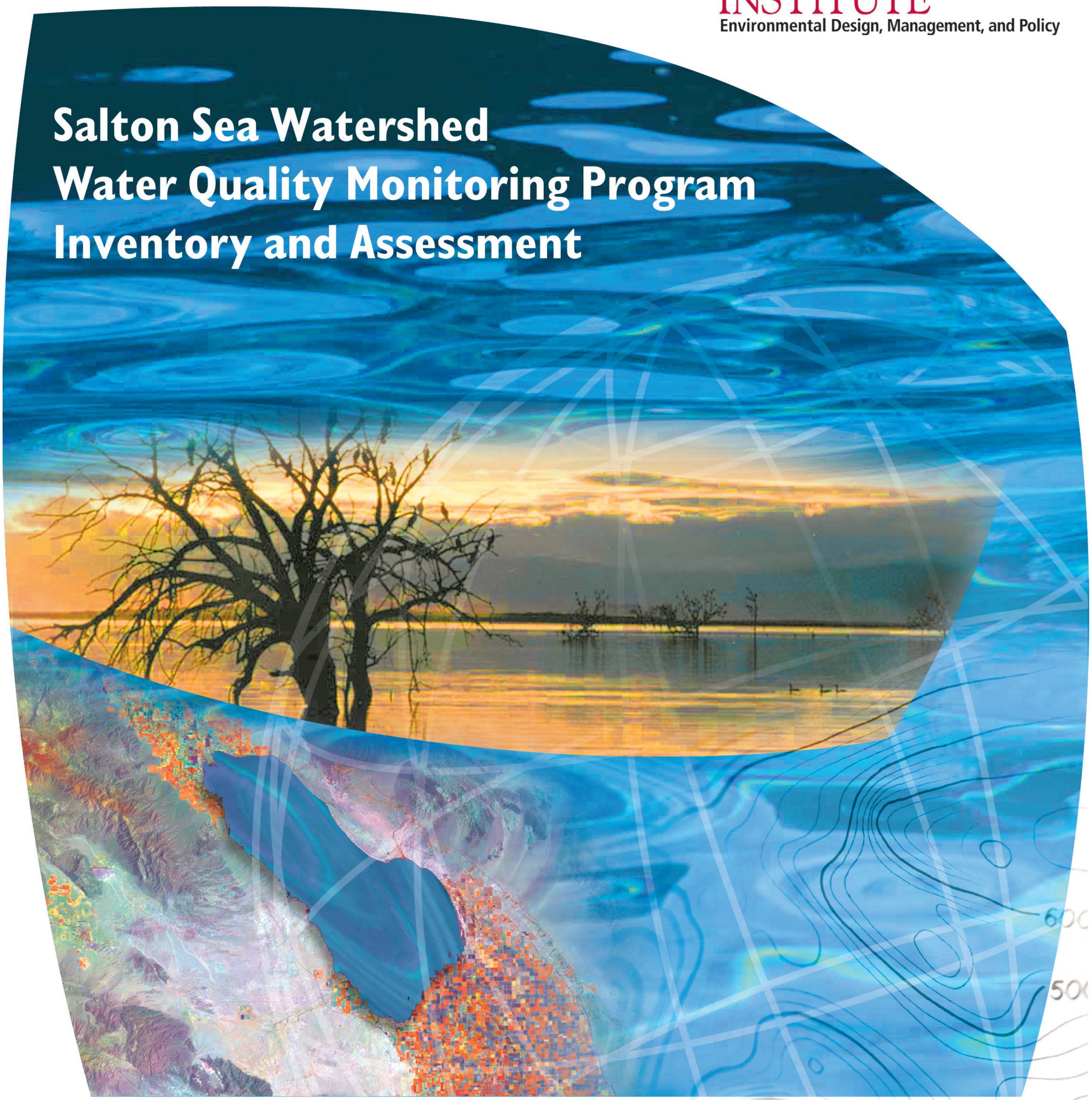
THE REDLANDS INSTITUTE
Environmental Design, Management, and Policy

Salton Sea Watershed Water Quality Monitoring Program Inventory and Assessment



UNIVERSITY OF REDLANDS

SALTON SEA DATABASE PROGRAM

Salton Sea Watershed

WATER QUALITY MONITORING PROGRAM

INVENTORY AND ASSESSMENT

Final Report

April 2001

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1. Introduction

1.1 Background

The survival of the Salton Sea as a water resource and wildlife habitat is critically dependent on a collaborative effort between federal, state, regional, and local agencies. 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 Water Quality Technical Committee (WQTC) members decided that a relevant 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.

In addition, the Science Office plans to develop baselines for a water quality 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 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 research. 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 of the Water Quality Technical Committee (WQTC)

In July 2000, Dr. Milton Friend initiated the formation of the 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.*

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 in order 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 unbiased 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 specific 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; and*
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[1]. 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 18 organizations that have conducted, are conducting, or plan to conduct 76 separate water quality monitoring programs or activities within the basin.

Information collected during the inventory was ultimately entered into a database that was utilized to analyze and display information as matrices, summary charts, and maps. Many of the matrices and maps are too large and complex to be included in this report as hard copy. The entire project documents including this report, maps, and data matrices are contained in a compact disk (CD) included with this report. This information is also available at the following URL:

http://cem.uor.edu/pub/huynen/wq/index.htm

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

2.1 Interview Methodology

The Regional Water Quality 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*

[1] The terms Salton Basin and Salton Sea Basin are used as synonyms for watershed.

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 (**Appendix A**) was constructed 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 the 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 location) and from what substrates?

WHY — are/were the samples taken (specific 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 or constraints to more collaboration and data sharing. The full interview documentation is included in **Appendix E**.

Step 3 - Synthesize interview information

The third step involved evaluation and synthesis of information collected during the interviews. This included a number of assessments that are 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, which was then "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. The results of this workshop are summarized in section 5.0.

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);*
- *U.S. Bureau of Reclamation (Chris Holdren, Denver, CO);*
- *Environmental Health Department of Riverside (Don Park, Riverside, CA);*
- *Wright University (Wayne Carmichael, Dayton, OH);*
- *California Department of Pesticide Regulation (Nan Singhasemanon, Sacramento, CA);*
- *LFR Levine Fricke (Richard Vogl, Costa Mesa, 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 those commonalities, duplicative efforts, and apparent joint needs that agencies expressed about the various water quality monitoring efforts in the Salton Sea basin. The discussion also includes those organizations or types of agencies that may have limits or constraints to collaborative water quality monitoring efforts.

3.2 Synthesis Methodology

Information for the synthesis was culled from the interviews, various reports and documents, and from data samples provided by the different organizations (see **Bibliography** for a detailed list of references). Extracting and summarizing the information in Excel spreadsheets (see enclosed CD) resulted in a series of tabular and comparative analyses to see which organizations share similar program types, objectives, monitoring locations, monitoring timeframes, and data constituents.

The following data assessment is divided into three separate components: *organizational, program/activity, and data constituents.* Each assessment category is characterized by descriptive terms to assist in evaluating the inventory. A list of detailed descriptions defining these terms is given in **Appendix B**.

The inventory data were organized by agency, followed by water quality monitoring program, or activities these agencies conducted. These programs or activities represented a combination of past, present, or future water quality monitoring efforts. The ***organization assessment*** contained the following information:

- *Organization*
- *Program*
- *Brief Program or Activity Description*

This is followed by the ***program assessment*** that characterized and provided descriptive information about each water quality monitoring 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 inventory additional information on a variety of other program/activity characteristics. However, not enough information was collected on these characteristics to report findings at this time (Note: many of these characteristics will be established in a future data analysis phase).
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. Approximately 80 different data constituents were tabulated. These constituents were classified by sampling medium into three major categories:

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

The bulk of water quality monitoring efforts extract constituents from water samples. Thus, ***Water Extracts*** was further broken down into seven categories as follows:

Water Extracts

General Physical/Chemical (including Nutrients)
Organisms (including Bacterial and Biological)
Pesticides
Hydrologic
Metals

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

3.3 Organization Assessment

The 18 organizations, agencies, and the private firm 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 jurisdiction refers to an agency's legal or chartered responsibility to monitor or administer a specific function. Examples would include U.S. 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, such as universities, that have participated in this study 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 focused data collection only. Organizations with geographic jurisdiction, on the other hand, 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 challenging where multiple agencies have various types of jurisdictions and mandates.

Some agencies working in the Salton Sea basin, such as federal agencies conducting National Irrigation Water Quality Program (NIWQP) studies, have shared water quality data in the past. 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 18 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 U.S. Geological Survey (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 of a broad mandate, the USGS is more apt to participate in cooperative efforts. Other federal agencies, like the U.S. Bureau of Reclamation (BOR), are project focused therefore usually get involved in joint data collection where it directly supports project objectives. U.S. 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. Often times, federal agency water quality monitoring efforts are fund source specific thus limiting the scope and duration of the project. Federal agencies in this inventory include:

U.S. Bureau of Reclamation
U.S. Fish and Wildlife Service
U.S. 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. State agencies 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. County agencies 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. The utilities represented in this study are public agencies governed by locally elected board of directors. These agencies are special districts and are nonprofit agencies that provide public services. Utilities include:

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 limit 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. Universities include:

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

Private Companies/Consulting Firms. While private companies typically do not have a specific interest in water quality monitoring for their own activities, they often perform water quality monitoring for other government or municipal agencies on a contract basis. These private companies may offer water quality monitoring expertise including the following disciplines: biology, biochemistry, engineering, hydrology, hydrogeology, limnology, etc. One private consulting firm that provided data for this study conducted water quality monitoring for the Salton Sea Authority and is listed below:

LFR Levine Fricke, P. C.

3.4 Program Assessment

The 18 agencies and organizations reported a total of 76 different water quality monitoring programs or activities. They are listed below by organization, program/activity, followed by a brief description of the program.

Note: To support the NEPA/CEQA process, Secretary Babbitt created two government/stakeholder committees to guide and integrate scientific research related to restoration issues: a high-level Research Management Committee and a Science Subcommittee (SSC), consisting of scientists and technical representatives from federal, state, and local organizations. The SSC was charged with providing scientific information for the Environmental Impact Statement (EIS), to be completed in 1999, and has funded a series of 'reconnaissance' surveys to gather information quickly.

In addition, the Salton Sea Reclamation Act passed by the U.S. Congress in 1998 formally established the decision-making hierarchy to evaluate restoration alternatives in order to remediate environmental degradation in the Sea. Title I of the Act authorized preparation of a feasibility study to evaluate restoration alternatives and prepare baseline reconnaissance studies to support this evaluation. The Lead Agencies for preparation of the feasibility study were the Salton Sea Authority (the State lead agency established under a Joint Powers Agreement between the Imperial and Riverside Counties and the Imperial Valley and Coachella Valley Water Districts) and the Bureau of Reclamation (the Federal lead agency).

To date, several baseline reconnaissance studies have been commissioned to help fill data gaps associated with the ecological assessment activities of the Science Subcommittee. The studies represent a collection of synthesis reports, compiling information about Algal Toxins, Birds, Fish, Bio-Limnology, Physical Limnology, Micro Pathogens, Sediment, Vegetation, Pupfish, Air Quality, Public Health, and Water Resources, within the Salton Sea Region. These studies were conducted under the auspices of an Environmental Protection Agency (EPA) grant administered by the Salton Sea Authority. Several of the agencies interviewed as part of this project represent contractors to the Salton Sea Authority and conducted research within the aforementioned context. These programs are marked with an asterisk symbol in the following section.

Organization

Program/Activity

Brief Description

Agua Caliente Band of Cahuilla Indians

Groundwater Monitoring

Groundwater monitoring 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
Monitor storm water discharges and receiving water within the Whitewater River Watershed.

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 Plan

Lewis Drain Pilot Project
Explore drainwater treatment options

River Water Monitoring Program
General monitoring to determine contamination

Raw Surface Water Monitoring/Title 22
General surface water monitoring

Surface Water Monitoring at Salton Sea
Monitor sediment loads in drains entering the Salton Sea

Peach/Pampas Watershed Study
Study of water quality issues in sample watershed

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

Department of Pesticide Regulation (DPR)

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)

Measure levels of bio-accumulative substances in fish tissue

Trend Monitoring

Support assessment 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 at International Boundary

Alamo River Monitoring

General Monitoring

All American Canal Monitoring

General Monitoring

*San Diego State University (SDSU)

Plankton Populations

Determine and characterize plankton populations in Salton Sea

Benthic Invertebrate Populations

Determine and characterize 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 (UC Davis)

New and Alamo River Preliminary Studies

Historical monitoring of five constituents

*University of California – Riverside (UC Riverside)

Nutrient Cycling in Salton Sea

Look at nutrient loading and TMDL

U.S. Bureau of Reclamation (BOR)

NIWQP-1986/87 Reconnaissance

Water, sediment, and biota samples to determine concentrations of selected trace elements and pesticides in irrigation drainwater

NIWQP-1988/90 Detailed Study

Detailed study of water, sediment, and biota in irrigation drainwater – focus on selenium, boron, and organochlorine pesticides

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

Focus on selenium in subsurface drainwater

New River Wetlands

Design of demonstration wetlands and monitoring study

Lewis Drain

Selenium removal demonstration project

New River

Aeration downstream of International Boundary

**Chemical /Physical Analyses of the Salton Sea*

Physical and chemical analyses of Salton Sea and Rivers

U.S. Fish and Wildlife Service (US F&WS)

Piscivorous Birds/Colonial Waterbirds, 1990-91

Determine toxicity in birds, bird eggs, and fish

Piscivorous Birds/Specific Study, 1992

Determine toxicity in birds and bird eggs

Piscivorous Birds/Black Skimmers, 1993

Determine toxicity in birds, bird eggs, and sediment samples

Boron in Waterfowl, 1991-92

Determine boron levels in sediments, vegetation, invertebrates, and birds

Yuma Clapper Rail, 1994

Determine toxicity in birds, crayfish, and sediment

Algal Biotoxin Study, 1995-96

Determine toxicity issues in algae

Eared Grebe Mortality 1992-93

Determine probable cause of Grebe die-off

NIWQP, Egret Eggs, 1993
Determine toxicity in egret eggs

NIWQP, Sailfin Mollies, 1994
Study toxicity impacts on Sailfin Molly as surrogate for Desert Pupfish

Desert Pupfish Habitat, 2000
Determine toxicity in Pupfish habitat

U.S. 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

New River Study 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 toxicity of algal blooms and biotoxins

***LFR Levine Fricke**

Physical/Chemical study of sediments – Phase I/II

Sediment size distribution and contaminants

3.4.1 Program Purpose and Objective

Programs or activities were classified into similar purposes or objectives for evaluation. Programs with comparable purposes often have similar types of data needs. For example, permit compliance programs (described below) 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 studies and 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 that has occurred over a certain time period. Historical data are often compared with current data to assess trends in pollutant levels. Where trend analysis requires all new monitoring data, expense may limit the amount of data collected.

Modeling. An investigative technique using mathematical or physical representation of a system or theory that accounts for all or some of its known properties. Models are often used to test the effects of changes of system components in the overall performance of the system. Data collection is typically focused on several key constituents that are designed to simulate certain physical or chemical processes of interest. An example would be hydrologic modeling of the Sea in which field monitoring was conducted to provide additional characterization of actual circulation, including data required to calibrate and verify model results.

Permit Compliance. Certain permits may require that specific water quality data be 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 occurs, 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, a 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 can often be 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 meet 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, analysis method or standards to be useful.

Research. Monitoring conducted for specific research purpose. Research data often have 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 are the results of a tabulation of all programs and activities by their primary purpose or objective.

Table 1. Number of Programs/Activities and Their Associated Purpose/Objective.

Purpose/Objective	Number of Programs/Activities
Research	24
General Monitoring	22
Permit Compliance	6
Monitor Specific Site	6
Reconnaissance	5
Trend Analysis	3
Unknown	3
Demonstration Project	2
Pollution Event	2
Modeling	2
Storm Event	1

The greatest number of programs are or have been engaged in research or "general" water quality monitoring, i.e. routine water quality monitoring. Research oriented water quality monitoring, the largest number of programs, usually investigates a wider span of water quality data that 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. 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.

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 International Boundary and Water Commission (IBWC) are engaged in general monitoring activities. These agencies, which have jurisdictional areas or health mandates, perform general monitoring on surface waters. The Regional Water Quality Control Board (RWQCB), which has water resource quality responsibilities, is involved in Total Maximum Daily Load (TMDL)[2] development and compliance, and the protection of various surface waters including drains and channels. The CVWD lists five general monitoring programs. Research programs are the domain of universities (UC-Davis, UC-Riverside, SDSU, and Wright State University) and federal agencies (U.S. Bureau of Reclamation, U.S. 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 (IID) is the only agency to conduct a number of both general monitoring (4) and demonstration projects (2).

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. **Table 2** and **Figure 2** show the number of programs that perform monitoring at various locations.

The total is larger than the 76 programs previously listed as some programs collect data in more than one type of location.

[2] A TMDL is the maximum allowable pollutant load that can be present in a water body and still ensure the designated beneficial uses are attained and maintained.

Table 2. Monitoring Locations and Number of Programs/Activities.

Monitoring Location	Number of Programs/Activities
Surface Waters	
Rivers (typically Alamo and New Rivers)	28
Salton Sea	21
Irrigation Runoff Drains	14
Other (includes wetlands, channels, treatment plants)	9
Non-Surface Waters	
Biota	19
Sediments	15
Groundwater	6
Unknown	5
Other non-surface waters	3

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 1970s and 80s, 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.

Due to concerns about the impacts of toxicity on wildlife health and disease/mortality, many monitoring studies have been conducted on biota (birds, fish, invertebrates, algae) and sediments.

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 3**). As suspects for transporting nutrients and selenium — amongst other contaminants resulting from agricultural activities — a large number of programs focus on monitoring of irrigation drains. The Salton Sea, the receptacle of all runoff and pollutants of the basin, is also the geographic focus of over 15 programs.

Table 3 and **Figure 3** summarize the distribution of programs by monitoring location for each of the 18 agencies.

Table 3. Monitoring Locations and Their Associated Organizations and Number of Programs.

Monitoring Location	Organization	No. of Programs
Surface Waters		
New and Alamo Rivers	RWQCB	8
	USGS	7
	29 Palms Band	3
	IBWC	2
	IID	2
Salton Sea	USFWS	9
	USGS	4
	RWQCB	3
Irrigation Drains	IID	6
	USGS	4
	RWQCB	3
	CVWD	2
	U.S. BOR	2
Non-Surface Waters		
Organisms/Tissue	U.S. BOR	5
	USFWS	4
	USGS	2
	SDSU	2
Sediments	U.S. BOR	5
	USGS	4
Groundwater	29 Palms Band	3

The New and Alamo Rivers are or have been monitored by the IBWC (2 programs/activities), RWQCB (8), and USGS (7). Drains are monitored by CVWD (2), IID (6), RWQCB (3), U.S. BOR (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 are 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 — evaluation of constituents potentially causing toxicity— is usually the same.

3.4.3 Water Quality Monitoring Sites

Some 1704 water quality monitoring sites were reported in the inventory. It is our estimate that these sites represent only about 40% to 50% of the total number of sampling locations. The sites reported are those that could be identified by location using data samples, maps, and coordinates provided by the study participants. A digital map was prepared showing the location of these points and is included on the CD accompanying this report. Most water quality points are clustered around the Salton Sea and Imperial Valley agricultural lands. 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 23 of the 76 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 at what time, and 2) to determine what data were collected at what time. Included on the CD accompanying this report are two large timeline summaries outlining and comparing the duration of the programs by the type of water quality monitoring programs. The two timelines are described as follows:

- *The **Organizational Summary** shows the time line of water quality monitoring efforts by data constituents for each organization. The data constituents were divided into the nine categories discussed earlier.*
- *The **Constituent Summary** illustrates the same data, but shows timelines by each of the nine data constituents and the agencies that monitored these 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, IBWC, 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. However, inconsistencies in levels of funding have led to sporadic efforts to characterize water quality in the watershed.

A number of organizations began conducting studies in the mid and late 1970s when contamination through constituents such as pesticides and heavy metals became a major national concern. U.S. Bureau of Reclamation and U.S. Geological Survey initiated coordinated efforts in the mid and late 1980s, with a main focus on irrigation drain water quality. More recently in the 1990s, 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 University, UC Davis, UC Riverside, and Wright State University.

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 Sampling Frequency

The monitoring frequency, i.e. how often monitoring samples are collected, varies widely, usually based on the program purpose, available funding, and the constituents being monitored. The frequency of general monitoring programs ranges from bi-weekly to semi-annual monitoring, but tends to include monthly or quarterly monitoring. Research or reconnaissance oriented programs often include data that was collected over a relatively short time period (one year or less), usually with multiple sampling sites or multiple constituents. Hydrologic data, used mostly in general monitoring activities, are often gauged continuously.

3.5 Data Assessment

Over 80 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 shows that most programs or activities have monitored the typical physical/chemical constituents, nutrients, and bacterial agents, which is consistent with the large number of general monitoring programs. Also, constituents such as selenium, a metalloid that may result in decreased bird reproductive success, was studied extensively in water, sediments, and biota as part of the NIWQP during the 1980s and 1990s. Many organisms, usually birds and fish, have been sampled to measure the levels of toxic substances (including selenium and DDT metabolites) that may have contributed to bird mortalities and decreased reproductive success.

3.5.1 Inventory of Data Monitored

The purpose of the inventory is to assess the types of water quality data that have been collected or are planned to be collected in the Salton Sea basin. The purpose of this inventory is *not* to assess the quality or specify the usefulness of these data for other water quality monitoring programs or research. If data identified in this assessment are deemed useful for another study or water quality monitoring program, they need to be evaluated independently for their reliability, consistency, and quality.

Table 4 presents the monitored data for nine general data categories (the data constituents for each category are shown in **Appendix B**):

Table 4. Number of Data Constituents Reported as Collected.

Data Category	Reported as Collected
1. General Physical/Chemical	204
2. Nutrients	60
3. Bacterial	33
4. Biological	14
5. Pesticides	30
6. Hydrologic	16
7. Metals	46
Total Water Extracts	**403**
8. Total Sediments	68
9. Total Organism/Tissue	71
Total Inventory	**542**

The issues related to 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 treated and untreated effluent discharges, are introduced into the rivers and the Salton Sea, and were monitored in at least 60 separate sampling efforts in the past two decades. Further evidence of increasing impacts of agricultural and unplanned development is directly reflected in the substantial amount of monitoring of bacteria (33) and pesticides (30). A number of sediment and organism/tissue monitoring programs also included pesticide sampling, 11 and 9 times, respectively.

Table 5 shows the specific data constituents that were reported as collected most frequently:

Table 5. Frequency of Data Constituents Collected.

Data Category	Reported as Collected
Water Extracts	
General Physical/Chemical	
pH	22
Specific Conductance	20
Temperature	19
EC (Salinity)	16
Dissolved Oxygen	16
Minerals	15
Turbidity	12
Nutrients	
Nitrogen	42
Phosphorus	18
Bacterial	
Fecal Coliform	12
Total Coliform	10
E. Coli	7
Fec. Strep. Cocci	2
Antero Cocci	2
Biological	
Fish	7
Invertebrates	2
Zooplankton	2
Algae	2
Pesticides	
General	9
Organo-Phosphorus	7
Carbamates	5
Hydrological	
Flow	7
Metals	
Selenium	19
Dissolved Metals	15
Other	12

Data Category	Reported as Collected
Sediments	
Other	11
Selenium	10
Trace Metals	10
Particle Size	9
Pesticides	9
PCBs	6
Organisms/Tissue	
Boron	13
Selenium	12
Other	11
Trace Metals	10
Pesticides	9
Birds	9

Almost one-third of the programs reported typical physical and chemical data such as pH, temperature, salinity (EC), and dissolved oxygen (DO). Nutrient data were collected by almost half of the programs listed. Of the metals, selenium was reported 19 times as a water extract, 10 times in sediment sampling media, and 12 times in organisms/tissue. Pesticides were reported 21 times as water extracts, 9 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. **Table 6** lists the number of data collection occurrences categorized by data currency.

Table 6. Number of Data Collection Occurrences Categorized by Data Currency.

Data Monitoring Status	Number of Constituents Collected
Historical/Completed	289
Current/Ongoing	112
Unknown	92
Future/Planned	49
Total Occurrences	**542**

Of data currently collected, the water quality monitoring efforts tend to concentrate on general water extracts such as pH, temperature, minerals, specific conductance, total dissolved solids (TDS), and dissolved oxygen (DO). Nutrients such as nitrogen or bacteria such as total coliform are also frequently collected.

Historical data collection was primarily focused on 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 several programs and constituents, the timeframe for their collection is presently unknown.

3.6 Opportunity and Constraints 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 require a strong coordination function.*

4. Relevant Findings

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 parts 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 to 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 USGS, U.S. Fish and Wildlife Service and U.S. 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 had no predetermined specific research objectives or purposes. 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 latter two 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 onetime basis or infrequently. However, the Toxic Substance Monitoring Program (TSMP) has been collecting data since 1978.

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 have 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.

The availability of funding also greatly impacts agencies' ability to coordinate. When agency programs cannot be consistently depended upon from one year to another, cost-sharing arrangements are hampered. In addition, under touch-and-go funding, it is risky for an agency to rely heavily on another, since fundamental program components may be sacrificed if the other agency loses funding.

Also, a lack of formal agreement on QA/QC procedures and sampling/analysis techniques can make agencies hesitant to 'buy-in' to each other's data. Usually, there is no intent by agencies to utilize different methods, but there is a lack of access to information/training that has been exacerbated by inconsistent funding.

5. Water Quality Technical Committee (WQTC) Workshop Results

5.1 Background

This section summarizes the brainstorming session that was carried out during the Water Quality Technical Committee workshop held on February 14, 2001, at the Regional Water Quality Control Board, Region 7, Palm Desert, CA.

Workshop participants were requested to give three major topics of interest that they thought must be addressed to accomplish the stated objectives of the WQTC. The topics were subsequently collected and grouped by the workshop facilitators, setting the basis for a constructive discussion in the forum. The following provides a synthesis of the various comments expressed by the workshop participants. It is organized into six basic "Tracks", including: 1) Organizational and Administrative Framework; 2) Information Technology; 3) Standard Methods/Quality Assurance (QA); 4) Framework Data; 5) Modeling Applications; and 6) 'Science Gaps'. The comments listed by the workshop participants are cited in *italics* at the beginning of each topic. These specific comments and the dialog that they stimulated are summarized in each section's text.

5.2 Workshop Summary

Track 1 - Organizational and Administrative Framework

- *Develop sub-committee charged with responsibility of maintaining cross-agency coordination on water quality monitoring activities;*
- *Develop funding source for different agency personnel to spend 10-30 days working on these issues;*
- *Identify opportunities for combined/collaborative efforts to efficiently utilize limited funding: Fed-fed; fed-state; state-state; state-local; state-tribal; fed-tribal.*

Coordinating Committee. Several workshop participants indicated that a Coordinating Committee or other small group of representatives could be mobilized to facilitate and coordinate the common initiatives of the community involved in water quality monitoring. Other members could be drafted to participate in focused working groups to address specific issues such as information technology, modeling, and sampling/analysis methods. The Committee would be focused on identification of immediate useful and actionable initiatives that can be carried out in conjunction with others, or through funded research projects. This would also include a planning component to facilitate the coordination across the various working groups, and to implement and guide pilot programs, for example.

Working Groups. Working groups could be set on an as-needed basis to address specific issues, such as information technology architecture, standard sampling and analysis methods development, and framework data specifications. Several potential working groups are described in more detail in later sections.

Funding. There would need to be some source of funding to cover expenses, and perhaps a significant commitment of core staff to support and follow up on the directions set by the Coordination Committee. Institutions and agencies could contribute some level of staff time, and perhaps a small membership fee to support operational costs.

Track 2 - Information Technology

- *A clearinghouse for proposed, on-going and completed projects;*
- *Use the GIS database as a tool to disseminate information needs, gaps, techniques, etc. – a tool for a dynamic forum;*
- *Data accessibility;*
- *Continue to support the SSDP in their fine effort regarding information management;*
- *Establish metadata standards and data repository;*
- *Accessibility to query the SSDP database;*
- *Standardize metadata requirements for data collection, analysis, archiving;*
- *Data submission to multi-agency database;*
- *State the standard needs of the SSDP, i.e. the data formats, organization of data, etc.;*
- *Standard metadata format for sampling programs.*

Most of the above comments refer to the need of developing some kind of a coordinated data/information repository, investigating metadata standards, and using geographic information technology as an infrastructure to increase operational efficiencies. These topics are discussed in more detail as follows:

Data Access and Dissemination. Often data users find themselves spending a significant amount of their time looking for, acquiring, qualifying, and processing data from other sources. In many cases, users are reluctant to make this kind of investment because of the time and resources that might be involved and the uncertainty that the information will actually be useful for their particular application. The development of a data clearinghouse function could help data users search for, qualify and acquire needed data in a useful format in a time-efficient manner. With more coordination, data users could find data more easily to support their work, thus reducing the number of times such data are collected redundantly. Consequently, coordinated efforts could result in the development of datasets with multiple purposes.

Metadata Standards. The agencies and organizations involved in water quality monitoring could benefit greatly from a comprehensive Data Catalog for the Salton Sea watershed, based on standard metadata. Metadata are “data about data” and describe the content, quality, condition, and other relevant characteristics of data. Metadata can assist locating information and determining whether it may be useful for a particular application, in advance of actually seeing the information. As data sharing is increasing, so is the necessity for describing the information in a manner that can be readily understood by users who may not be familiar with the data and its way of creation. While in the past some of the agencies and organizations have been cataloging their data holdings in one form or another, there has generally been no or very little standard framework defined for this information. This often makes it difficult for data users to search for and qualify the information that might be useful for their purpose.

One of the topics to be addressed by the information technology group would be the development of metadata standards. This may also require the development of domain-specific metadata standards and descriptive semantics to adequately cover the broad range of water quality monitoring data. As part of the preliminary data inventory process, the SSDP has explored several national and regional water quality monitoring projects in which certain content and structure standards for data topics have already been identified. This first step towards a structural information design — including the development of metadata standards — could set the basic framework and "information infrastructure" that is needed to support future research and work regarding this subject.

Geographic Information Systems (GIS) Technology. GIS technology is commonly described as a computerized system for the compilation, access, retrieval, analysis, and display of geographic and geographic-related data. GIS is not only a computerized mapping tool, it also provides an information infrastructure for bringing various different types of data together — including water quality data — to support integrated and multi-sector decision-making at many levels.

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 developed 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 across a network of data source "nodes". Through this approach, data is developed and maintained across a number of organizations, and data standards, common metadata, and data dissemination policies, methods and tools, allow this information to be shared effectively, thus maximizing public and institutional investment. The WQTC represents an important water quality "domain" that can benefit from this approach.

Track 3 - Standard Methods/Quality Assurance (QA)

- *Provide review/comments as requested of Quality Assurance/Control plans and reports;*
- *Develop guidelines (handbook?) for standard collection techniques, applicable to each major constituent such as nutrients, metals, TDS, and EC including QA/QC procedures;*
- *Methods discussion;*
- *Suggest standard method of testing;*
- *Establish a technical forum for planned activities to recommend standard collection and analysis methods (and constraints to utilizing them);*
- *Development of comparable standards for water quality monitoring;*
- *Forum for assessment of quality specific information (water quality) associated with specific issues;*
- *When we talk about different methodology in sampling, does it include the analytical techniques?*
- *Standard sampling and analysis techniques for key parameters, i.e. salts, nutrients, bacteria, and selenium;*
- *Establish criteria for the evaluation of water quality information;*
- *Standard data format, sampling and analysis methods.*

Hundreds of organizations and agencies across the country conduct some type of water quality monitoring. States and regions need specific monitoring data that they can use to evaluate whether the criteria are met to support certain water quality standards. Because there is so much data being collected by so many organizations, states face an enormous task of trying to assemble relevant data. As a result, many states have formed monitoring councils to help coordinate related efforts across organizations. A monitoring council generally provides a forum for identifying environmental measures and the sampling and analytical methods most appropriate for answering questions about local waters. Councils also provide an opportunity to enhance mechanisms for data sharing and to test state-of-the art tools such as GIS–based mapping and data collection, management, analysis, modeling, and visualization techniques.

The workgroup concerned with standard methods and quality assurance procedures could research several of the existing monitoring councils to identify the most appropriate and useful standards applicable for this project. By focusing on already established, national and regional water quality monitoring projects in which certain content and structure standards for data topics have already been identified, the group would have a recognized framework to build on. This approach could facilitate the agencies and organizations in comparing their data collection and data analysis methods, and would serve as a fundamental guideline for data quality assurance.

Track 4 - Framework Data

- *Recommend key sampling locations;*
- *Collect data on important nutrients affecting Salton Sea water quality;*
- *Trends in Selenium concentrations in subsurface drainwater;*
- *Time series of Phosphorus sampling in tailwater runoff and surface drains;*
- *Develop biological measures/indicators;*
- *Facilitate the development of collaborative networks of compatible water quality monitoring;*
- *Identify long-term common monitoring needs for the watershed;*
- *Discuss data trends; what future data needs might be;*
- *Develop a final recommendation/synthesis report (as a product of the WQTC) to support recommendations to top-level management and funding requests. The report would demonstrate collaboration and potential for collaboration, priority setting, agency/entity roles.*

Data are the foundation resource of any spatial data infrastructure. What is available, and how it is compiled, structured and documented, will determine its value to the community collecting water quality data in the Salton Sea watershed. Certain data are needed in common by most water quality projects, and these may have to be available at various levels of detail or during different time intervals. Workshop participants expressed the need to focus on such common key constituents to enhance collaborative efforts among the group including data collection, data analysis and resource sharing. Also, this type of focused and coordinated monitoring would prepare the foundation for applied modeling and simulation efforts in the watershed.

In addition to key constituents, it is important to consider key locations, seasonality, timeframes and other issues for sampling these constituents. The WQTC group will have to come to a consensus about what processes or issues need to be addressed and subsequently define the appropriate sampling locations and other issues.

Track 5 - Modeling Applications

Today, many of the problems and issues related to the Salton Sea result from the complex interplay of human and natural (physical, chemical, and biological) processes. Modeling efforts and simulations of such intricate environments are gaining more importance as we try to understand how the different components of a system interact with one another and the various roles they play. A better understanding of hydrophysical characteristics, for example, and its potential influence on the Salton Sea's ecosystem and the surrounding environs are critical for informed decision making. Water quality represents only one of the numerous components of the watershed system, and is one of the key factors determining crucial processes such as eutrophication. There is a need to establish an agreed-upon process for determining model types, scales, data requirements, and outputs appropriate for this kind of assessment. This work would include several associated tasks such as reviewing completed, ongoing, and planned data collection projects related to modeling requirements, and summarizing the goals and methods of hydrologic circulation or other hydrologic-related modeling efforts. This process can result in better informed public dialog, policy formulation, resource management, and other decision-making over time.

Track 6 - Science 'Gaps' Work Group

- *Support information management objectives to monitor inputs and potential dynamic equilibrium as of target elements of concern to the Salton Sea restoration effort;*
- *My interest is in the technical evaluation of water quality information for monitoring changes in the Salton Sea;*
- *Which nutrients are most important to Salton Sea water quality?;*
- *Recommendations on data needs to better characterize nutrient cycling.*

The knowledge about water quality and causative factors in the region is incomplete. Knowledge gaps can be identified and filled more effectively by a network of collaborating agencies, institutions and tribes, than can be done alone by isolated research and assessment projects and programs. The Salton Sea Science Office is seeking to leverage existing efforts in the watershed to better understand water quality conditions and trends relative to the Salton Sea restoration effort. Others are carrying out organizational objectives towards more effective water resource management, environmental protection, and the protection of human health, welfare, and beneficial use. While some interests are in conflict at the moment (court cases, etc.), the greater majority of stakeholders can benefit by more complete knowledge in the region. The WQTC has recognized the need for continuing research, dialog, and the sharing of findings and data to support better understandings regarding water quality in the watershed.

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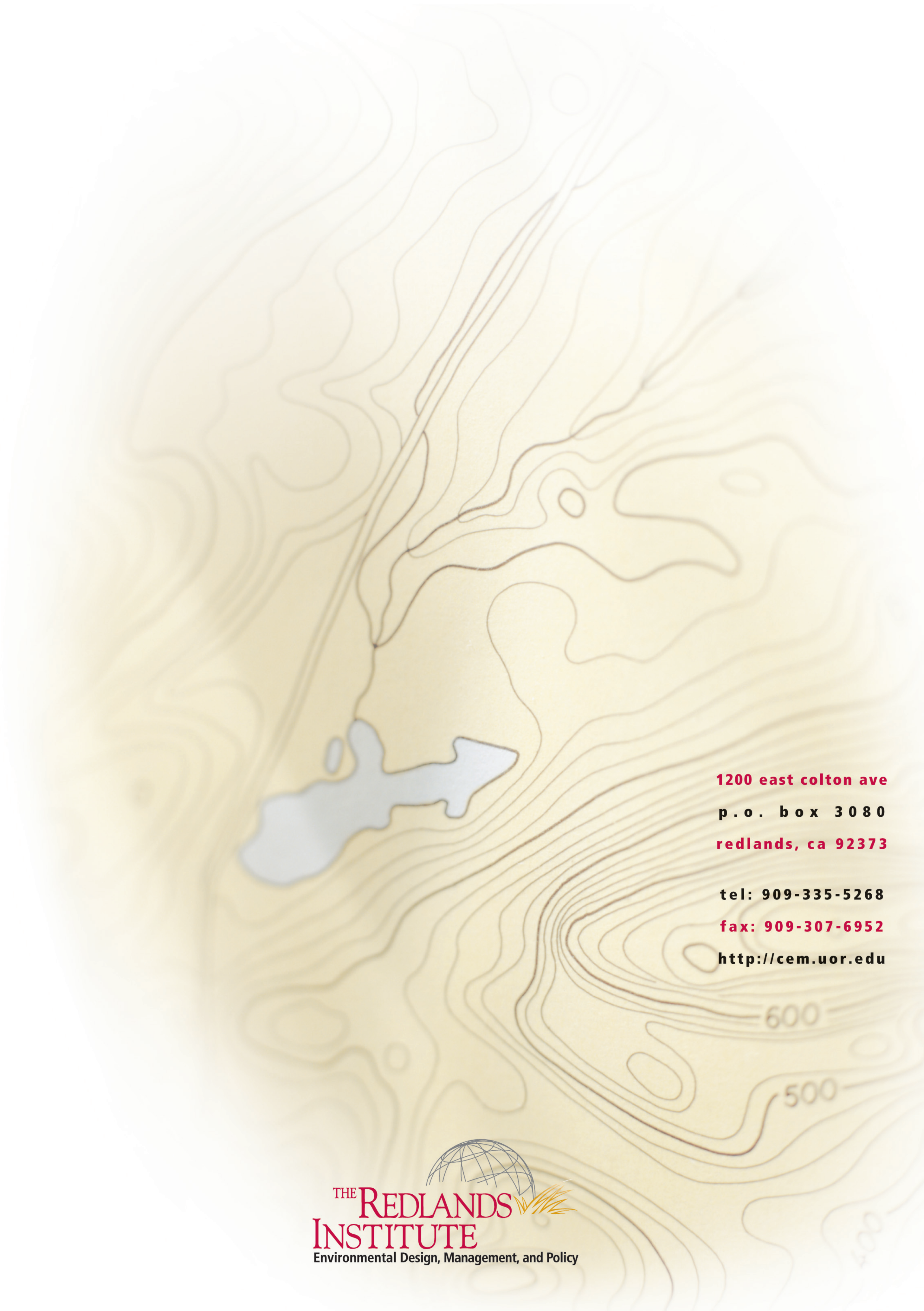

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