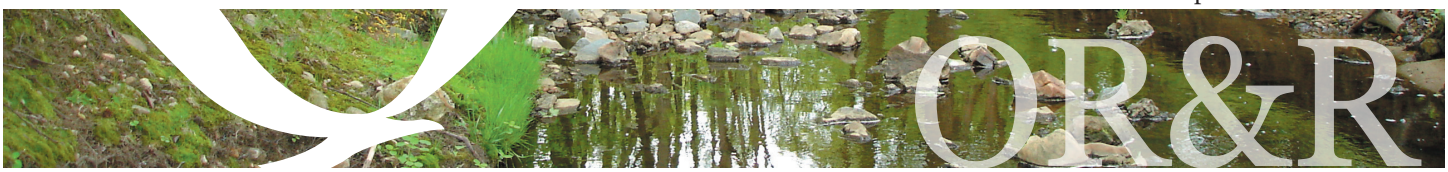


Watershed Database and Mapping Projects/San Francisco Bay (California)

Protection and restoration of coastal watersheds requires the synthesis of complex environmental issues. Contaminated site remediation, dredging and disposal of contaminated sediments, and restoring injured habitats are a few of the challenges facing coastal managers. The evaluation of multiple environmental issues can be significantly improved by combining scientific data and watershed characteristics into a Geographic Information System (GIS). NOAA's Assessment and Restoration Division (ARD) has developed decision-support tools for specific watersheds that combine the use of a standard database structure, database-mapping application (Query Manager™/ MARPLOT®) and an ArcView® GIS project (i.e., Watershed Database and Mapping Projects). Contaminant concentrations in sediment and tissues of aquatic organisms, results of sediment toxicity tests, natural resource occurrence, and potential habitat restoration projects are overlaid on a watershed's features and landuses, to be analyzed and displayed on maps at flexible spatial scales. This integrated approach simplifies data synthesis and communication of critical information.

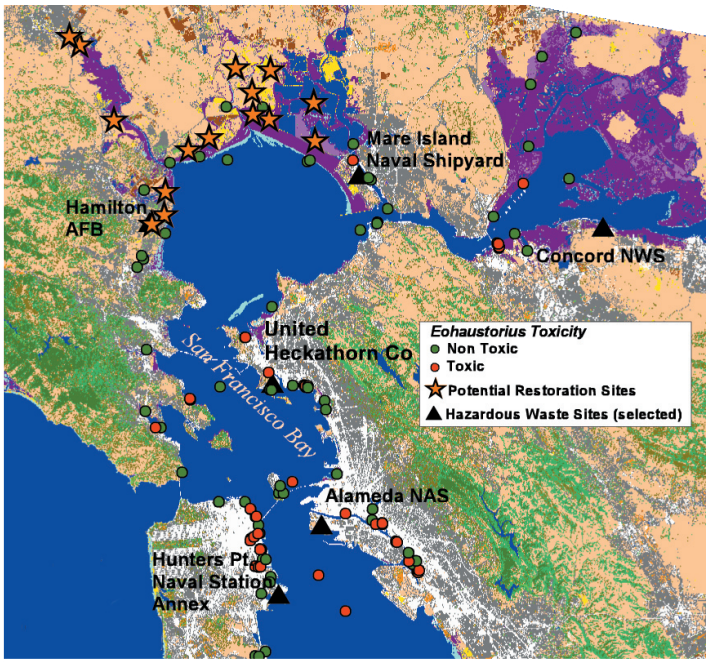
NOAA has used this approach in several watersheds, which have been affected by contaminant releases from Superfund sites and other sources. The Anacostia River, Calcasieu River Estuary, Hudson River, Newark Bay, Puget Sound, and San Francisco Bay are some examples of where this approach has been applied. These watershed Projects use the standardized structure along with information tailored to the major objectives of each watershed. For example, the Newark Bay Watershed Project supports decisions about remediation and disposal of contaminated sediment, while the San Francisco Bay Watershed Project focuses on Superfund site remediation and habitat restoration. The common organizational structure for data and spatial information promotes data sharing among Federal, state, and local agencies working within a watershed.

The San Francisco/Sacramento-San Joaquin delta estuary is the largest estuary on the U.S. Pacific Coast. The estuary supports a diverse and productive ecosystem, which is currently at risk due to a variety of stressors including increased coastal development, mining, and expansion of marine transportation systems.

ARD is continuing to develop the San Francisco Watershed project, which includes North, Central, South, and Suisun bays. The Project integrates data from state and federal programs measuring sediment chemistry, sediment bioassay, and tissue chemistry, including:

- Superfund investigations for various sites;
- San Francisco Estuary Institute Regional Monitoring Program;
- The San Francisco Regional Water Quality Control Board's Bay Protection and Toxic Cleanup Program;
- NOAA Benthic Surveillance;
- NOAA Mussel Watch; and
- NOAA's Magnitude and Extent of Contaminated Sediment and Toxicity Study.

The Project incorporates GIS-mapped waste sites, digital Environmental Sensitivity Index data, aerial photography, San Francisco Estuary Institute (SFEI) EcoAtlas maps, and input from the San Francisco regional partners (SFEI, USEPA, ACOE, and several others).



San Francisco Bay potential restoration sites and hazardous waste sites of interest to NOAA are mapped on NOAA's Coastal Services Center Land Cover 1993 Analysis remote sensing image. Eohaustorius toxicity data from the Regional Water Quality Control Board's Bay Protection and Toxic Cleanup Program and the San Francisco Estuary Institute's Region Monitoring Program are indicated by red (toxic stations) and green dots.

San Francisco Watershed project is designed to help state and federal trustees integrate existing point data on sediment chemistry, tissue chemistry, and sediment toxicity with maps that identify key habitats and potential restoration sites. Potential restoration sites are identified and screened by selecting projects with a high probability of long-term enhancement or restoration of habitat and functions beneficial to targeted species.

For example, projects which provide nursery, spawning, and foraging habitat for anadromous fish are given high priority. Potential habitat enhancement projects are mapped, and can be linked to specific attribute data such as acreage, existing and proposed habitat, and species expected to benefit.

Although previous Watershed Projects have focused on wetland restoration efforts, ARD has entered into a partnership with several other NOAA agencies (OCS, NCCOS, CSC, NMFS) and California State University's Moss Landing Marine Laboratory in an effort to better manage and restore sub-tidal habitats in the Bay. The goal of the partnership has been to collect and analyze data on the quantity and quality of sub-tidal habitats based on existing multibeam and newly acquired sidescan sonar surveys, as well as historical habitat information. As a result of this partnership, the San Francisco Watershed Project has been updated and expanded to include subtidal habitats and species information regarding eelgrass beds, rock reefs, sand shoals, and oyster reefs. By incorporating enhanced subtidal habitat mapping and assessment techniques, compiling fundamental habitat ecology data, and creating geo-spatial tools to deliver information to support habitat management, resource managers will be better able to interpret available data and to establish subtidal habitat goals.

NOAA's approach is to provide a rapid, convenient way to create maps of the watershed that display analyzed, sorted, and summarized data that coastal managers have selected from a menu of programmed queries. The primary data types include sediment chemistry, sediment toxicity, and tissue chemistry data. The base maps display geomorphology, habitat characteristics, and landuse information. Integrating remedial investigation data with landscape information in a single system helps investigators associate the distribution of contaminants with specific sources and evaluate the possibility of contaminant effects in potential habitat restoration areas.

Combining natural resource information and contaminant distributions across the watershed enhances the potential for successful restoration of wide-ranging populations.

The watershed projects have benefited a variety of user groups and have enhanced cooperation and data sharing.

The database mapping system allows users to:

- Evaluate multiple data sets within a geographic area;
- Identify chemical concentration and toxicity gradients;
- Prioritize problem areas based on sediment chemistry, sediment toxicity, and/or tissue chemistry;
- Catalog and evaluate potential habitats for restoration;
- Identify important data gaps; and
- Add and share new information.

Analytical tools such as database queries and import/export scripts developed for one project can be applied to all projects because of the common database and GIS project structure. Query Manager can be used to select and export data to any program that supports standard spreadsheet, database, or tab-delimited text files. Scripts have been developed for seamless import of data from Query Manager, to an ArcView GIS project to enhance and simplify further data analysis and presentation.

The Watershed Projects run on standard desktop Microsoft Windows®-based personal computers. The database and mapping application, Query Manager, is an easy-to-use, interactive system that allows you to query the database and rapidly display the results on a map in MARPLOT or deliver the data in the appropriate form to an ArcView GIS project. In addition, both standard and customized base maps are developed in ArcView to support all Watershed Projects. Standard layers include wetlands, Superfund sites, and other regulated industrial facilities. Digitized ortho-rectified aerial photographs and other spatial data layers also are routinely used with data from the Query Manager database.

ARD's Watershed Projects are proving useful throughout the Superfund remedial decision-making process, from identifying locations for the collection of additional samples to providing the historical context for interpreting data, to identifying areas for restoration. This versatile tool not only improves NOAA's ability to protect and restore the biodiversity of watersheds that contribute to healthy coastal habitats, and has the potential to help address other important environmental issues.

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NOAA's Office of Response & Restoration—Protecting our Coastal Environment

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