartered, or otherwise committed mandates may affect an organization's ability or inclination to collaborate with other organizations. For example, a resource protection mandate may require both a general approach to monitoring the status and trends of a resource, as well as a specific approach to addressing problems. Agencies providing water resources as a utility have a fiduciary responsibility to the members or rate-payers that may require rate justification, and protection of user rights.

Jurisdiction. Organizations may have topical and geographic jurisdiction. Topical refers to an agency's legal or chartered responsibility to monitor or administer a specific function. Examples would include US Fish & Wildlife Service's topical

responsibility to protect wildlife, or the Regional Water Quality Control Board's responsibility to administer storm water discharge permits.

Geographic jurisdiction represents an agency's responsibility for a specific geographic area. Examples include Imperial Irrigation District's mandate to deliver irrigation water within the Imperial Valley, or the Twenty Nine Palms Band of Mission Indians jurisdiction over water quality within tribal lands.

Some organizations that participated in this study, such as Universities, have no specific jurisdiction, but topical concerns dictated by research interests or funding. Organizations with topical jurisdiction desire information that supports their specific issues or concerns. Their funding source may not allow a broad based data collection over the longer term, rather only focused data collection. Organizations with geographic jurisdiction may only be concerned with data that are specific to their lands, and not to issues outside their boundaries. Thus, coordinating water quality monitoring efforts over an entire large water body or watershed becomes difficult where multiple agencies have various types of jurisdiction.

Some agencies working in the Salton Sea basin have shared water quality data in the past such as Federal agencies conducting NIWQP studies. Other agencies with more confined mandates or jurisdictions generally operate more independently. The following reviews organizational matters that are relevant in assessing organizations ability to participate in collaborative data sharing activities.

The 17 agencies interviewed are categorized below by organizational/administrative types.

Federal Agencies. The activities of federal agencies are generally mandated by federal law. Some agencies, like the USGS, are focused on the collection and dissemination of various sorts of geographic and environmental data, and are more likely to have developed the technical and administrative infrastructure needed to share data with others. Also, because they have a broad mandate, the USGS is also apt to participate cooperative efforts. Other federal agencies, like the Bureau of Reclamation are project focused, and therefore usually get involved in joint data collection where it directly supports project objectives. US Fish and Wildlife and other such resource protection or management agencies may only be interested in monitoring activities where the locations and constituents are consistent with their mandate. Federal agencies in this inventory include:

US Bureau of Reclamation
US Fish and Wildlife Service
US Geological Survey
International Boundary and Water Commission

State Agencies. These agencies can be topical or jurisdictional in nature and also have responsibilities mandated by State law. They may also respond to specific issues through the Governor's office or State legislature. They include:

California Department of Pesticide Regulation
California Department of Water Resources
Regional Water Quality Control Board

County Agencies. County agencies involved in water quality monitoring are almost always jurisdictional in responsibility, with the obvious county boundaries as their domain. They include:

County of Riverside - Health Services Agency
Imperial County Department of Public Health Services

Utilities. Utilities are unique amongst the group of agencies interviewed as they deliver a product, i.e. water, and receive revenue for their product. Utilities have a fiduciary responsibility to serve their users and stockholders.. Thus, utilities are not in a position to engage in activities that might decrease their revenue stream or compromise the interests of their users.

Coachella Valley Water District
Imperial Irrigation District

Indian Tribes. Tribal nations tend to be fully engaged in their own affairs and often have Sovereign Nation Status that may limits their engagements with outside agencies. Tribes include:

Agua Caliente Band of Cahuilla Indians
29 Palms Band of Mission Indians

Universities. Universities perform basic or applied research, almost always through grants or contracts. Basic research will focus on the agenda of the Principal Investigator, whereas applied research will usually be carried out to support a project or policy issue.

San Diego State University
University of California - Davis
University of California - Riverside
Wright State University

3.4 Program Assessment

The agencies and organizations reported a total of 78 different water quality monitoring programs or activities. They are listed below by organization, program/activity, followed by a brief description of the program:

Organization
Program/Activity
Brief Description

Agua Caliente Band of Cahuilla Indians
Groundwater Monitoring
Groundwater monitoring plan on tribal lands
Surface Water Monitoring
Monitors surface water on Tribal lands

California Department of Water Resources (DWR)
Description Surface Water
Surface water monitoring

Coachella Valley Water District (CVWD)
Agricultural Drainages
Monitor agricultural drainages
Drinking Water
Monitor nine systems, 100+ wells
Groundwater
Monitor for replenishment issues
Irrigation Water
Coachella Canal WQ monitoring
Salton Sea
General monitoring
Storm Water
Impacts on Coachella Canal water quality monitoring
Wastewater and Recycled Water
Monitor six wastewater facilities

County of Riverside - Health Services Agency
Monitor for Bacterial Quality
Monitor bacterial quality in bathing areas

Imperial County Department of Public Health Services
Monitoring of Salton Sea
Monitor bacterial quality in bathing areas

Imperial Irrigation District (IID)
New River Wetlands Project
Monitoring proposed for constructed wetlands
Fig Lagoon
Lagoon created following drain storm damage
Drain Water Quality Improvement Plan
Drainwater quality and BMP potential
Lewis Drain Pilot Project
Explore drainwater treatment options
River Water Monitoring Program
General monitoring to determine contamination

Irrigation Runoff & Reduction Program
Reducing pollutants in irrigation runoff
Tailwater Return Systems (Demo & MWD)
Returning drainwater to irrigated fields
Raw Surface Water Monitoring/Title 22
General surface water monitoring
Surface Water Monitoring at Salton Sea
Reduce sediment loads in drainwater
Peach/Pampas Watershed Study
Study of water quality issues in entire watershed
Triploid Grass Carp Aquatic Vegetation Control
Reduce sediment through grass reduction
Imperial Dam Desilting Program
Reduce sediments through desilting basins
BOR-IID Cooperative Drainwater Reclaim & Reuse
Reuse of drainwater

International Boundary and Water Commission (IBWC)
New River Sanitation Project (No 264/1980)
Monitor impacts of effluents from Mexico
Alamo River
General hydrologic data compendium
River Flow Data - New River/Alamo
General hydrologic data compendium
Western Water Bulletin 1994
General hydrologic data compendium

Department of Pesticide Regulation
Pesticide Monitoring Program
Determine pesticide levels in surface waters

Regional Water Quality Control Board – Region 7 (RWQCB)
New River/Mexicali Sanitation
Determine if sanitation projects improve water quality
Toxic Substance Monitoring Program (TSMP)
Determine toxic substances impact on fish
Trend Monitoring
Supports requirements of Clean Water Act
TMDL Development/Compliance Monitoring - New River
Focused studies on 303d) list
TMDL Development/Compliance Monitoring - Alamo River
Focused studies on 303d) list
TMDL Development/Compliance Monitoring - Salton Sea
Focused studies on 303d) list
New River Monitoring
General Monitoring
Trifolium 12 Drain
General Monitoring
Alamo River Monitoring
General Monitoring
All American Canal Monitoring

General Monitoring
Summary of Water Quality: Several Locations
General Monitoring

San Diego State University (SDSU)
Plankton Populations
Determine plankton populations in Salton Sea
Benthic Invertebrate Populations
Determine benthic invertebrate populations in Salton Sea

29 Palms Band of Mission Indians
CWAct/Section 109/1999
General Monitoring
104b Program/2000
Point source discharge monitoring
FIFRA / 1999
Monitor pesticides through new shallow well
State 319/1999
Monitor non-point pollution sources
State 319/2000
Monitor non-point pollution sources

University of California - Davis
New and Alamo River Preliminary Studies
Historical monitoring of five constituents

University of California - Riverside
Nutrient Cycling in Salton Sea
Look at nutrient loading and TMDL

US Bureau of Reclamation (US BOR)
NIWQP-1986/87 Reconnaissance
Water quality in various sampling types
NIWQP-1988/90 Detailed Study
Detailed study of irrigation drainage parameters
NIWQP-1994 Stilt Reproduction Impacts
Impact of selenium on Stilt reproduction rate
NIWQP-1988 Sediment Cores
Salton Sea as nutrient sink
NIWQP-1998/99 Sediment Cores Salton Sea
Salton Sea as nutrient sink and selenium levels
NIWQP-1994/95 Selenium Study
Salton Sea as nutrient sink and selenium levels
New River Wetlands
Water quality reconnaissance along New River
Lewis Drain
Unknown at this time
New River
Unknown at this time
Salton Sea Monitoring
Unknown at this time

US Fish and Wildlife Service (US F&WS)

NIWQP-Selenium/Irrigation Drains
Determine contaminant exposure to wildlife
NIWQP-Piscivorous Birds 92/93
Determine contaminant exposure to birds
Organochlorine/Selenium in Birds/Fish 91
Determine pesticides and selenium in waterbirds
Boron in Waterfowl at the Salton Sea
Determine level of boron toxicity in waterfowl

US Geological Survey (USGS)

NIWQP-1988 Sediment Cores
Salton Sea as nutrient sink
NIWQP-1998/99 Sediment Cores Salton Sea
Salton Sea as nutrient sink and selenium levels
NIWQP-1986/1987 Reconnaissance
Water quality in various sampling types
NIWQP-1988/1990 Detailed Study
Detailed study of irrigation drainage parameters
Bi-National Sampling Program 95/96
Joint project with several agencies
Tritium Study, Schroeder, 94
Determine groundwater movement into drains
Pesticide Study, Grebe Die-0ff 92
Determine if pesticides contributed to bird death
Dissolved Oxygen Project 78/79
Dissolved oxygen travel time and biological component
Study of Pesticides, Eckels, 77/78
Focus on pesticides in large drains
NASQAN
General monitoring
Nutrient & Pesticide Study, Irwin 69/70
Nutrient and pesticide monitoring
Groundwater Monitoring Program 60's
Earliest groundwater monitoring
Surface Water Flow Monitoring
Unknown at this time

Wright State University

Algae Blooms & Biotoxins
Determine impact of algal blooms and biotoxins

3.4.1 Program Purpose and Objective

Programs or activities were classified into similar purposes or objectives for evaluation. Programs with similar purposes often have similar types of data needs. For example, permit compliance (described below) programs have applicants who may be required to

provide their own water quality data. For each of the monitoring programs or activities listed previously, a *primary* purpose or objective was assigned, defined as follows along with some organizational and data implications:

Reconnaissance. Describes an initial water quality monitoring effort, usually a short-term study, to define the occurrence or extent of a water quality issue for further study. Reconnaissance studies often define the data parameters for further study. Reconnaissance studies often perform one-time data sampling or use historical or field observation data. They may be confined to a small geographic area or take fewer samples over a larger area.

Trend Analysis. A study to establish temporal data for a water quality trend which has occurred over a certain time period. Often historical data, if available and appropriate are combined with some term of ongoing water quality data. Where trend analysis requires all new monitoring data, expense may limit the amount of data collected.

Permit Compliance. Certain permits may require specific water quality data that is collected to fulfill permit requirements. Often the monitoring effort is borne by the permittee for a specific site. If the permittee's data could be standardized and coordinated with other data gathering efforts, it could contribute to an overall database structure.

Pollution Event. If a pollution event, such as a leaking fuel storage area or collapse of effluent storage basin, water quality data may be collected to monitor apparent adverse water quality. Often this monitoring is specific in nature and confined to the apparent impact area.

Storm Event. Similar to above, water quality monitoring that follows a storm event to determine the storm's impact on water quality.

Volunteer Monitoring. Monitoring performed by citizens or a concerned organization not under the auspices of a governmental body or institution. This data monitoring is usually very difficult to coordinate with other monitoring efforts. It is possible, however, that public access to communal data would negate the need for private data gathering efforts by the public. This also allows data to be utilized that meets generally agreed upon standards for collection and analysis.

General Monitoring. Typically ongoing monitoring which provides long-term background data on water quality or is used to determine if a water quality threshold is breached. These efforts usually examine the most common data constituents so that a breadth of water quality objectives can be monitored. General monitoring efforts, often of the same constituents in the same sample areas over the same time period, are typically not coordinated in the Salton Sea basin.

Monitor Specific Site. Water quality monitoring of a specific location, usually evaluating a project's post-construction impact on water quality. While historic monitoring data may be available for a specific site, it may not be of the proper constituents, time period, or analysis method or standards to be useful.

Research. Monitoring conducted for specific research purpose. Research data often has the capability to contribute to longer term monitoring data base development if standards for constituents and analysis methods are established.

Demonstration Project. Monitoring the results or impacts of specific projects designed to show the benefits of some specific change in the physical environment. Longer term general monitoring or trend analysis data, if available for the demonstration project area, can form the baseline for demonstration project monitoring. An example would be monitoring down stream areas for turbidity and suspended solids after retention or siltation basins have been installed upstream.

Unknown. The purpose of the monitoring was not established at this time.

Following is the results of a tabulation of all programs and activities by their primary purpose or objective.

Purpose/Objective	Number of Programs/Activities
General Monitoring	25
Research	19
Reconnaissance	6
Permit Compliance	6
Monitor Specific Site	6
Trend Analysis	4
Demonstration Project	2
Pollution Event	1
Storm Event	1

The greatest number of programs are or have been engaged in "general" water quality monitoring, which refers to routine water quality monitoring. General monitoring programs tend to gather the same kind of data constituents — usually water extract data — including general physical/chemical, nutrient, bacterial, and hydrologic data. Research oriented water quality monitoring, the second largest number of programs, usually investigates a wider span of water quality data which are related to specific research objectives. Research projects monitor typical physical/chemical parameters and also pesticides, biota, and constituents found in sediments and organism/tissue. Yet, usually a more limited number of constituents are collected.

Figure 1 shows which agencies are involved in the leading types of water quality monitoring programs, general monitoring and research. As one might suspect, County

agencies, Indian Tribes, water utilities, and the IBWC are engaged in general monitoring activities. These agencies, which have jurisdictional areas or health mandates, perform general monitoring on surface waters. The RWQCB, which has water resource quality responsibilities, is involved in TMDL development and compliance and the protection of various surface waters including drains and channels. The RWQCB lists 5 general monitoring programs. Research programs are the domain of universities (UC-Davis, UC-Riverside, SDSU, and Wright State University) and federal agencies; US Bureau of Reclamation, US Fish & Wildlife Service, and USGS. These federal agencies have been responding to specific issues including nutrification, selenium contamination, and pesticide toxicity. The Imperial Irrigation District is the only agency to conduct a large number of both general monitoring (4) and research projects (3).

3.4.2 Geographic Distribution of Programs

The location of water quality monitoring activities is not generally geographically wide ranging in the basin due to the specific concentration of surface waters in the Salton Sea and Alamo and New Rivers. The table below (and **Figure 2**) shows the number of programs that perform monitoring at various locations.

The total is larger than the 78 programs previously listed as some programs collect data in more than one type of location.

Monitoring Location	Number of Programs/Activities
Surface Waters	
Rivers (typically Alamo and New Rivers)	27
Salton Sea	17
Irrigation Runoff Drains	17
Other (includes wetlands, channels, treatment plants)	10
Non-Surface Waters	
Biota	13
Sediments	10
Groundwater	6
Soil	1
Other	1
Unknown	7

It is no surprise that most monitoring programs and activities are concentrated along the New and Alamo Rivers, and within the Salton Sea. As the concentration of natural and chemical constituents in the Salton Sea has increased rapidly over the past decades, and selenium and pesticide concerns elevated in the 1970's and 80's, the New and Alamo Rivers became obvious suspects for transporting pollutants to the Sea. Virtually all the irrigation drains, storm drains, and surface runoff in the Imperial Valley lead directly into the New and Alamo Rivers. Additionally, waters of questionable quality originating from Mexico are transported via the two rivers and introduced into the Sea.

Despite multiple programs and activities, and virtually hundreds of water quality monitoring sites located along and around these two rivers, there are very few coordinated data efforts among the many organizations monitoring the rivers (see table below). As suspects for transporting nutrients and selenium — amongst other contaminants resulting from agricultural activities — irrigation drains are also characterized by a large concentration of programs. The Salton Sea, the receptacle of all runoff and pollutants of the basin, is also the recipient of over 15 programs.

The table below and **Figure 3** summarizes the distribution of programs by monitoring location for each of the 17 agencies.

Monitoring Location	Organization	Number of Programs
Surface Waters		
New and Alamo Rivers	RWQCB	8
	USGS	6
	IBWC	4
	29 Palms Band	3
	IID	2
Salton Sea	USGS	4
	RWQCB	3
Drains	IID	6
	USGS	4
	RWQCB	3
	CVWD	2
	US BOR	2
Non-Surface Waters		
Organisms/Tissue	US BOR	5
	US F&W	4
	USGS	2
	SDSU	2
Sediments	US BOR	5
	USGS	4
Groundwater	29 Palms	3

The New and Alamo Rivers are monitored by IBWC (4 programs/activities), RWQCB (8), US Bureau of Reclamation (5) and USGS (6). Drains are monitored by Coachella Valley Water District (2), Imperial Irrigation District (6), RWQCB (3), US Bureau of Reclamation (2) and the USGS (4). An investigation of the water quality monitoring sites and timeframes later in this section will show that there is great overlap in locations and time periods where water quality monitoring data is collected.

While several federal agencies have programs which examine biota (mostly water birds, nests, and fish), the species and locations tend to be different, although the purpose, constituents causing toxicity, is usually the same.

3.4.3 Water Quality Monitoring Sites

Some 1630 water quality monitoring sites were reported in the inventory. It is our estimate that sites represent only about 40% to 50% of the total number of sites. The sites reported are those that could be identified by location using data samples, maps, and coordinates provided by the study participants. Digital maps were prepared that showed the location of these points. Most water quality points are clustered around the Salton Sea and New and Alamo Rivers. However, a large number of outlying points, including drains and groundwater monitoring sites were also identified.

3.4.4 Time Frame of Monitoring Activities

As shown in **Figure 4** only 17 of the 78 monitoring programs or activities reported are *currently* being conducted. Most programs are historical and completed or their dates are unknown. To analyze the trends in the time frames of monitoring activities, two analyses were conducted; 1) to determine which agencies collected data when, and 2) what they collected when. As part of February 14th's workshop, several two large timeline summaries were prepared to summarize these objectives (see SSDP web site addresses at beginning of this section):

- The ***Organizational Summary*** showed for each organization, the time line of water quality monitoring efforts by data constituents. The data constituents were divided into the nine categories discussed earlier.

- The ***Constituent Summary*** examined the same data, but showed timelines by each of the nine data constituents and the agencies that monitored this data.

In examination of these timelines, it is apparent that certain constituents have been collected for several decades and continue to be collected, such as bacteria, nutrients, various chemical and physical characteristics, and hydrologic data. Organizations such as the RWQCB, International Boundary and Water Commission, and County agencies such as the Health Services Agencies have conducted ongoing monitoring over the past decades, as part of their organizational duty and assignment.

A number of organizations began conducting studies in the mid and late 70's when groundwater contamination through constituents such as pesticides and heavy metals became a major national concern. . US Bureau of Reclamation and US Geological Survey initiated coordinated efforts in the mid and late 80's, with a main focus on irrigation drain water quality. More recently in the 1990's, collaborative sampling efforts were undertaken as part of the initiation of the Salton Sea Restoration project. Most of these sampling efforts represent reconnaissance studies conducted over limited time periods (one or two years) with a focus on specific research objectives. This pattern is reflected by the participation of several Universities including San Diego State, UC Davis, and UC Riverside.

Future water quality monitoring efforts seem to be increasingly focused on sediments, metals, organism/tissue, and biological constituents as more organizations and agencies become aware of the lack of understanding of certain processes related to constituent deposition in sediments — both bottom and suspended — and subsequent physical and chemical reactions. The effects on wildlife health and disease represent a further issue of concern and explain the expanded monitoring efforts in the realm of biological constituents and organism tissue.

3.4.5 Frequency of Sampling

The frequency of monitoring, how often monitoring samples are collected, varies widely usually based on and the purpose of the program, available funding, and the constituent being monitored. General monitoring programs range from bi-weekly to semi-annually monitoring, but tend to have monthly or quarterly monitoring frequencies. Research or reconnaissance oriented programs often have one time monitoring, usually with multiple sampling sites or multiple organism. Hydrologic data, used mostly in general monitoring activities, is often gauged continuously.

3.5 Data Assessment

This section answers the "what" question --- what actual data constituents have been monitored over the years. Some 69 different data constituents were reported in interviews and information provided by participants. **Appendix B** lists the common data constituents. Additional data usually unique to one program was also listed but not tabulated. Analysis of the data inventory showed that most programs or activities have monitored the typical physical/chemical constituents, nutrients, and bacterial agents, which is consistent will the large number of general monitoring programs. Also, constituents like Selenium, a metal suspected to cause many wildlife deaths, was studied extensively in various water sampling medium as part of the NIWQP during the 1980's and 1990's. Many organisms, usually birds and fish, have been studied to determine toxic elements (including selenium) that caused the die-off of several species. This research or response to pollution events, have focused on the toxicity, either in the soil or water, or in the wildlife themselves.

3.5.1 Inventory of Data Monitored

Below, the monitored data constituents are tabulated for nine general categories of data (the data constituents for each category is shown in **Appendix B**):

Data Category	Reported as Collected
1. General Physical/Chemical	233
2. Nutrients	64
3. Bacterial	22
4. Biological	9
5. Pesticides	28
6. Hydrological	21
7. Metals	54
Total Water Extracts	431
8. Total Sediments	52
9. Total Organism/Tissue	45
Total Inventory	**528**

The issues of agricultural/irrigation runoff, urban runoff and effluent figure largely in the data constituents monitored in a number of programs. Nutrients, the residue from fertilizers, animal wastes, and sewage systems are introduced into the rivers and the Salton Sea, and were monitored in at least 64 separate sampling efforts in the past two decades. Further evidence of increasing impacts of agricultural and unplanned development have been the concerns about pesticides (28) and bacteria (22) which figured in many programs. Many sediment and organism/tissue monitoring programs also included pesticide sampling, 11 and 9 times, respectively.

The following table shows the specific data constituents that were reported as collected most frequently:

Data Category	Reported as Collected
Water Extracts	
General Physical/Chemical	
pH	23
Temperature	22
TDS (Salinity)	22
Dissolved Oxygen	21
Minerals	18
Specific Conductance	18
Turbidity	14
Nutrients	
Nitrogen	31
Phosphorus	22
Ammonia	11
Bacterial	
Total Coliform	11
Fecal Coliform	7
E. Coli	4
Biological	
Macro invertebrates	5

Pesticides	
General	10
Organo-Phosphorus	6
Carbamates	4
Hydrological	
Flow	10
Metals	
Selenium	23
Dissolved Metals	17
Other	14
Sediments	
Selenium	7
Trace Metals	7
Other	7
Pesticides	6
PCB's	5
Particle Size	6
Organisms/Tissue	
Selenium	10
Other	10
Pesticides	9
Trace Metals	8

Almost 1/3rd of the programs reported gather typical physical and chemical data such as pH, temperature, TDS (salinity), and dissolved oxygen. Nutrient data was collected by almost have the programs listed. Of the metals, selenium was reported 23 times as a water extract, 7 times in sediment sampling mediums, and 10 times in organisms/tissue. Pesticides were reported 20 times as water extracts, 6 times in sediment, and 9 times in organisms/tissue.

3.5.2 Currency of Monitoring Data

The study team also determined the currency of data collection. The table below lists the number of data collection occurrences categorized by data currency.

Data Monitoring Status	Number of Constituents Collected
Current/Ongoing	128
Historical/Completed	226
Future/Planned	56
Unknown	118
Total Occurrences	**528**

Of data currently collected, the concentration is general water extracts such as pH, temperature, minerals, specific conductance, TDS, and dissolved oxygen. Nutrients such as nitrogen or bacteria such as total Coliform are also frequently collected.

Historical data collection was primarily concerned with physical chemical data, nutrients, bacterial, and pesticides.

Future data collection efforts appear to be more concerned with selenium and other metals in drainwater and the New and Alamo Rivers. In addition, nutrients, DO, TDS, TSS, and other general parameters will be collected by a number of programs.

For a number of programs and constituents, the timeframe for their collection is presently unknown.

3.6 Opportunity and Constraint Assessment

The following section lists the various opportunities and constraints related to data sharing collaboration that were expressed by the interviewed organizations:

Data is freely available upon request, but…

- It is not available in digital form.
- Not sure it can be found in old archives as there is no formal infrastructure in place for information management.
- May need to charge for staff time.
- Staff is unavailable to fulfill requests.
- Not sure of quality or consistency of data and collection methods over time.
- Not until Quality Control checks have been made and not sure where to retrieve the data (i.e. location).
- Current staff may get assigned to distribute information but may not be familiar with the data strengths and constraints/quality.
- Not readily available information, such as that which can be downloaded off the web.
- Synthesized information is available in reports or other forms (appendices, manuscripts), but the basic information is not accessible.
- The form of digital data is not "user friendly".
- Some technological infrastructure is in place, but staff may lack technical skill to provide right information in usable from. Conversely, IS staff my have technical computing skill but are not familiar with the scientific data.
- The data knowledge went with the ex-employee with little documentation left behind.

I would like to collaborate with others, but…

- I don't know who is or has been collecting data, plans to collect data, what, where and when.
- Existing activity inventories are highly specific (i.e. Department of Pesticide Regulation compendium of pesticide-related monitoring activities).
- Constrained by administrative issues (local, regional, state, national, or international).
- I won't cooperate until "they" cooperate.
- We do not have the staffing, funding, computing skills, and infrastructure to participate effectively.
- Legal actions may not be conducive to data access and sharing among the involved parties.
- Some monitoring data is held in confidence and is exempt from Public Records Access laws.
- I do not want others to know about my problems until I have a chance to do something about it.

Data Sharing is great, but what real problems are we trying to solve?

- Data sharing and cooperation should be organized around specific problems.
- Collaboration should include the development of common understanding regarding the processes that drive the transport and fate of water quality constituents.
- More intensive question-driven monitoring programs are needed to address specific problems.
- Need to take advantage of available tools for data analysis and display.

Data sharing is great, but let's focus on the constituents and locations that we have in common:

- Certain key constituents are of "fundamental" interest to a large number of stakeholders.
- Consistency in standard data collection and Quality Control methods, structure, and formats could yield broad benefit across many organizations.
- Collection, management, and dissemination of common interests, and fundamental data requires a strong coordination function.

4. Discussion and Conclusions

The relevant findings of the inventory at this phase can be summarized as follows:

- Most **organizations** at the local level tend to be jurisdictional while Federal and State agencies tend to be topical in their mandate. Thus, Federal and State agencies cross county and local jurisdictions in the examination of water quality issues in the New and Alamo Rivers, for example. Counties, utilities, and Tribes tend to be concerned with management issues within their borders, which may include only part of the Salton Sea.

- Most **programs or activities** reported in this inventory represent either general monitoring efforts or research related efforts. General monitoring efforts capture data often with a broad set of monitoring objectives or look for thresholds to be triggered. Thus, these programs have gathered the widest range and largest amount of data constituents. Research data collection efforts are often focused on a smaller set of data for a specific geographic area or organism. Most research efforts would benefit from access to general data to support their work.

- The **sampling media** are mostly surface waters, although sediments and wildlife are often monitored to help understand how water quality issues affect the former. Federal and state agencies tend have a greater mandate to address the issues in the Salton Sea and New/Alamo River areas. Water agencies like the Imperial Irrigation District are most concerned with irrigation drains. Biota and sediments represent the typical domain of university research and Federal agencies such as US Fish and Wildlife Service and US Bureau of Reclamation.

- **General physical/chemical data** support a wide range of objectives and have been monitored continuously over the past several decades. Some of these monitoring efforts have been without any specific research objectives or purposes determined. However, due to the elevated concerns regarding the water budget in Southern California, this may become a larger area of interest once the quantity of water flow may have direct consequences for the physical and chemical parameters of water.

- Data related to **nutrients, pesticides and bacteria** figure largely in the degradation of the surface waters, and are also monitored with frequency. However, to date, the only organizations monitoring bacterial constituents are the County of Riverside, the Regional Water Quality Control Board, and the International Boundary and Water Commission. The two latter collect bacterial samples mostly along the New and Alamo Rivers but not in or at the Sea itself. Imperial County - Department of Health Services, was forced to conclude their ongoing sampling efforts along and in the Salton Sea due to lack of funding and personnel. A first area to enhance collaborative efforts would be among these three constituent categories as they manifest clear signatures of human activities and will probably have the most impact on the natural environment.

- Data involving **biota, sediments, and organisms** tend to be research oriented and are mostly gathered on a one- time basis only or infrequently. As noted in the previous section, in order to understand basic physical and chemical *processes* it will be necessary to include these constituent categories on a longer term basis. The importance of sediments and the associated deposition of various constituents has been largely neglected up to this point in time. This effort requires cross-institutional/organizational collaboration since several different categories of constituents need to be addressed.

- **Agency cooperation** tends to occur among the Federal and State agencies, yet a local organization is often involved in large collaborative water quality monitoring efforts. On a more general note, it appears that programs and monitoring efforts are shifting from a more static type of approach in which monitoring was mainly conducted to determine thresholds, to a more dynamic and complex approach where research begins to put pieces of the larger ecological puzzle together. Collaboration will be unavoidable if we want to understand how the simple contributes to the complex in the interwoven and entwined nature of our system.

Figure 1: Agencies Performing General Monitoring or Research WQM Programs

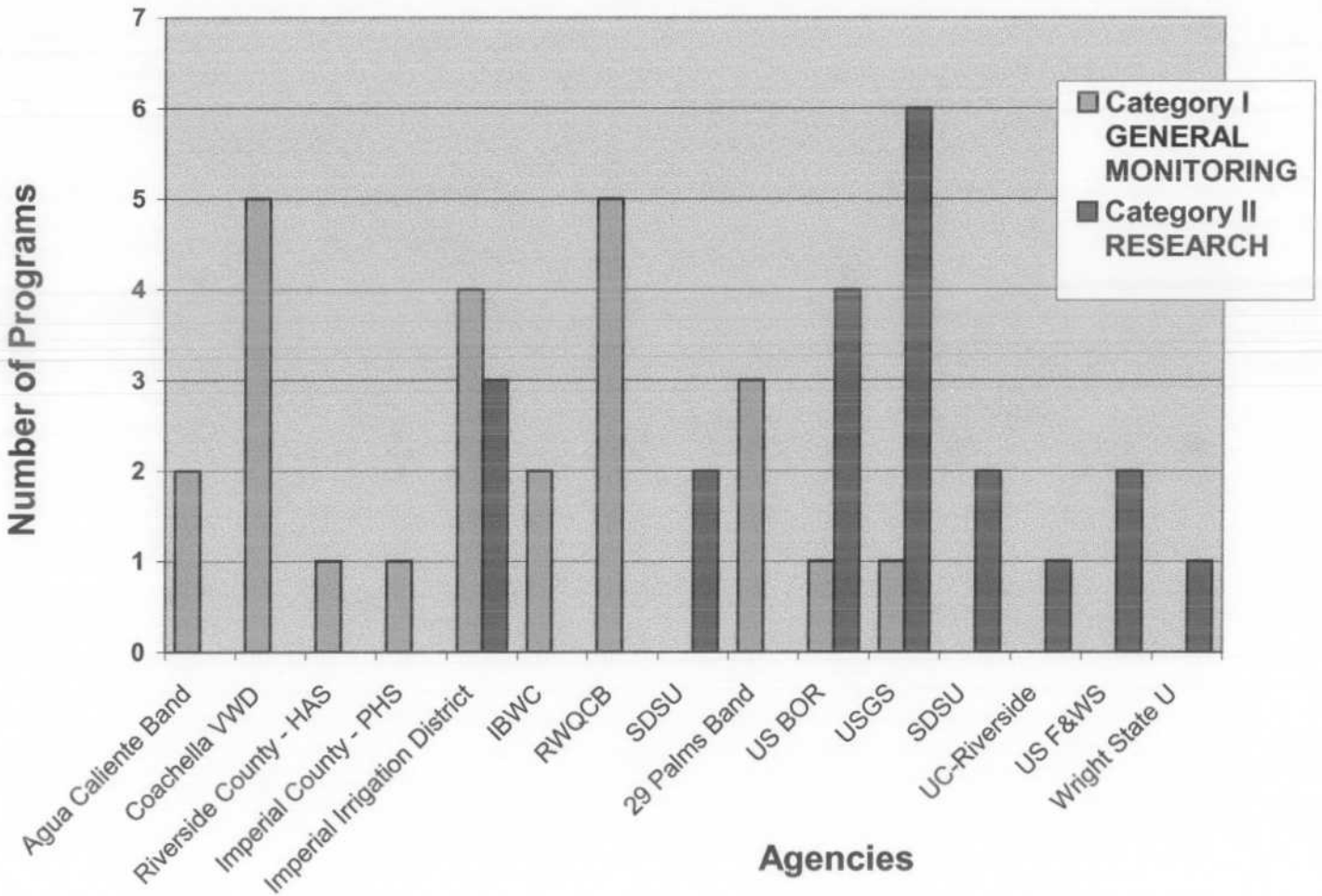


Figure 2: Sampling Medium for WQM Programs

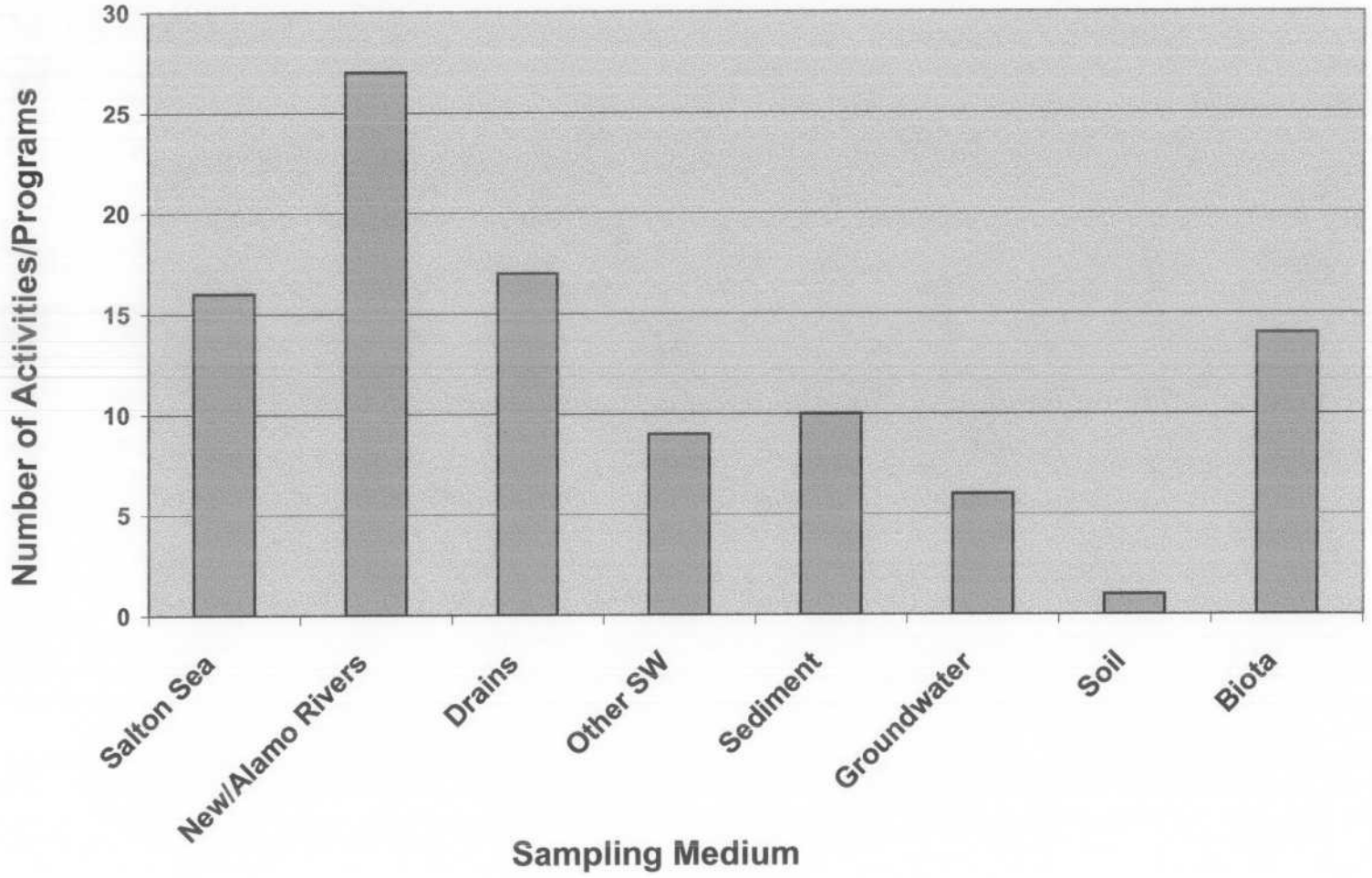


Figure 3: Sampling Location of WQM Programs by Agency

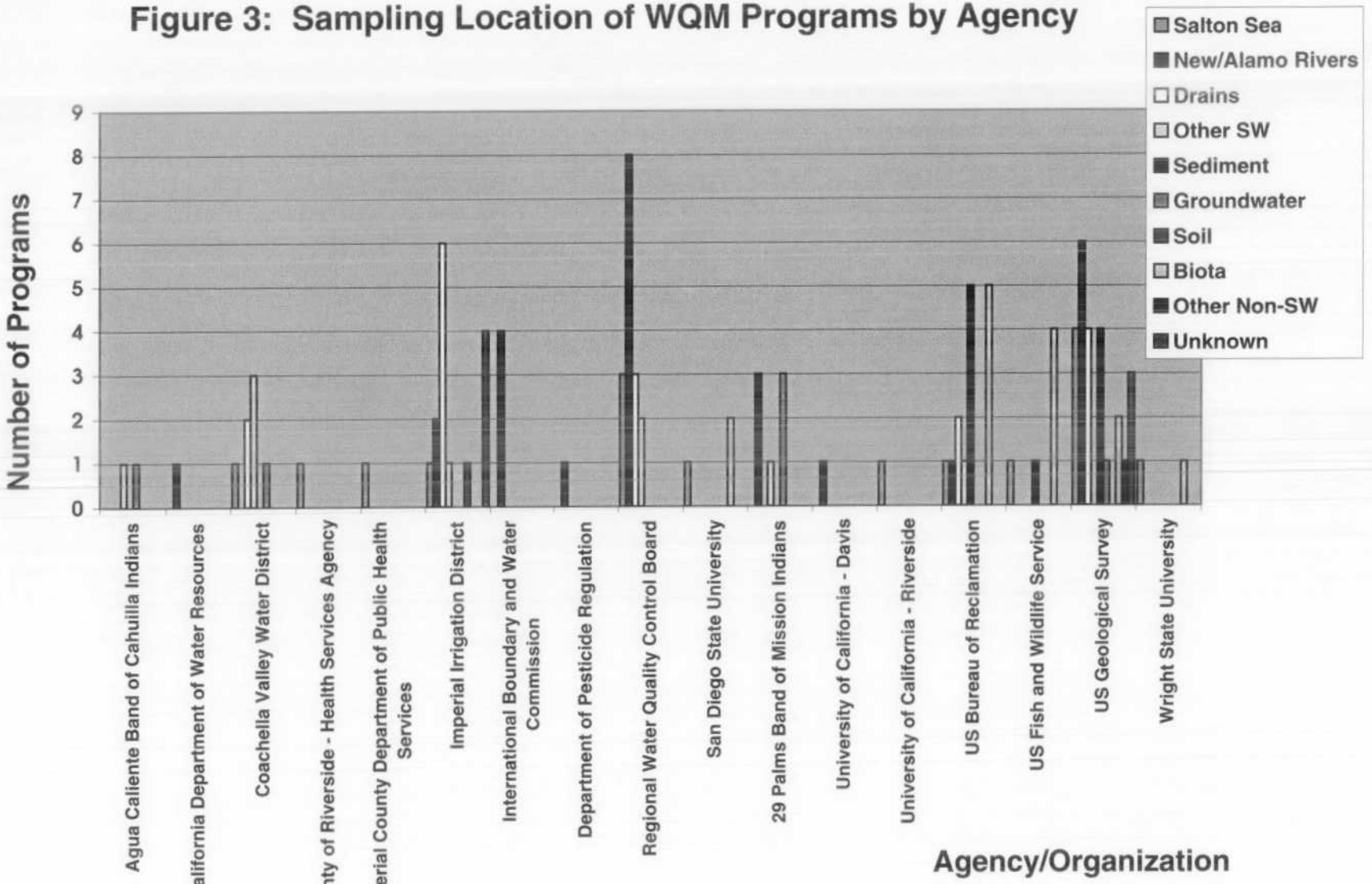
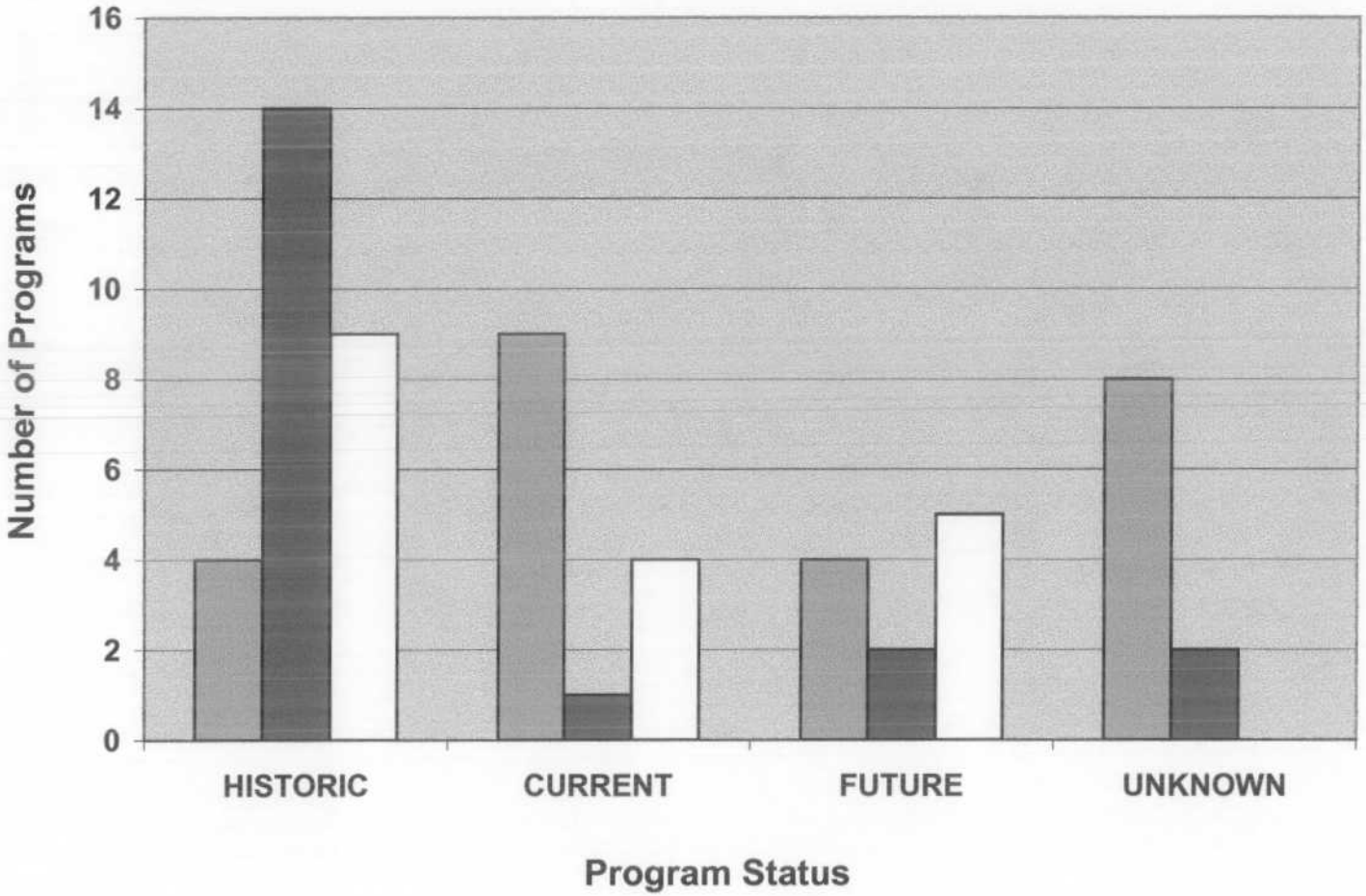


Figure 4: Program Status



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Appendix A
Interview Checklist

INTERVIEW CHECKLIST

ORGANIZATIONAL INFORMATION (WHO)

- Agency (Name, Address)
- Mandate
- Organizational Structure
- Sampling Programs:
    - Project/Program Description
    - Project/Program Contact
    - Project/Program Purpose/Reason

LOCATION (WHERE)

- Where are the samples taken (lat/long, altitude, etc.)?
- How are the sampling locations identified (e.g. GPS, Thomas Bros. Map, etc.)?
- What are the water body types (e.g. surface water: stream, canal, wetlands, etc.; groundwater)?
- What are the sampling point types (e.g. entry point to the distribution system, end of distribution line, etc.)?

SAMPLE MEDIUM (WHAT)

- What are the sampling categories/types (e.g. water, tissue, plant, sediment, etc.)?
- What are the parameters for each sample medium?
- How many samples (of each parameter/category) are taken?
- What is the sample type (e.g. field sample, confirmation sample, repeat sample, etc.)?
- What is the digital format of the source medium?

DATE / TIME (WHEN)

- Starting date of the sampling – for each parameter (year/month/day)?
- Sampling frequency (e.g. 24hrs cycle/weekly/monthly/other)?
- Planned duration of sampling?

SAMPLE COLLECTION METHOD (HOW)

- What is the method used to collect the sample - for each parameter (e.g. grab, pump, collection filter, etc.)?
- What are the sample sizes?
- At what water level are the samples taken?
- How are the samples described/identified?

SAMPLE ANALYSIS

- What is the sample analysis measurement type?
- What is the sample analysis average period?
- What is the precision and accuracy of each measurement method used?
- What are the quality assurance procedures and requirements?
- What are the sample result valid indicators (indicate whether the sample met all the Quality Assurance and Quality Control Standards)?

REASON FOR SAMPLE COLLECTION (WHY)

- Reconnaissance, Trend Analysis, Permit Compliance, Pollution Event, Storm Event, Research, Other?

FINDINGS

- What are the findings/results?
- What is the validity of the findings?

DATA SOURCE (WHO OWNS IT)

- Data Owner: Name, address, telephone number of organization to direct questions about the sample analytical results.
- Sampling Entity: Name, address, telephone number of the organization to direct questions about the sample collection.
- Laboratory: Name, address, telephone number of the organization to direct questions about the laboratory analysis.
  What are the lab analysis methods for each parameter (accuracy and precision for each parameter!)?
  Quality assurance methods?

DATA AVAILABILITY/PUBLICATION

- How sensitive is the sampled data?
- In what format is the data available (digital, hard copy, etc.)?
- Is it available to the public?

ISSUES AND OPPORTUNITIES

Appendix B
Data Inventory Descriptions

The following defines all the categories and classifications of data that were used in the inventory. Also discussed are the methods of organizing inventory data.

Organization and Activities/Programs. The first step represented the identification of each participating agency or organization conducting activities and programs containing some level of water quality monitoring. This could include, for example, routine surface water monitoring to determine bacterial quality at bathing beaches, or specific research efforts focused on the source of toxicity resulting in bird deaths. Following each agency or organization is the program or activity reported in which water quality monitoring is performed. Each program or activity received a unique code. All subsequent data is collected by the specific program. For each unique program or activity, a brief text description of the program or activity is provided. The following data was collected:

Organization. Lists the 17 organizations that participated in this study, each of which performs some level of water quality monitoring.

Activities/Programs. Lists the 78 water quality monitoring programs or activities that are presently being or have historically been conducted.

Description. Brief text description of each program or activity.

Information about Activities/Programs: Each water quality monitoring program or activity was then described in terms of where it was conducted, how it was funded, when it occurred, how was it done, how the data was stored, etc. The following lists these fields.

Name of Monitoring Site. Describes in general or specific terms where the water quality monitoring takes place. "Various" refers to programs or activities that conduct water quality monitoring in several locations which may be different, such as both irrigation canals and rivers. Monitoring sites include:

Salton Sea
New River
Alamo River
New River/Alamo River
Canal
Major Drains
Minor Drains
Irrigation Canal
Mexico
Wetlands
Other Surface Water

Various Locations
Unknown
Not Applicable

Objective/Purpose. Each program was categorized by its general purpose or objective, defined below.

Reconnaissance. Describes an initial water quality monitoring effort, usually a short-term study, to determine the extent or occurrence of a water quality issue for further study. Reconnaissance studies often perform one-time data sampling or use historical or field observation data.

Trend Analysis. A study to establish background data for a water quality trend which has occurred over a certain time period. Often a combination of historical data, if available, is combined with some term of ongoing monitoring data. Where trend analysis requires all new monitoring data, expense may limit the amount of data collection.

Permit Compliance. Requires specific water quality monitoring that is conducted to fulfill permit requirements. Often the monitoring effort is borne by the permittee for a specific site. If the permittee's data could be standardized and coordinated with other data gathering efforts, it could contribute to an overall data monitoring database.

Pollution Event. Water quality monitoring that follows an event, triggering apparent adverse water quality. Often this monitoring is specific in nature.

Storm Event. Water quality monitoring that follows a storm event to determine the impact on water quality. Often this monitoring is specific in nature.

Volunteer Monitoring. Monitoring performed by citizens or a concerned organization not under the auspices of a governmental body or institution. This data monitoring is usually very difficult to coordinate with other monitoring efforts. It is possible, however, that public access to communal data would negate the need for private data gathering efforts by the public. This also allows data to be utilized that meets generally agreed upon standards for collection and analysis.

General Monitoring. Includes general ongoing monitoring which provides long-term background data on water quality or triggers a response when some water quality threshold is breached. These efforts usually examine the most data constituents to cover a breadth of monitoring objectives. General monitoring efforts, often of the same constituents in the same sample areas over the same time period, are typically not coordinated in the Salton Sea basin.

Monitor Specific Site. Water quality monitoring of a specific location. While historic monitoring data may be available for a specific site, it may not be of the proper constituents, time period, or analysis method or standards to be useful.

Research. Monitoring conducted for specific research purpose. Research data often has the capability to contribute to longer term monitoring data base development if standards for constituents and analysis methods are established.

Demonstration Project. Monitoring the results or impacts of specific projects designed to show the benefits of some specific change in the physical environment. Longer term general monitoring or trend analysis data, if available for the demonstration project area, can form the baseline for further data gathering.

Unknown. The purpose of the monitoring was not established at this time.

Funding. Where the funding for water quality monitoring originates. These categories will be refined at a later time. Categories include:

Environmental Protection Agency (EPA)
Other Governmental Funding
Operating Budget
Capital Budget
Other
None
Not Applicable
Unknown

Water Quality Monitoring Sites. Refers to the number of actual sites where water quality monitoring is or was performed. As of this time, 1630 water quality sites were identified. Where no number is listed, water quality monitoring sites were not disclosed in the interview or sites planned for the future have not been selected. Many of the interview participants provided data samples, which listed the monitoring sites with a map location, address, or coordinates. These locations where then digitally mapped using geographic information software (GIS). These sites were then mapped as shown in the attached demonstration map samples.

Status. Describes the present status of the water quality monitoring program or activity. Includes:

Current/Ongoing
Historical/Completed
Future/Planned
Not Applicable
Unknown

Date of Monitoring. Describes the beginning date and the end date of the monitoring program. If the monitoring program is ongoing and the end date is not known, a date of UNKNOWN is assigned, as for monitoring continued through the future.

Sampling Frequency. Describes the interval of data collection. "Various" indicates that collection intervals varied in the program for different data constituents. Categories include:

Continuous
Hourly
Daily
Bi-Weekly
Weekly
Bi-Monthly

Monthly
Quarterly
Trimester
Bi-Annual
Annual
Varies
One-Time
Desired
Other
Unknown
Not Applicable

Sampling Method. Refers to the typical sampling method used in the collection of water quality monitoring data. "Various" indicates that two or more collection methods were used, which would be typical for a monitoring program which is collecting data in more than one type of sampling medium. The categories of sampling methods will be more fully developed as the data becomes available.

Data Format. Describes the medium in which the data is stored, including:

Paper
Digital – WP (word processing format)
Digital – Spreadsheet (eg Excel)
Digital – Database (e. g. DBII, Quattro)
Digital – ASCII
Web (available on web site)
Not Applicable
Unknown

Additional data will be required in review by participating agencies prior to the completion and analysis of the following data fields:

Update Frequency. A text field to describe how often water quality monitoring data is updated with field data.

Data Access. Whether or not the data is easily available to the public.

User Constraints. Any issues which limit the access of data such as cost or specialized technical knowledge.

Analysis Method. The standard method of analysis used to quantify the data.

Reference Cited. Whether or not a document was provided which describes the monitoring program or activity.

Agency Cooperation. Other agencies or organizations that participated or collaborated in a particular water quality monitoring program.

Data Constituents. As part of the data assessment, the inventory determined which data has or has been collected for each program reported by the interviewees. This data includes (as structured hierarchically):

WATER EXTRACTS

Physical/Chemical

General
- Alkalinity
- pH
- Hardness
- Temperature
- Secchi Depth
- Thermocline
- Picocline
- Water Color

Ion Related
- Major Ion Chemistry
- Minerals
- Specific Conductance
- TDS (Salinity)

Solids
- Total Suspended Solids
- Volatile Suspended Solids
- Settleable Solids
- particle size
- turbidity

Nutrients
- ammonia
- nitrogen
- phosphorus

Other
- BOD
- dissolved oxygen
- MBAS
- sulfer
- total organic carbon
- dissolved organic carbon
- toxicity acute
- toxicity chronic
- TIE toxicity
- VOC's
- Other

Organisms

Bacterial
- e. coliform
- fecal coliform
- total coliform

Biological
- fecal strepto cocci

antero-cocci
macro invertebrates
other

Pesticides

general
pyrethrodes
chlorinated herbicides
organochlorine
organophosphorus
carbamates

Hydrologic

flow
gage height
velocity
other

Metals

dissolved metals
selenium
other

SEDIMENTS

suspended bottom or both
nutrient content
organic content
particle size
pesticides
PCB's
pH
selenium
trace metals
other elements

ORGANISM/TISSUE

Biology

species analyzed

Organic Chemistry

pesticides

Inorganic Chemistry

trace metals
selenium

Other

For each data constituent, the currency of the collection was also graphically shown as part of an ongoing/current program, a historic/completed program, planned for future collection, or unknown at this time. Also shown for each constituent, is the frequency of collection if known.

Appendix C
List of Participants

Water Quality Participants

University Representatives

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Appendix D
Original Interview Write-Ups

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46-200 Harrison Place
Coachella, CA 92236
Tel: (760) 775-4227
Fax: (760) 775-3627
Email: tribal-epa@worldnet.att.net

Person(s) Interviewed:
Marshall K. Cheung, Environmental Coordinator

Interviewer(s):
Sabine Huynen, GIS Technician

Interview Date: September 19, 2000

Draft
September 23, 2000

The 29 Palms Laboratory is a non-profit environmental analytical laboratory owned and operated by the Twenty-Nine Palms Band of Mission Indians, located in the lower Coachella Valley just west of the Salton Sea. The laboratory is certified as an environmental testing laboratory under the State of California Environmental Laboratory Accreditation Program (ELAP), and is part of the Tribal EPA. Besides providing analytical testing services, the laboratory also offers technical consulting services such as interpreting environmental data, performing environmental assessments and surveys, developing and reviewing quality assurance program plans, and implementing and providing training for sampling programs. The Laboratory's main focus is on pesticide analysis.

EPA PROGRAMS

U.S. EPA Region 9 is committed to helping build tribal capacity to manage Indian Country environmental programs and to ensure that tribes have a voice in decisions affecting their land, air, and water resources. The EPA supports the principle of tribal self-government and operates on the basis of consultation cooperation among tribes, other federal agencies, state, and local governments.

The EPA grants received by the 29 Palms Tribal EPA are generally on a yearly basis. The following sampling programs set up by or in conjunction with the 29 Palms Laboratory are funded by a number of such EPA grants:

1. Clean Water Act, Section 106 / Fiscal Year 1999. 29 Palms is monitoring water quality of surface waters and groundwater on its Reservation. The components measured include the routine battery of substances such as trace metals, general minerals, pesticides, and nutrients. The 29 Palms Tribal EPA provides training and education to enable water quality sampling in a self-supporting and independent manner, and simultaneously establishing EPA Quality Assurance standards on the 29 Palms Reservation. The training was carried out by using EPA resources as well as 29 Palms tribal assets.

BIA PROGRAMS

1. PL638. This program provides funding for infrastructure and general laboratory facilities. The 29 Palms Tribe has been supported by this program for the last 2 years. Other Tribes have had this kind of funding for many years.

2. Water Resource Program / Fiscal Year 2000. This program helps to support and extend the capacity of resources within the Tribal EPA and 29 Palms Laboratory including sampling equipment, analysis instruments, etc. The 29 Palms Laboratory would like to develop more microbiological capabilities in the future.

General Sampling Information. In each of the above described programs, the sample sizes are defined by the according Quality Assurance Project Plan set up by the Tribal EPA and approved by the U.S. EPA. Each sample is given a unique laboratory number. Within the next year, the Laboratory would like to start sampling soils and sediments.

Surface Water Sampling Results. The samples collected in the storm drain channel are in non-attainment for microbiology.

Groundwater Sampling Results. The water quality generally increases with depth. The water found in the upper aquifer is non potable. On the second aquifer level, the water may possibly be implemented as irrigation water. To date, no traces of significant contaminants have been found.

GIS Related Activities

At present, the Tribal EPA has two staff members entering the data into a GIS database. The data are maintained in a record/field format using ArcView.

Computing Infrastructure. The GIS software used is ArcView. The Tribe borrows a ProXR GPS unit from another local Tribe. The GPS unit is employed to geocode the sampling sites in the Coachella Valley Storm Water Channel and on the Reservation.

Interaction with other Agencies

Agencies involved with the 29 Palms Tribal EPA are as follows:

- Regional Water Quality Control Board (RWQCB)
- Federal Environmental Protection Agency (FED EPA)
- Coachella Valley Water District (CVWD)
- Valley Sanitary District
- Bureau of Indian Affairs (BIA)
- City of Coachella
- Torres-Martinez Tribal EPA

Agua Caliente Band Of Cahuilla Indians
Six Hundred
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Tel: (760) 325-3400
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Person(s) Interviewed:
Sean Milanovich, Environmental Technician

Interviewer(s):
Mark Sorensen, Project Coordinator
Sabine Huynen, GIS Technician

Interview Date: September 12, 2000

Draft
September 12, 2000

The Reservation comprises an area of approximately 33,000 square acres, including a population of 355 tribal members. The Tribe works closely with the local Bureau of Indian Affairs (BIA), Palm Springs Field office, as well as the BIA based in the Sacramento Area Office. Beth Wenstrom is the GIS Coordinator for the latter and collaborates with Sean Milanovich and Michael Kellner (Sean's direct supervisor) on a regular basis.

Present Monitoring Activities

Water quality monitoring by the Tribe is being carried out for both groundwater and surface water resources.

Groundwater. The Tribe currently has one monitoring well. To date, the private and district wells located on the Tribal territory have been developed and managed by the Coachella Valley Water District (CVWD) and the Desert Water Agency (DWA). Thus general information about the wells such as well quality, water quantity, boring logs, water levels, etc. have been collected and archived by the water agencies themselves. The Tribe is in the process of acquiring groundwater data for the Reservation area, and is talking to both water agencies about acquiring their information. The Tribe is also building its own monitoring well.

Mark Anderson, a GIS consultant to the Consortium of Indian Tribes, is coordinating and managing a groundwater flow model for the Indian Reservation territory. This information is not available to the public at this point in time and will only be used as a support tool in the event of groundwater contamination.

Surface Water. The Tribe has also initiated a program for monitoring surface water quality within several perennial streams and water bodies. At present, there are five fixed locations that are periodically tested (monthly) for a number of chemical constituents. Regular testing for

archeological sites, endangered plant areas, etc. Coordinates were established for all the water quality monitoring sites and are saved in Excel spreadsheets.

Interaction with other Agencies

Agencies involved with the Agua Caliente Band of Cahuilla Indians are as follows:

- Bureau of Reclamation (BOR)
- Regional Water Quality Control Board (RWQCB)
- Coachella Valley Water District (CVWD)
- Desert Water Agency (DWA)
- Federal Environmental Protection Agency (FED EPA)
- California Department of Forestry (CDF)
- Bureau of Land Management (BLM)
- Coachella Valley Association of Governments (CVAG)
- Department of Forestry

BOR is the only agency with which the Tribe has been discussing water quality issues. Much of the interaction between the two agencies has taken place due to Colorado River water being dumped into the clean aquifer. Other important topics discussed with the agencies listed above are natural resources, air quality, and land use (Michael Kellner is mainly involved with these issues).

Opportunities and Constraints to Data Sharing

The Tribe is very open to sharing the data they have been collecting with others. Information now maintained in Excel spreadsheets is to be restructured to a database record/field format that will be easier to use and manipulate in both GIS and statistical analysis environments in the future.

Legal actions relative to local and regional water rights are not conducive to widespread data access and sharing among the involved parties.

LOCATION (WHERE)

- Where are the samples taken (lat/long, altitude, etc.)?
- How are the sampling locations identified (e.g. GPS, Thomas Bros. Map, etc.)?
- What are the water body types (e.g. surface water: stream, canal, wetlands, etc.; groundwater)?
- What are the sampling point types (e.g. entry point to the distribution system, end of distribution line, etc.)?

Salton Sea sampling locations were located using a Rockwell HNV-560B PLGR global positioning system (GPS). The Alamo River (AR) site was located at the Garst Road bridge just downstream of USGS Station Number 10254730. The New River (NR) site was located west of Lack Road at USGS Station Number 10255550. The Whitewater River (WR) sampling site was located at the Lincoln Street crossing west of USGS Station 10259540. Locations of the sampling sites are shown in Table 1.

Table 1. Coordinates of Sampling Stations

Station	Latitude	Longitude
SS-1	33E 24' 00"	115E 55' 30"
SS-2	33E 20' 00"	115E 49' 00"
SS-3	33E 16' 00"	115E 45' 30"
Alamo River	33E 11' 57"	115E 35' 46.5"
New River	33E 06' 16.5"	115E 39' 50"
Whitewater River	33E 31' 29"	116E 04' 41"

SAMPLE MEDIUM (WHAT)

- What are the sampling categories/types (e.g. water, tissue, plant, sediment, etc.)? - Water
- What are the parameters for each sample medium? – See above
- How many samples (of each parameter/category) are taken? – See above
- What is the sample type (e.g. field sample, confirmation sample, repeat sample, etc.)? – field samples
- What is the digital format of the source medium? I'm not sure what you mean by this. All data is currently in a QuattroPro spreadsheet.

DATE / TIME (WHEN)

- Starting date of the sampling – for each parameter (year/month/day)? Sampling took place during calendar year 1999

Total Kjeldahl Nitrogen	0.05	0.1	75-125	% recovery	<20	RPD
Dissolved Silica (As silicon)	0.02	0.02	75-125	% recovery	<20	RPD
Dissolved Organic Carbon	0.5	1.5	85-115	% recovery	<20	RPD
Total Suspended Solids	4	4	N/A	N/A	N/A	N/A
Alkalinity	1.0 mg/L as $CaCO_3$	1.0 mg/L as CaCO3	85-115	% recovery	<20	RPD
Dissolved Oxygen Profile	0.01	0 - 20	± 0.2 mg/L	Instrument response	N/A	Instrument response
Temperature Profile	-5EC	-5 - 50EC	± 0.15EC	Instrument response	N/A	Instrument response
Conductivity Profile	1 ΦS/cm	0 - 100 mS/cm	± 1%	Instrument response	N/A	Instrument response
pH Profile	N/A	0 - 14 units	± 0.2 units	Instrument response	N/A	Instrument response
Turbidity Profile	1 NTU	0 - 100 NTU & 100 - 1000 NTU	± 5%	Instrument response	N/A	Instrument response
ORP Profile	N/A	-999 - 999 mV	± 20 mV	Instrument response	N/A	Instrument response
Secchi depth	0.01 m	0.1 m	N/A	N/A	N/A	N/A
Light penetration	0.1 m	0.1 m	N/A	N/A	N/A	RPD
Carbonate	1.0 mg/L as $CaCO_3$	1.0 mg/L as CaCO3	85-115	% recovery	<20	RPD
Bicarbonate	1.0 mg/L as $CaCO_3$	1.0 mg/L as CaCO3	85-115	% recovery	<20	RPD
Sulfate	0.2	1.0	75-125	% recovery	<20	RPD
Chloride	0.2	1.0	75-125	% recovery	<20	RPD
Al	0.012	0.03	75-125	% recovery	<20	RPD
As	0.03	0.07	75-125	% recovery	<20	RPD
B	0.004	0.01	75-125	% recovery	<20	RPD
Ba	0.0006	0.004	75-125	% recovery	<20	RPD

Table 7 - Parameter Table

Parameter	# of samples	Sample Matrix	Sample Preservation	Holding Time (Maximum)
Soluble Orthophosphate	240	Water	Field filter, cool to 4°C	48 hours
Total Phosphorus	240	Water	H_2SO_4 to pH <2, cool to 4°C	28 days
Nitrate+Nitrite-N	240	Water	H_2SO_4 to pH <2, cool to 4°C	28 days
Ammonia Nitrogen	240	Water	H_2SO_4 to pH <2	28 days
Total Kjeldahl Nitrogen	240	Water	H_2SO_4 to pH <2	28 days
Dissolved Silica	240	Water	Field filter, cool to 4°C	28 days
Dissolved Organic Carbon	240	Water	H_2SO_4 to pH <2	28 days
Total Suspended Solids	240	Water	Cool to 4°C	7 days
Alkalinity	240	Water	*in situ*	14 days
Dissolved Oxygen Profile	108	Water	*in situ*	N/A
Temperature Profile	108	Water	*in situ*	N/A
Conductivity Profile	108	Water	*in situ*	N/A
pH Profile	108	Water	*in situ*	N/A
Turbidity Profile	108	Water	*in situ*	N/A
ORP Profile	108	Water	*in situ*	N/A
Secchi depth	108	Water	*in situ*	N/A
Light penetration	108	Water	*in situ*	N/A
Calcium	48	Water	1 mL HNO_3/L (pH <2), cool to 4°C	6 months
Magnesium	48	Water	1 mL HNO_3/L (pH <2), cool to 4°C	6 months
Sodium	48	Water	1 mL HNO_3/L (pH <2), cool to 4°C	6 months
Potassium	48	Water	1 mL HNO_3/L (pH <2), cool to 4°C	6 months

Turbidity Profile	Water	2130 B
ORP Profile	Water	2580 B
Secchi depth	Water	N/A
Light penetration	Water	N/A
Calcium	Water	200.7
Magnesium	Water	200.7
Sodium	Water	200.7
Potassium	Water	200.7
Carbonate	Water	310.1
Bicarbonate	Water	310.1
Sulfate	Water	300.0
Chloride	Water	300.0
Heavy metals (dissolved and total Al, B, Ba, Cd, Cr, Co, Cu, Fe, Pb, Mn, Mo, Ni, Si, Ag, Sr, V, Zn)	Water	200.7 (with chelation cleanup)
Hg	Water	1631***
As, Se	Water	Hydride Generation
Semivolatile Organics	Water	8270/3540****
Pesticide/PCB Organics	Water	8080/3540****

*Method numbers from *Standard Methods*, 1995
**EPA, 1991
***EPA, 1996
****SW846

REASON FOR SAMPLE COLLECTION (WHY)

- Reconnaissance, Trend Analysis, Permit Compliance, Pollution Event, Storm Event, Research, Other? - Research

FINDINGS

- What are the findings/results?
- What is the validity of the findings?

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Interviewer(s):
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Sabine Huynen, GIS Technician

Interview Date: October 17, 2000

Draft
October 17, 2000

Data Collection – Past and Current Status

Established in 1902, the Bureau of Reclamation (BOR) is best known for the dams, powerplants, and canals it constructed in the 17 western states. More than 600 dams and reservoirs including Hoover Dam on the Colorado River and Grand Coulee on the Columbia River have been constructed over the years.

Today, Reclamation is the second largest wholesaler of water in the country. The organization brings water to more than 31 million people, and provides one out of five Western farmers (140,000) with irrigation water for 10 million acres of farmland that produce 60% of the nation's vegetables and 25% of its fruits and nuts.

Reclamation also functions as a contemporary water management agency with a Strategic Plan outlining numerous programs, initiatives and activities that are intended to help the Western States, Native American Tribes and others meet new water needs and balance the multitude of competing uses of water in the West. The Reclamation's mission is to assist in meeting the increasing water demands of the West while protecting the environment and the public's investment in these structures.

1994. This project was focused on the stilt reproduction rate in nesting areas located along the Salton Sea shoreline. The goal was to test whether selenium measured in potential stilt food sources would impair reproduction activity. Due to the small amount of samples (30 nests total), the results were statistically invalid and inconclusive. Reclamation published the report on this study.

As part of the National Irrigation Water Quality Program, Reclamation, the USGS, and USFWS conducted an earlier study that was divided into two main phases:

1986-1987: Reconnaissance Phase (including the Imperial Valley and margins of the Salton Sea) – Jim Setmire, USGS, was the Study Team leader.

1988-1990: Detailed Phase as part of the National Irrigation Water Quality Program (NIWQP). – Jim Setmire, USGS, was the Study Team leader.

For the Reconnaissance Study, bottom sediment samples were collected at 15 sites, water samples from 8 tile drains, and biological samples from 5 sites in the basin (Coachella and Imperial Valleys). The locations were based on USGS quad maps with the exception of the Salton Sea where composite samples were collected off of the Alamo River Delta. (the samples were collected at the center of the Sea and near Salt Creek, in 1990 and 1996). A detailed map illustrating the various sampling locations is shown in Setmire and others, 1990.

For the detailed study, water samples were collected at 119 tile drains and sumps in the Imperial Valley, at the New and Alamo Rivers at the border and at their outlets to the Salton Sea, the East Highline Canal, and from the shallow groundwater in multiple depth wells and lysimeters at three sites in the Imperial Valley. Water and bottom sediment samples also were collected in the delta of the Alamo River. Biological samples were collected at 39 sites in both the river and drain systems as well as in the Salton Sea for analysis of selenium, boron, and DDE concentrations. The water samples were taken with Niskin bottles (grab samples). The bottom sediment samples were collected with an Eckman Dredge (grab sample) or a calm shell dredge (Eckman Dredge 10in x 10in used for Salton Sea). A piston core was used in areas where cohesive materials prevailed.
The sediments were sampled once at each station (snapshot). The water samples were collected on a monthly basis over a time period of one year. The U.S. Fish and Wildlife Service was responsible for gathering and analyzing the biological data. The sediment, soils, and water samples were analyzed by the USGS's Central Laboratory near Denver, Colorado. The data are available in both hardcopy format (reports) and in digital form. The data can be downloaded from the NIWQP website that also provides a detailed statistical analysis of the data collected for all 26 sites.

JIM: DID BOR DO ANY SAMPLE ANALYSIS OR ARCHIVE ANY OF THESE DATA SETS? NO

2. New River Wetlands Project (1997 – present?)

The Citizen's Congressional Task Force on the New River was formed to plan, construct and operate wetlands on the New River. The Bureau of Reclamation is the federal lead for the project with Desert Wildlife Unlimited the local lead. The Imperial Irrigation District (IID) is the local agency through which US EPA funding is provided. A number of other agencies (see list of agencies) have had a variety of roles in planning and implementing the project. The purpose of

longitudinal profile of the river. The study also included a biological component with a focus on identifying algae and benthic invertebrates and measuring the number of fecal coliform and fecal streptococcal bacteria. Biological data also showed how the diversity of organisms improved as the river cleaned itself by the time it discharged to the Salton Sea. Water samples were collected along the New River with monthly measurements of dissolved oxygen concentration at bridges crossings the New River. Two time-of-travel studies were performed to help determine the rate at which water quality improved. The project was carried out in conjunction with Phil Gruenberg from the Regional Water Quality Control Board, Region 7.

GIS Activities

To date, the BOR is not involved in any kind of GIS activities.

Computer infrastructure. A couple of years ago, the BOR office in Temecula purchased a Unix Ultra 2 and had ArcInfo and Arcview installed. However, the staff was not trained sufficiently to use the software autonomously.

Interaction with other Agencies

Agencies collaborating with the BOR are as follows:

- U.S. Geological Survey
- California Dept. of Fish and Game
- U.S. Fish and Wildlife Service
- Regional Water Quality Control Board
- Imperial Irrigation District
- California State Agencies
- County Agencies
- Cities
- U.S. Environmental Protection Agency
- Indian Tribes
- Universities

Data Used and Generated

Jim Setmire provided a map of the different duck ponds sampled, including geographic coordinates. Other data include invertebrate samples, water samples, and bottom sediment samples collected for the BOR/IID joint-project on drain water.

Data Format. The data are stored in WordPerfect files or Excel spreadsheets.

Opportunities and Constraints to Data Sharing

The data collected by the BOR, the USGS, and USFWS are open to the public and available upon request.

- **Sample Type:** The sample type is field sample.
- **Data Format:** DPR currently stored as a Microsoft Excel spreadsheet file.

DATE/TIME

- **Sampling Dates:**
  - 03/15/93
  - 04/26/93
  - 04/27/93
  - 05/24/93
  - 06/21/93
  - 07/26/93
  - 08/16/93
  - 09/27/93
  - 10/04/93
  - 10/18/93
  - 11/01/93
  - 11/29/93
  - 12/13/93
  - 01/24/94

SAMPLE COLLECTION METHOD

- **Method of Collection:** Samples were collected via grab method.
- **Sample Sizes:** Sample size was 1-L samples for each of the three screens.
- **Water Level:** Collection level was water's surface.
- **Sample Identification:** Samples were identified by date/site collected and sample numbers.

SAMPLE ANALYSIS

- **Analysis/Measurement Type:** Samples were analyzed via gas chromatography method using flame photometric detectors.
- **Sample Analysis Average Period:** N/A
- **Precision and Accuracy:** Unable to provide these numbers at this time.
- **Validity Indicators:** Unable to provide these numbers at this time.

REASON FOR SAMPLE COLLECTION

- **Reason for Study:** Reconnaissance, research, and interagency assistance.

FINDINGS

- **Finding/Result:** DPR's role was mainly to perform analysis of samples for SWRCB. DPR did not derive any official conclusions from the study; however, the results showed that carbaryl, chlorpyrifos, diazinon, diuron, endosulfan, and methomyl were frequently detected during the sampling period.
- **Validity of Finding:** N/A

INTERVIEW CHECKLIST

ORGANIZATIONAL INFORMATION (WHO)

- Agency (Name, Address)
  DWR-770 Fairmont,Glendale 91203
- Mandate
- Organizational Structure
- Sampling Programs:
  - Project/Program
    Description Surface Water
  - Project/Program
    Contact Bob Pierotti 818-543-4621
  - Project/Program Purpose/Reason

LOCATION (WHERE)

- Where are the samples taken (lat/long, altitude, etc.)?
  Sent in data file
- How are the sampling locations identified (e.g. GPS, Thomas Bros. Map, etc.)?
  DWR Station #
- What are the water body types (e.g. surface water: stream, canal, wetlands, etc.; groundwater)?
  Streams/rivers
- What are the sampling point types (e.g. entry point to the distribution system, end of distribution line, etc.)?
  River/stream banks

SAMPLE MEDIUM (WHAT)

- What are the sampling categories/types (e.g. water, tissue, plant, sediment, etc.)?
- What are the parameters for each sample medium?
- How many samples (of each parameter/category) are taken?
- What is the sample type (e.g. field sample, confirmation sample, repeat sample, etc.)?
  Field

FINDINGS

- What are the findings/results?
- What is the validity of the findings?

DATA SOURCE (WHO OWNS IT)

- Data Owner: Name, address, telephone number of organization to direct questions about the sample analytical results. Bob Pierotti 818-543-4653
- Sampling Entity: Name, address, telephone number of the organization to direct questions about the sample collection. Gary Gilbreath 818-543-1653
- Laboratory: Name, address, telephone number of the organization to direct questions about the laboratory analysis. Brtye Lab 916-375-6008
  What are the lab analysis methods for each parameter (accuracy and precision for each parameter!)? Call Bryte Lab-916-375-6008
  Quality assurance methods?

DATA AVAILABILITY/PUBLICATION

- How sensitive is the sampled data?
  Not
- In what format is the data available (digital, hard copy, etc.)?
  Both
- Is it available to the public?

ISSUES AND OPPORTUNITIES

International Boundary and Water Commission
United States Section
2225 Dairy Mart Road
San Diego, CA 92173
Tel: (619) 662-7600
Fax: (619) 662-7607
Email: cfischer@ibwc.state.gov

Person(s) Interviewed:
Charles Fischer, Environmental Protection Specialist

Interviewer(s):
Sabine Huynen, GIS Technician

Interview Date: September 25, 2000

Draft
October 5, 2000

General Background Information about the International Boundary and Water Commission

As established by Treaties in 1848 and 1853, the international boundary between the United States and Mexico extends over 1,952 miles (3,141 km), exclusive of the maritime boundaries. The boundary follows the middle of the Rio Grande from its mouth on the Gulf of Mexico a distance of 1,254 miles (2,019 km) to a point just upstream of El Paso, Texas and Ciudad Juárez, Chihuahua; then it follows an alignment westward overland and marked by monuments a distance of 533 miles (858 km) to the Colorado River; thence it follows the middle of that river northward a distance of 24 miles (38 km); and then it again follows an alignment westward overland and marked by monuments a distance of 141 miles (226 km) to the Pacific Ocean.

The Convention of 1889 creating the International Boundary Commission (IBC), and the 1944 Water Treaty which changed its name to the International Boundary and Water Commission (IBWC), both provide that it shall consist of a United States Section and a Mexican Section. The 1944 Treaty further provides that it shall in all respects have the status of an international body, that the head of each Section must be an Engineer Commissioner and that wherever Treaty provisions call for joint action or joint agreement by the two Governments such matters shall be handled by or through the Department of State of the United States and the Secretariat of Foreign Relations of Mexico.

The Commissioner for each Section functions under the foreign policy supervision of the Foreign Office of his Government.

The mission of the IBWC is to apply the rights and obligations which the Governments of the United States and Mexico assume under the numerous boundary and water treaties and related agreements, and to do so in a way that benefits the social and economic welfare of the peoples on the two sides of the boundary and improves relations between the two countries.

Once the project is approved by both Governments, authorized and funded, each Government through its Section proceeds to perform under the joint supervision of the IBWC, its share of the works, as determined in the approved agreement.

The two Governments generally share the total costs of the projects in proportion to their respective benefits in cases of projects for mutual control and utilization of the waters of a boundary river, unless the Governments have predetermined by treaty the division of costs according to the nature of a project. In cases of man-made works in one country or operations in one country causing or threatening to cause damage in the other country, the cost is borne by the Government in whose territory the problem originated.

The United States Section prepares its assigned part of the plans for works or contracts for their preparation with other federal agencies or with private consulting engineers. I awards contracts for and supervises its part of the construction of a project under the overall supervision of the IBWC. The United States Section operates and maintains the part of the project assigned to its Government.

Data Collection — Past and Current Status

1. New River Sanitation Project (Sampling No 264 / Minutes 1980). This program addressed recommendations for solutions of the New River border sanitation problem at Calexico, California/Mexicali, Baja Norte (Approvals: United States - September 26, 1980 Mexico - December 4, 1980).

Sampling was carried out by the IBWC office based in Yuma. The samples were collected at three stations (one in the United States; two in Mexico) defined by coordinates. One of the sites (VONS station) was sampled prior to IBWC by USGS and the Regional Board. The IBWC took over monitoring activites at this station in the 1980's. The data collected at the VONS station was carried out twice a month:

- 1st week of the month: sampling of BOD, COD, fecal Coliform and the general hydro lab (pH, conductivity, turbidity, etc.)
- 3rd week of the month: sampling of hydro lab only (no BOD/COD)

The two stations in Mexico are located at the Mexicali Lagoons and at the New River above the International Drain. Data were collected once a month and included BOD, COD, and the hydro lab.
The BOD/COD samples collected in the United States were analyzed in a laboratory in San Diego. The other samples were analyzed in the field by the Yuma staff.

Sampling has been carried out on a continuous basis, with electronic data missing for the following years:

- 85/86 (partial)
- 87-89
- 90-93

From 1994 onwards the data series is complete.

Imperial Irrigation District
333 East Barioni Blvd.
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Tel: (760) 339-9143
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Person(s) Interviewed:
Stephen Charlton, Assistant Engineer – Water Engineering Services

Interviewer(s):
Mark Sorensen, Project Coordinator
Sabine Huynen, GIS Technician

Interview Date: September 21, 2000

Draft
September 27, 2000

The Imperial Irrigation District (IID) is a community-owned utility and provides irrigation water and electric power to the lower southeastern portion of California's desert. Their service area encompasses the entire Imperial Valley and the southern section of Coachella Valley, including 500,000 acres of farmland. Established in 1911 under the California Irrigation District Act, IID is governed by a five-member board of directors elected by the public. The organization is divided into eight functional areas: Executive Offices, Water Department, Power Department, Finance & Treasury, Human Resources, Public Affairs, Information Systems, and General Services.

EXISTING WATER QUALITY PROJECTS

1. New River Wetlands Project. The purpose of the Brawley Constructed Wetlands Demonstration Project is to study how wetlands can improve the quality of agricultural drain water, New River stream flows, and inflows to the Salton Sea. To achieve this goal, two wetlands have been constructed: the 7-acre Brawley Site and the 68-acre Imperial Site. These sites will serve to demonstrate the effectiveness of using constructed wetlands through a 3-year monitoring program for constituents of concern in the water column, sediment, and biota. At the Brawley site, water from the New River is diverted to the wetland to test the effectiveness of vegetative cells to remove organic carbon nutrients from the water and to provide critical wetland habitat all without contaminating the wildlife. The wetland located at the Imperial Site receives water diverted from the Rice 3 Drain which is composed entirely of agricultural effluent. The focus of this wetland is slightly different from the smaller Brawley Site. This wetland is designed to remove sediment from tailwater runoff, nutrients from fertilizer application, and selenium from evaporative concentration of irrigation water.

2. Fig Lagoon. This project was carried out in conjunction with the U.S. Bureau of Reclamation. The Fig Lagoon was created from the need to repair the Fig Drain outlet that was damaged during Tropical Storm Kathleen in September of 1976. During reconstruction of the area near the New River channel, the outlet was enlarged creating an evaporation pond. The pond receives water

The project is part of the 'Imperial Valley Water Reclamation and Reuse Study' that represents a cooperative effort between the IID and BOR.

The Lewis Drain is sampled for selenium, nitrate, and ammonia on a weekly basis in the water column as well as periodic soil sampling for pesticides (see attached sampling schedule for the wetlands). This sampling was initiated in January, 2000. The measurements indicate that some selenium is lost to the pond (see hardcopy document for more information).

6. Triploid Grass Carp Aquatic Vegetation Control. Triploid grass carp are used by the IID to control the spread of hydrilla weeds which clog the IID's canal system. These fish are voracious eaters of hydrilla weeds. The use of triploid grass carp for vegetation control in the IID canal system began 1981. Currently, IID is California's only authorized breeder and producer of triploid grass carp. With less debris clogging the canals, suspended sediment is less likely to accumulate, resulting in reduced sediment build-up and dredging. Furthermore, chemical and mechanical means of vegetation control in the canals are avoided.

7. River Water Monitoring Program. This program involves monitoring of general physical and mineral properties in the major drains. The sampling sites represent fixed locations situated at the inlet of the Alamo River (border region) as well as at the outlet to the Salton Sea. Further sampling sites are located in the New River outlet area to the Salton Sea (more information in regards to monitoring projects along the New River is available from the Regional Board that does extensive monitoring in this particular region, especially in the inlet area). Sampling is conducted on a monthly basis and is not part of any kind of Trend Analysis program. To date, there is no knowledge of any particular trigger points. The IID is prepared to take action in the case of significant contamination, however the need for this has never arisen. Historical data are available upon request.

8. Irrigation Runoff and Reduction Program. This program was initiated in 1983 to evaluate the technical and economic feasibility of reducing irrigation runoff on a variety of crops. Tailwater recovery systems collect tailwater in a small field reservoir three to four acre-feet in size. The water is then delivered at the appropriate flow rate and time to the head of the field via a pump and pipeline system. With reduced run-off, suspended sediment is also decreased in the drainage water. Twenty-five tailwater recovery and return systems have been constructed and operated as part of the IID/MWD Project. In 1998, two other methods were added to this program, including level basin and cascade basin irrigation. The level basin consists of a uniform level farm plot that produces no irrigation runoff. This method effectively conserves water and eliminates sediment discharge into drains. In uneven or undulating terrain, the cascade basin method is used. This method uses a series of plots that drain irrigation water from one plot to the next, which conserves water and reduces suspended sediment discharge.

9. Tailwater Return Systems (Demo and MWD). Tailwater return systems are used to reclaim irrigation water that would otherwise be discharged to drains. The surface runoff from irrigation of a single field or multiple fields is collected in a small reservoir. Recovered water is pumped back to the head of the field by means of a pump and underground pipeline where it is blended with canal water and reused for irrigation. Since tailwater discharge is significantly reduced or eliminated, suspended sediment in the drains is decreased. A Tailwater Recovery Demonstration Program was performed and funded by IID to evaluate pumpback system operation alternatives as well as the technical and economic feasibility of their use in the Imperial Valley. The program consisted of a five-year study of five pumpback systems that were designed and constructed by the IID and installed on grower/operator fields. The systems were intensively monitored to determine potential impacts on soil and water resources. The impact on soil salinity from the use of recycled water was not conclusive, however it appeared insignificant. There was not enough

GIS Activities

The IID currently has GIS layers for drains, canals and canal gates, lakes and reservoirs, roadways, land parcels, city boundaries, and the Salton Sea. Water quality data is not integrated into the GIS at this point in time.

Computer infrastructure. The IID have a central IT department.

Interaction with other Agencies

Agencies collaborating with the IID are as follows:

- TMDL TAC
- USGS
- Cities
- County Health Department
- Indian Tribes
- Desert Wildlife Unlimited
- U.S. Bureau of Reclamation
- Imperial County – Properties Service
- California Dept. of Fish and Game
- U.S. Fish and Wildlife Service
- University of California
- County Agencies
- Imperial County Board of Supervisors
- Ducks Unlimited
- U.S. Geological Survey
- U.S. Environmental Protection Agency

Data Used and Generated

The following information was provided in the form of brochures and hardcopy documents:

- Summary of the existing water quality projects
- New River Wetlands Project

Regional Water Quality Control Board (RWQCB)
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Palm Desert, CA 92260
Tel: (760) 776-8933
Fax: (760) 341-6820
Email: mccld@rb7.swrcb.ca.gov
Website: http://www.swrcb.ca.gov/rwqcb7

Person(s) Interviewed:
Daniel McClure, Water Resources Control Engineer

Interviewer(s):
Mark Sorensen, Project Coordinator
Sabine Huynen, GIS Technician

Interview Date: October 31, 2000

Draft
November 1, 2000

General Background Information

The Porter-Cologne Water Quality Control Act (Porter-Cologne) is the principal law governing water quality regulation in California. This statute established the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards (RWQCB), which are charged with implementing its provisions. Porter-Cologne establishes a comprehensive program for the protection of water quality and the beneficial uses of water. It applies to surface waters, wetlands, and ground water and to both point and nonpoint sources. Porter-Cologne is found in the California Water Code beginning with Section 1300. In addition, Title 23 of the California Code of Regulations (CCR) contains administrative and regulatory elements of water quality and quantity management in California. The SWRCB was formed in 1967 when the State Water Rights Board and the State Water Quality Control Board were merged by the State Legislature, based on the realization that decisions affecting water quality and water rights are inseparable. Under its dual legal authority, the SWRCB allocates rights to the use of surface water and, together with the nine Regional Water Quality Control Boards (RWQCBs), protects water quality in all waters of the State.

Present Roles and Responsibilities

The SWRCB and the RWQCBs have primary responsibility for managing water quality in California. The SWRCB provides program guidance and oversight, allocates funds, and reviews

The Planning Unit identifies water quality impairments through monitoring and assessment activities, then develops a strategy for implementation of pollution control practices for NPS pollution. Non-point source pollution is defined as pollution not originating as a discharge from a facility such as a Wastewater Treatment Plant, or other "point sources".

In the Colorado River Basin Region, wastewater resulting from agricultural practices flows into ag drains, then into the New River or the Alamo River, and eventually is discharged into the Salton Sea. This wastewater carries sediment, nutrients, pesticides, and elevated levels of Selenium. The Salton Sea, New River, Alamo River, and Imperial Valley ag drains are currently listed as impaired, meaning they are polluted to an extent that their designated Beneficial Uses cannot be fully supported. These Beneficial Uses are described in the Water Quality Control Plan for Region 7, along with Water Quality Objectives, which are pollutant limits necessary to support the Beneficial Uses for each water body in the Region.

The Mexicali and Imperial Valleys drain into the Salton Sea, representing a trans-boundary basin component of the Salton Sea Watershed. Untreated sewage and other illegal discharges into the New River in Mexicali flow into the Imperial Valley and Salton Sea. Currently there is bi-national cooperation in addressing this problem, with a new wastewater treatment plant planned for construction in Mexicali.

Past, Current, and Future Monitoring Programs

1. New River / Mexicali Sanitation Program (1975 - present)

The main purpose is to assess to what degree the sanitation projects improve water quality of the New River at the boundary. Monitoring data indicate that the New River is polluted by pesticides, bacteria, silt, nutrients (e.g. nitrate and phosphate), and volatile organic constituents.

Currently, the New River's headwaters originate about 15 miles south of the City of Mexicali, in the Mexicali Valley, Mexico. The New River carries urban runoff, untreated and partially treated municipal wastes, untreated and partially treated industrial wastes, and agricultural runoff from the Mexicali Valley into the United States. After it crosses the International Boundary at Calexico, California, the New River travels about 60 miles through Imperial County before it discharges its entire flow into the Salton Sea. By the time the New River reaches the Salton Sea, most of its flow consists of wastewater in the form of agricultural runoff from Mexico and Imperial County.

The California Regional Water Quality Control Board, Colorado River Basin Region, has been actively involved in the cleanup of the New River and has been a significant force in molding the proceedings. The Regional Board has monitored the water quality of the New River from 1975 to the present. For this particular program, sampling was - and still is - carried out at one station (New River at the International Boundary), a USGS flow gauge station. Up until 1995, the sampling frequency varied from quarterly to monthly, with each sampling event lasting approximately 24 hours and 8 hours, respectively. The main constituents analyzed include ions, VOCs, nutrients, suspended solids, fecal Coliform Bacteria, and others, measured in the surface waters.

Future monitoring will include sampling of sediments for Dioxins, and PCBs at the border and addition of downstream monitoring stations, including the outlet to the Salton Sea mid point

Section 303 (b). *The National Water Quality Inventory Report to Congress (305(b) report) is the primary vehicle for informing Congress and the public about general water quality conditions in the United States. This document characterizes our water quality, identifies widespread water quality problems of national significance, and describes various programs implemented to restore and protect our waters.*

The Regional Board intends to reinitiate this program and to add more stations, with an increased focus on pesticide monitoring (PCBs, toxic pollutants, Selenium, etc.). The stations are distributed throughout the region. To date, sampling constituents include the general battery such as ions, bacteria, conventional parameters (pH, conductivity, etc.), and are sampled in surface waters (surface grab samples). The sampling frequency varies between monthly, quarterly, and yearly – prioritized based on the size of the water body and relative to associated issues.
The information is archived in digital form in the database (no annual reports). Data documentation is limited at this point in time. The majority of the sample analysis is conducted in-house (non certified lab).

For future monitoring, the Regional Board will be developing a quality assurance plan that meets all requirements defined by the RWQCB protocols and the EPA QAR5 plans.

4. TMDL Development and Compliance Monitoring

Future plans include more focused studies on the 303d) list. Currently, the Regional Board is working on the development of two TMDLs that will be implemented in the coming months. In this context, there will be extensive monitoring conducted on the New River, the Alamo River, and tributary drains.

New River. Constituents of interest will include selenium, pesticides, sediments, and bacteria. The TMDL developed for the New River will have a focus on pathogens. In the past (1999), sampling was conducted at two stations located along the New River, at the border, and at the outlet in the past. This year, the sampling sites will be increased to ten stations.

Alamo River. Constituents of interest will be the same as for the New River, except with less bacteria sampling. The TMDL will be focused on sediments. Sampling will be conducted at five stations seven stations stretching from the border to its outlet. Several other stations, including many agricultural drains, were also monitored during the development of this TMDL.

Salton Sea. The Regional Board plans to develop a nutrient TMDL for the Salton Sea. This project would include a monthly sampling program, with data being collected in the New River and Alamo River deltas, along various agricultural drains, and in the Sea itself. Constituents of interest will include nutrients (nitrogen and phosphorous), sediments, organic pollutants, conventional parameters (pH, conductivity, etc.), and pesticides. The data collection would occur once a month.
The purpose is to assess the current external nutrient loading to the sea.

GIS Activities

Currently, the RWQCB7 staff have a GIS workstation running PC ArcView and a Color Plotter. There is limited in-house GIS expertise, although two of the current staff know the basics of running ArcView. Regional Board staff currently utilize this work station for the generation of

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Person(s) Interviewed:
Stuart Hurlbert, Professor of Biology / Director, Center for Inland Waters
Joan Dainer, Webmaster

Interviewer(s):
Mark Sorensen, Project Coordinator
Jacqueline Lesch, Digital Librarian
Sabine Huynen, GIS Technician

Interview Date: October 24, 2000

Draft
October 29, 2000

General Background Information

Increasingly serious economic, environmental, and political problems concerning the water supplies and aquatic ecosystems in southern California have stimulated San Diego State University to create a Center for Inland Waters. Members of the Center come from, at present, four SDSU Colleges. They include specialists in economics, geographic information systems, remote sensing, environmental engineering, hydrology, water resources, geochemistry, animal physiology, limnology, fisheries biology, ecotoxicology, and other disciplines.

The Center fosters interdisciplinary research among scientists and other scholars and the application of their collective expertise to the solution of water-related problems in southern California and adjoining regions. A major regional focus for the Center is the Salton Sea, the lower Colorado River, and the Coachella, Imperial and Mexicali valleys. A major topical focus for the Center are issues of water supply, water use, and water law and policy in the American Southwest and northwestern Mexico.

Other areas of interest to the Center include groundwater hydrology, overdrafts and contamination, water-borne diseases, agricultural water use practices, freshwater aquaculture, water quality in drinking water reservoirs, restoration and protection of wildlife habitat along the Colorado River and in its delta, and in the rivers and watersheds of coastal southern California, and collaborative projects with Mexican scientists, professionals and institutions in all these areas.

The Center contributes to undergraduate and graduate education at SDSU by helping coordinate courses and curricula that deal with water-related issues, by stimulating the development of new

Station	Depth (m)	Distance to shore (km)	Geographic coordinates (N latitude; W longitude)
Primary sampling stations			
S-1	**14**	**6.7**	**33° 25' 00" ; 115° 55' 00"**
S-2	**12**	**6.1**	**33° 21' 00" ; 115° 51' 00"**
S-3	**12**	**7.6**	**33° 18' 00" ; 115° 48' 00"**
S-4	**7**	**3.5**	**33° 16' 30" ; 115° 38' 50"**
S-5	**7**	**4.5**	**33° 10' 00" ; 115° 45' 30"**

Monitoring was conducted at 2–5 week intervals. In 1997 – 1998 only the first three stations were monitored. Furthermore, some stations were not visited on all dates due to logistical problems or stormy weather. Sampling dates were, for 1997: 21 Jan (2,3), 3 Feb (3), 22 Feb (2,3), 19 Mar (2,3), 16 Apr (3), 20 May (3), 3 Jun (3), 24 Jun, 18 Jul (2,3), 13 Aug (2), 6 Sep (2,3), 17 Oct, 7 Nov, 25 Nov; and for 1998: 6 Jan (2,3), 6 Feb (2,3), 27 Feb (3), 30 Mar, 24 Apr (2,3), 22 May, 4 Jun, 3 Jul, 16 Jul, 30 Jul, 24 Aug (2,3), 12 Sep (2,3), 7 Nov (2,3), 12 Dec (Numbers in parentheses in this list indicate the specific stations that were not visited on a given date.)

In 1999 all five stations were monitored on every sampling date: 25 Jan, 28 Feb, 16 Mar, 7 Apr, 25 Apr, 10 May, 25 May, 8 Jun, 23 Jun, 5 Jul, 19 Jul, 30 Jul, 16 Aug, 28 Aug, 25 Sep, 19 Oct, 2 Nov, 23 Nov, 7 Dec 1999, and 6 Jan 2000.

Variables measured included: phytoplankton and zooplankton densities (by species), chlorophyll a concentration, temperature, dissolved oxygen, nitrogen (all forms), phosphorus (all forms), dissolved silica, pH, redox potential, specific conductance, Secchi depth, and light transmission.

Our second monitoring program was for the benthos and was carried out only in 1999. Benthic invertebrates were collected from samples of sediments taken at stations along 3 transects extending out from shore. These transects were selected in relation to the three stations (S-1, S-2, S-3) used for plankton sampling and water quality monitoring during 1997. Transect 1 began at the State Recreation Area and extended along a course of 165° toward S-1. Transect 2 began offshore of Bombay Beach and extended on a course of 261° toward S-2. Transect 3 began off of the shoreline approximately 8 km south of Bombay Beach, and extended on a course of 244 ° toward S-3. Stations S-1, S-2 and S-3 are located at 115° 55' W, 33° 25'N (9.6 km south of State Recreation Area); 115° 5l' W, 33° 21' N (8.0 km northeast of Salton City); and 115° 48' W, 33° 18' N (9.0 km east of Salton City), respectively. Samples on Jan 18–19, Mar 27, Apr16–17, May 19, Jul 13, Sepr 27–28, and Nov 20, 1999. Triplicate samples were taken at each of 6 stations along each transect at depths of 2, 4, 6, 8, 10, and 12m. Separate sampling operations were conducted on the same dates at the shoreline to document abundance of benthic invertebrates on rocky substrates at Red Hill and on barnacle shell substrates at four locations along the eastern shoreline.

Data Format

This is highly variable from one SSERG researcher or project to another, and even from one variable to another. Most of its data files are Word or Excel documents. All data are being analyzed, synthesized, interpreted and presented in articles to be published in the open scientific literature. All original data gathered under contracts with the Salton Sea Authority are being

INTERVIEW CHECKLIST

ORGANIZATIONAL INFORMATION (WHO)

- Agency (Name, Address) — University of California, Riverside, Dept. of Environmental Sciences
- Mandate — Higher Education
- Organizational Structure
- Sampling Programs:
  - Project/Program Description — Nutrient Cycling in the Salton Sea
  - Project/Program Contact — Michael A. Anderson & Chris Amrhein
  - Project/Program Objective — Determine rates of internal loading and cycling of nutrients in the Sea

LOCATION (WHERE)

- Where are the samples taken (lat/long, altitude, etc.)?
  Samples are taken at various locations throughout the Sea.

- How are the sampling locations identified (e.g. GPS, Thomas Bros. Map, etc.)?
  All sampling locations are determined and recorded using GPS.

- What are the water body types (e.g. surface water: stream, canal, wetlands, etc.; groundwater)?
  Sampling has been restricted to the Salton Sea proper, although limited sampling at the confluence with the principal rivers draining into the Sea may be included.

- What are the sampling point types (e.g. entry point to the distribution system, end of distribution line, etc.)?
  Water column and sediment within the Sea.

SAMPLE MEDIUM (WHAT)

- What are the sampling categories/types (e.g. water, tissue, plant, sediment, etc.)?
  Water column, suspended sediment, and bottom sediments.

- What are the parameters for each sample medium?

Water column:	Temperature
	DO
	PH
	Electrical conductivity
	Transparency (Secchi depth)
	Dissolved nutrients (NH_4-N, PO_4-P, NO_3-N)
Sediment: (bottom and suspended)	Particle size
	Total C, N and S
	$CaCO_3$
	Total, inorganic and organic P

Suspended sediment - 3, 8, ~15 m at most (deep) sites.
Bottom sediments - at bottom (<1 - 16 m depth).

- How are the samples described/identified?
  Samples are assigned a unique identification number with GPS coordinates and recorded on corresponding field log sheets.

SAMPLE ANALYSIS

- What is the sample analysis measurement type?
  Water column - physical and chemical
  Sediment - physical, chemical and mineralogical

- What is the sample analysis average period?
  Water column - point (in both space and time)
  Suspended sediment - 3-4 day collection period
  Sediment - point (in both space and time)

- What is the precision and accuracy of each measurement method used?
  Methods are generally accurate to 5-10%

- What are the quality assurance procedures and requirements?
  Duplicates - within 15% relative percent difference
  Spike recoveries - within 10%

- What are the sample result valid indicators (indicate whether the sample met all the Quality Assurance and Quality Control Standards)?
  Samples are re-analyzed if duplicates or spike recoveries fall outside the specified acceptance levels.

REASON FOR SAMPLE COLLECTION (WHY)

- Reconnaissance, Trend Analysis, Permit Compliance, Pollution Event, Storm Event, Research, Other?
  The primary purpose for the study is research, although the results should be of significant benefit to the RWQCB in development of a nutrient TMDL for the Sea.

FINDINGS

- What are the findings/results?
  Work is ongoing, so no final results or conclusions have been made.

- What is the validity of the findings?
  See above.

DATA SOURCE (WHO OWNS IT)

- Data Owner: Name, address, telephone number of organization to direct questions about the sample analytical results.

Michael Anderson and Chris Amhrein
Dept. of Environmental Sciences
University of California
Riverside, CA 92521

INTERVIEW CHECKLIST

ORGANIZATIONAL INFORMATION (WHO)

Agency (Name, Address)
Carol Roberts, U.S. Fish and Wildlife Service
2730 Loker Avenue West
Carlsbad, CA 92008

Mandate
The mission of the Fish and Wildlife Service is working with others to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people.

Organizational Structure
The Environmental Contaminants Program is part of the broader function of Ecological Services within the Fish and Wildlife Service. The purpose of this program is to evaluate contaminant threats to fish and wildlife resources (particularly threatened and endangered species) both on and off National Wildlife Refuge lands.

Sampling Programs
Project/Program Description
The Environmental Contaminants Program has cooperated on several efforts at the Salton Sea under the National Irrigation Water Quality Program (NIWQP). These have not been regular or recurring studies, but have been a phased approached to determining the effects of irrigation related contaminants on fish and wildlife resources. The Fish and Wildlife Service has also funded some additional studies to look at specific species or groups of species at the Salton Sea. In 2000 the Service collected water, tissue, and sediment samples from shoreline pool and drain areas that are or may be habitat for the desert pupfish. This is a one year effort to determine if use of these sites may result in selenium impacts to the desert pupfish.

Project/Program Contact
Carol Roberts/Jim Setmire/Roy Schroeder

Project/Program Purpose/Reason
The NIWQP was developed to evaluate irrigation related contaminant problems in areas receiving water from federal irrigation projects. Some remediation is conducted where feasible, but the primary focus has been identification and characterization of problems. The Service sampling programs are focused on specific management questions that would result in protection or enhancement of recovery of trust resources.

LOCATION (WHERE)

Where are the samples taken (lat/long, altitude, etc.)?
The locations for samples for each phase of these studies is provided in the reports that have been published through either the USGS or the NIWQP. Specific locations for this year's pupfish sampling can be provided if necessary.

Sampling frequency (e.g. 24hrs cycle/weekly/monthly/other)?
Most efforts did not involve repeat sampling. Our most recent sampling was conducted at two month intervals. As part of the 1994-95 Drain Study, clams placed in drains as a biomonitoring tool were retrieved on a weekly or biweekly basis for one month.
Planned duration of sampling? **No additional field sampling is planned for these studies.**

SAMPLE COLLECTION METHOD (HOW)

What is the method used to collect the sample - for each parameter (e.g. grab, pump, collection filter, etc.)?
Water samples were collected by means of a water sampler or by grab using the sample container. Some samples were filtered, other samples were preserved with acid, depending on the purpose of the study. Sediment samples were obtained by hand trowel or by means of an Ekman sampler. Plant tissues were obtained by hand. Fish samples were obtained by means of minnow traps or dip nets. Benthic organisms were sieved from sediment samples collected by hand trowel or Ekman sampler. Egg samples were collected by hand from bird nests, and the contents were removed from the shell prior to analysis. Bird tissues were removed by means of clean instruments during a general necropsy.

What are the sample sizes?
Water samples were generally 500mL. Sediment samples were a minimum of 250 mL. Plant tissue and fish sample sizes depended on the availability of material. Where possible individual species were analyzed separately. Bird eggs were analyzed individually. Bird tissue sample sizes varied depending on the size of the bird and its organs.

At what water level are the samples taken?
Most water samples were surface grabs, but bottom water samples were also collected during sampling of the Salton Sea.

How are the samples described/identified?
Service samples are required to have an eight character unique identifier. Notes were taken during all sampling events to specify the locations, methods, and any unusual sample characteristics.

SAMPLE ANALYSIS

- What is the sample analysis measurement type?
- What is the sample analysis average period?
- What is the precision and accuracy of each measurement method used?
- What are the quality assurance procedures and requirements?
- What are the sample result valid indicators (indicate whether the sample met all the Quality Assurance and Quality Control Standards)?

Specifics of the analyses and quality control/quality assurance are managed for the Service by the Patuxent Analytical Control Facility. The specifics would have varied somewhat depending on the needs of each investigation. Results that did not meet the QA/QC requirements of the Patuxent Analytical Control Facility were not interpreted for reports or management activities.

What are the lab analysis methods for each parameter (accuracy and precision for each parameter!)?
Quality assurance methods?

DATA AVAILABILITY/PUBLICATION

How sensitive is the sampled data?
It is the Service's policy not to release raw data, but rather to review, interpret, and write up data before it is released.

In what format is the data available (digital, hard copy, etc.)?
Hard copies are available for all reports. Some reports may be available in electronic form (WordPerfect). Specific raw data may be release depending on the nature of the request and the data in question. Hard copies are most readily available, but electronic data may be available for some data sets.

Is it available to the public?
The data is available to the public in the form of completed reports.

ISSUES AND OPPORTUNITIES

While it may be possible to plot all of the individual results of the many studies on a map or set of maps of the Salton Sea, in my view the more appropriate level of analysis for contaminant inputs would be on a "drain-shed" basis. After a review of the available data at this level, specific drain systems would be targeted for additional characterization. Through this process it might be possible to identify specific areas that should be considered for remediation/control of contaminated runoff. As for the Salton Sea itself, we are still lacking a good understanding of the fate of several constituents once they enter the Salton Sea. I would like to see greater emphasis on understanding these processes, rather than collecting data that will only give us more snapshots of the Sea's water quality at specific points in time and space. Obviously, some specific monitoring points are needed for baseline and long-term study, but understanding the processes that drive the transport and fate of these constituents is necessary to achieve the overall project goals.

1998/1999. The purpose of the program was to verify whether the sediments in the Salton Sea were acting as nutrient sinks or not. Sediment cores (pore water samples) were taken at two different locations in the Sea itself, at 30 foot depth levels. The sampling sites had been chosen in an earlier study (1998) and were defined by GPS. It was thought that undisturbed sediment cores would be recovered at particular sampling locations near the center of the Sea. The data collection was carried out during April 26 and 27 in spring 1999.

1998. Sediment cores (bottom water samples) were sampled at eleven different sites defined by GPS. The purpose of this project was to determine the variability in texture and chemical composition of sediments among all the different sites. The samples were taken at three different depth levels over a period of three days in summer 1998 (July 20–22). The depth levels are as follows:

- 15 feet (shallow, around the 5 principal river mouths - this would represent the area where the new water line would emerge under recently proposed water conservation efforts)
- 30-35 feet (White Water, New River, and Alamo River)
- 45-50 feet (deep areas in the central part of the Sea)

Water quality data were collected along with the sediment samples in both studies (1998 and 1999). Nutrient levels of phosphorous and nitrogen were measured near the bottom of the sea at the same locations as the sediment samples.
The sample analysis was conducted by the USGS laboratory in Denver.
Most of the data are stored in the central database in digital form. The chemical analysis reports and physical descriptions were put into open source reports and will be available online as .pdf files in the near future.

2. Bi-National Sampling Program 1995/1996

This program was funded by the EPA and was carried out as a joint-project together with a number of local agencies. The two principal agencies involved were the USGS (responsible for the data collection) and the Mexican and U.S. sections of the International Boundary and Water Commission (IBWC). The latter took on the role as an 'umbrella agency', coordinating the numerous agencies in the U.S. and Mexico, publishing the results and findings. The study area was focused on the New River and the Lower Colorado region (border region of Arizona/California), and included the collaboration of various state agencies in California, Arizona, and Baja California Norte.

New River. The data were collected at three different sites, defined on quad maps. The sites represent established gauging stations located in Mexicali, where treatment plant water is directly diverted into the New River, and the outlet to the Salton Sea. The media measured was on suspended sediments, bottom material, and in water chemical toxins, and nontoxic organic and inorganic materials. Fish for chemical analysis of tissues were collected by the Arizona Department of Game and Fish and by the Regional Water Quality Control Board. A report summarizing the findings is currently being finalized by the IBWC.

Lower Colorado River. Sampling was conducted outside of the Salton Sea watershed, along the Gila River, Colorado River, and in the Welton Mohawk Canal/Drain and the Yuma Main Drain.
The sample analysis for both study areas was conducted by the USGS Laboratory in Denver. The monitoring program will probably not be continued in the future.

4. Tritium Study, Roy Schroeder, 1994

The purpose of this project was to examine how long it takes water to pass through the groundwater column until it seeps into the agricultural drains. The constituent used to measure time was Tritium, and the project represented a modeling effort rather than water quality. The data are stored in the USGS Central Database and are published in a journal article.

5. Pesticide Study Related to the Eared Grebe Die-Off, 1992

This program was carried out in conjunction with the NIWQP and the Regional Water Quality Control Board. The purpose of the project was to study pesticides in agricultural drains to see whether there were any links to the Eared Grebe Die-off at that time. The samples were collected in late March/early April in 1992. The findings revealed no conclusive evidence of a positive correlation between the pesticides and the Eared Grebe die-off. The data used analytical methods then being developed so they have not been entered into a database up to this point in time.

6. Dissolved Oxygen Project, Jim Setmire, 1978/1979

This project was focused on the dissolved oxygen time of travel in surface waters. The study also included a biological component, with a main focus on establishing an algal taxonomy and measuring the number of fecal bacteria.
Samples were taken in the New River and Alamo River (WHAT WAS THE SAMPLING FREQUENCY? TIME PERIOD? HOW MANY STATIONS? HOW WERE THE LATTER IDENTIFIED? WHAT ARE THE FINDINGS/RESULTS?)
→ *See Jim Setmire interview write-up!*
The project was carried out in conjunction with the Regional Water Quality Control Board, Region 7.

7. Study of Pesticides, Larry Ecles, 1977/1978

This study was funded jointly by the Regional Water Quality Control Board and the USGS with a focus on pesticides in rivers and drains in the Salton Sea and Lower Colorado River basins. Samples were collected at 17 different sites in all large drains merging into the Alamo River and the New River (mostly in Imperial Valley, some in Coachella Valley and in the Lower Colorado area). The sampling sites were identified with the help of USGS quad maps.
Sampling was conducted on a bi-monthly basis during one year, with a focus on Organo-Phosphates, DDT's, Carbamates, and common herbicides. The data are stored in the USGS Central Database and in hardcopy reports.

8. National Stream Quality Accounting Network (NASQAN)

This program was initiated in the late 60's as a national monitoring program (no data analysis included). Water quality samples were collected on a monthly basis throughout the United States. The main constituents of interest included inorganic trace elements, nutrients, and pesticides. The program is still being continued on only three or four of the largest rivers in the United States (water quality sampling on the Colorado River ceased last year).

Interaction with other Agencies

Agencies collaborating with the USGS are as follows:

- California Dept. of Fish and Game
- U.S. Fish and Wildlife Service
- Regional Water Quality Control Board
- Arizona Dept. of Game and Fish
- California State Agencies
- County Agencies
- State Agencies in Baja
- International Boundary and Water Commission (U.S. and Mexico Sections)
- U.S. Environmental Protection Agency
- U.S. Bureau of Reclamation

Data Used and Generated

The following reports and documents associated with water quality monitoring activities conducted by the USGS are archived in the Salton Sea Database Program (SSDP) library:

- Detailed Study and Assessment of Irrigation Drainage in the Salton Sea Area, Imperial Valley, California
- Reconnaissance Investigation of Water Quality, Bottom Sediment, and Biota Associated with Irrigation Drainage in the Tulare Lake Bed Area, Southern San Joaquin Valley, California, 1986-87
- Selected toxic trace-element and pesticides concentrations in water, sediment, and biota from the Southern Tulare Lake Area near Kern National Wildlife Refuge, California
- Trace elements and pesticides in Salton Sea area, California
- Transferability of Environmental Assessments in the Salton Sea Basin, California, and Other Irrigated Areas in the Western United States to the Aral Sea Basin, Uzbekistan
- Use of stable isotopes, tritium, soluble salts and redox-sensitive elements to distinguish ground water from irrigation water in the Salton Sea basin
- Work Plan for Irrigation Drainage Field Reconnaissance Study: Salton Sea Area, California
- Physical, Chemical, and Biological Data for Detailed Study of Irrigation Drainage in the Salton Sea Area, California, 1988-90

Data Format. Data are/were available in the following formats:

- 1920-1960: published Professional and Water Supply Papers
- 1960-2000: USGS digital database (not publicly accessible, data available upon request only), water Resource Investigation, and Open-File Reports, technical journals, and symposium proceedings
- present: Data directly downloadable from the USGS data website

Most of the data are stored in tables in text format (ASCII?). With the database transfer onto the Internet, most of these data will be available in ASCII format, including header files describing the data (metadata).

Investigation of the Cause of Eared Grebe Mortality at the Salton Sea: Algal Blooms and Biotoxins

Principal Investigator: Wayne W. Carmichael
Institution: Wright State University, Dayton, Ohio 45435
Department of biological Sciences
Tel: 937-775-3173
Fax: 937-775-3320

Organizational Information-WHO

The project is part of the second round of funded projects and follows up as well as compliments the study entitled "An Environmental Reconnaissance of the Salton Sea". The project was initiated by the Salton Sea Research Management Committee and is under the direction of the Salton Sea Authority. The project reports through the study Project Officer to the Executive Director of the subcommittee.
This investigation of the cause of eared grebe mortality is a cooperative effort with individual researchers at the National Wildlife Health Center in Madison, WI, and the Salton Sea Authority.

Location-Where and Sample medium-What

Tahni Johnson, wildlife disease specialist contracted through SSA to work on the Wildlife Disease Prevention Program, has been designated to monitor the Sea for major avian disease outbreaks, fish kills, and algal blooms. Tahni Johnson, patrolling the sea by airboat, will be collecting water, algae, and bird specimens from the Salton Sea. Sample locations are designated by the SSA and include but are not limited to areas around the Whitewater, New and Alamo Rivers.
Three surface water grab samples will be taken from the side of the air-boat, from the beginning, middle, and end of each transect and collected into 500-ml Nalgene bottles, supplied by WSU. A nylon plankton net and nylon rope (Carolina Scientific 15", ten mesh, 153 mm porosity) supplied by WSU will be used to collect plankton samples by towing for 2 –3 minutes at low speed from the airboat for each transect. Collected plankton tow samples will be transferred to 250-ml Nalgene bottles. The plankton net will collect larger algae and bloom material, while the grab samples will be used to collect smaller nannoplankton that might pass through the net. At the river openings near shoreline areas, the sediment surface layer will be sampled for benthic mat-forming cyanobacteria by scraping the sediment surface with a large metal spoon and placing the material into a 60-ml Nalgene bottle. All sample bottles will be labeled with an alphabetical code for the site area (Alamo = A, New = N, Whitewater = W, open = O), the transect number (1 – 4), location along transect (beginning = B, middle = M, and end = E), and an alphabetical code for the sample type (grab = G, plankton tow = T, sediment = S).

Date/Time-When and Sample Collection Method-How

Throughout the year and especially during grebe winter residence from December to April, Tahni Johnson will conduct regular, periodic estimates of avian populations and their distribution on the SS. Sick grebes will be identified by observing signs of abnormal behavior such as excessive preening, exhibiting "drinking behavior", gathering at sources of freshwater and coming out of the water onto the shore. The locations of aggregates of birds and sampling

Reason for sample collection-WHY

Bloom and mat-forming cyanobacteria from fresh, brackish, and marine waters may produce a wide variety of toxins including hepatotoxins, neurotoxins and dermatatoxins. The most frequently found cyanobacterial toxins encountered worldwide are the hepatotoxic microcystins and nodularins, cyclic peptides consisting of seven or five amino acids respectively. To date 65 different structural variants are known that, depending on the specific chemical structure, vary in potency from highly toxic to non-toxic, with most being very toxic. Microcystins have been characterized from planktonic **Microcystis, Oscillatoria/Planktothrix, Anabaena, Nostoc, Anabaenopsis,** ***and certain picoplankton genera, whereas nodularin is produced by*** **Nodularia spumigena.** ***Of the three families of cyanobacterial neurotoxins, anatoxin-a has been found in*** **Anabaena, Oscillatoria, Aphanizomenon,** ***homoantoxin-a in*** **Oscillatoria,** ***anatoxin-a(S) in*** **Anabaena,** ***and saxitoxins from*** **Lyngbya, Aphanizomenon, Anabaena, Cylindrospermopsis** ***and*** **Planktothrix.** ***Toxins causing severe dermatitis among contacting swimmers may be produced by benthic cyanobacteria such as*** **Lyngbya, Oscillatoria** ***and*** **Schizothrix** ***in marine waters. Collectively, the cyanotoxins have been responsible for continued widespread poisoning of wild and domestic animals plus human fatalities. Preliminary observations have verified that several toxic algal species are present in the Salton Sea that may cause wildlife mortalities, especially in sublethally stressed animals, rendering them more susceptible to disease. Beginning in January 1999, organic solvent extracts of phytoplankton samples, containing prymnediophytes, coccolithophores, raphidophyceae, and dinoflagellates, taken from the top 50 –100 cm of the water column were tested for toxic activity in brine shrimp and mouse assays by researchers at San Diego State University. Although some blooms showed toxicity towards invertebrates and none were active in the mice, this limited study was not sufficient in ruling out toxic algae, particularly cyanobacteria, as a factor in major mortality events. Results from eared grebe tissues collected at the SS in 1992 -1994 identified the cyanotoxin, microcystin(s) produced by cyanobacteria, in high enough concentrations to cause acute toxicity Carmichael et al., unpublished data). Enzyme Linked Immunosorbent Assay (ELISA) performed with extracts from 25 grebe samples of liver, gizzard and upper gastrointestinal tract tissues, had measured levels of microcystin(s) as high as 700 ng/g, well above the known levels of microcystins that cause acute lethality of about 200 ng/g (Carmichael et al., unpublished data). Forty-nine Salton Sea water samples of phytoplankton provided by the US Fish and Wildlife Service in 1995 – 96, contained levels of microcystins that ranged from not detected to 2 ppb. Although these low levels are not likely to cause acute toxicity, the toxin was associated with a planktonic cell smaller than 5 microns. This background data forms the basis for the hypothesis of this project:*** *Microcystins contribute to the eared grebe mortalities on the Salton Sea and the source of the organisms producing the microcystins are to be found in the picoplankton.* ***The first objective of this study is to identify cyanobacteria algal species from Salton Sea water samples including any cyanotoxins produced from these species that may contribute to the unexplained deaths of eared grebes. Cyanobacteria suspected of microcystin-production will be isolated and cultured for verification of toxicity and characterization of toxic components. The possibility also exists for examination of cyanotoxins other than microcystins that may be produced by certain cyanobacteria if specific producers are identified, ie. Anatoxin-a from*** **Oscillatoria** ***or PSPs from*** **Lyngbya.** ***The second objective is to determine the presence or distribution of toxins in selected eared grebes, specifically from tissue samples subject to microcystin concentration and effect. Monitoring will include the major inflows, including the New, Alamo, and Whitewater Rivers, and areas where the grebes are observed dying or exhibiting excessive drinking and preening behaviors. Control tissues from unexposed grebes from another area similar in ecological and physical conditions, possibly Mono Lake in California where no episodes of grebe mortality have been observed, are being sought through***

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COACHELLA VALLEY WATER DISTRICT

POST OFFICE BOX 1058 • COACHELLA, CALIFORNIA 92236 • TELEPHONE (760) 398-2651

December 6, 2000

File: 0541.132

Sabine Huynen
University of Redlands
1200 East Colton Avenue
Redlands, California 92373

Dear Ms. Huynen:

Subject: Summary of Water Monitoring Programs for Evaluation of the Salton Sea

The enclosed summary of our water monitoring programs provides general information for sampling locations, water sources, monitoring frequencies and parameters tested.

During the past ten years we collected grab surface water samples from the Salton Sea in 1992, 1994, 1997 and 1998. We have enclosed global positioning system coordinates for our ten Salton Sea monitoring sites. Monitoring performed in 1992 and 1994 included general minerals and some "heavy metals." Only general mineral testing was completed on samples collected in 1997 and 1998.

We use many laboratories to complete the tests described in the enclosed monitoring summary. Generally, our district laboratory provides general mineral, inorganic, radioactive and biological analytical services. Contract laboratories are used for organic analytical services and bioassay evaluations. This data is district property and most information is available in hard copy to the public in accordance with the Public Records Act. Some of our monitoring data is held in confidence and is exempt from the Public Records Act.

We have enclosed two annual district publications which include results from some of our monitoring programs. Compliance reports are prepared routinely for our drinking water, stormwater and wastewater monitoring programs and are available to the public through various regulatory agencies.

If you have any additional questions regarding our water monitoring programs, please call Steve Bigley, water resources associate, extension 286.

Yours very truly,

Tom Levy

Tom Levy
General Manager-Chief Engineer

Enclosures/4/as

SB:jl\wg\wr\dec\juyuen

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gtorlob@ucdavis.edu

Person(s) Interviewed:
Dr. Gerald Orlob

Interviewer(s):
Mark Sorensen, Project Coordinator
Sabine Huynen, GIS Technician

Interview Date: October 28, 2000

Dr. Gerald Orlob referred the SSDP staff to the following document:

Huston, David W., Christopher B. Cook, and Gerald T. Orlob. *New and Alamo Rivers Project: Preliminary Data Collection and Analysis for Development of Hydrodynamic and Water Quality River Models*. Water Resources and Environmental Modeling Group, Department of Civil and Environmental Engineering Center for Environmental and Water Resources Engineering, University of California, Davis. Report 99-3. Davis, Ca: January 2000.