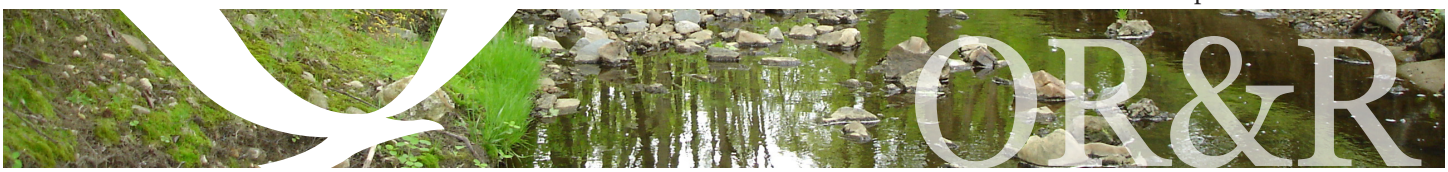


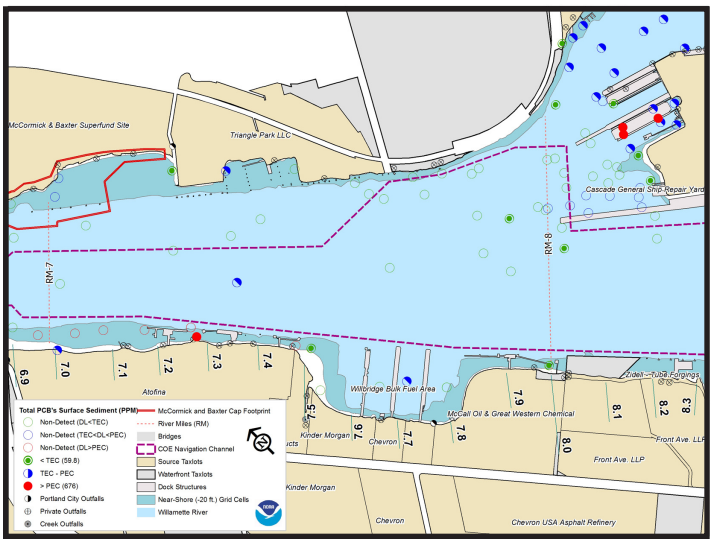
Watershed Database and Mapping Projects/Portland Harbor

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 Coastal Protection and Restoration Division (CPRD) 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 land uses, to be analyzed and displayed on maps at flexible spatial scales. This integrated approach simplifies data synthesis and communication of critical information.

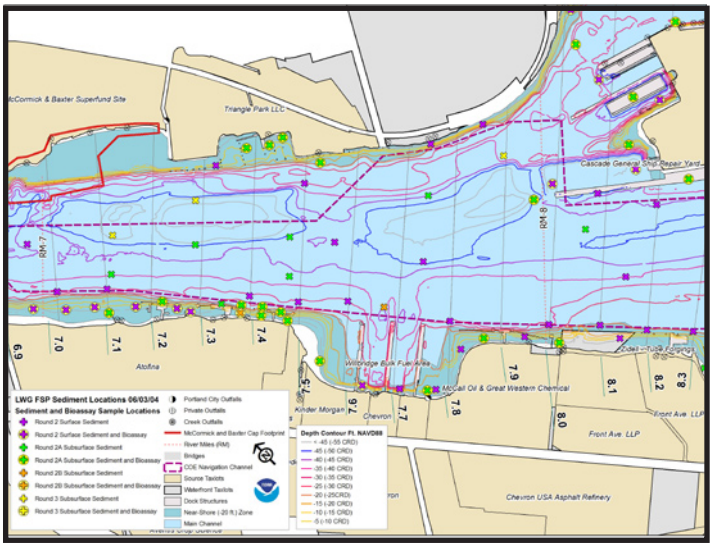
NOAA has used this approach in several watersheds, which have been affected by contaminant releases from Superfund sites and other sources. The Anacostia River, Calcasieu River Estuary, Hudson River, Newark Bay, Puget Sound, and San Francisco Bay are some examples of where this approach has been applied. The watershed Projects use the standardized structure along with information tailored to the major objectives of each watershed.

The lower Willamette River was named a Superfund site by the US Environmental Protection Agency (EPA) in 2000 because studies showed that sediments in the river bottom are contaminated with PAHs, PCBs, pesticides, herbicides, dioxins/ furans, metals. The Superfund site includes an approximately six mile stretch of the river where numerous industries, including an oil gasification plant, ship repair facilities, agricultural chemical manufacturing, rail car construction, wood treating facilities, and port activities occur or once occurred. The site has been nicknamed "Portland Harbor" since most of the site is a working waterway.

NOAA is involved in the site investigation and cleanup work because the site impacts natural resources that NOAA manages on behalf of the public. The Willamette River supports spawning



This figure shows total PCB concentrations in surface sediments. The red dots represent sediment samples from numerous studies where toxicity to benthic organisms is likely, due to total PCB concentrations that exceed screening guidelines. Analyses like this one highlight areas that require further study, and may be used to help identify possible sources of contamination in the river



This figure shows a small section of the field sampling plan that was developed using the watershed project. Many factors influenced the sampling plan, including the type and value of the various habitats in the river, the depth of the water, the location of existing data, and the proximity of known or suspected sources of contamination. The watershed project allowed us to integrate all these factors and identify data gaps where additional samples were needed.

populations of Chinook and coho salmon, steelhead, American shad, Pacific lamprey, and white sturgeon, which are all NOAA trust resources. The lower river, between the mouth and Willamette Falls, provides a migratory corridor for both juvenile and adult anadromous fish and juvenile rearing habitat for several anadromous species. Three runs of Chinook, two runs of steelhead, and individual runs of coho and sockeye salmon occur in the area. Several of these runs are either listed or proposed for listing under the Endangered Species Act.

CPRD is continuing to develop the Portland Harbor Watershed project, which covers the Portland Harbor site and adjacent areas upstream to Willamette Falls and downstream into the Columbia River. The project integrates data from state, federal, city, and private sources. It allows users to analyze and display numerous types of data, including but not limited to:

- sediment chemistry data from numerous sources
- sediment bioassay study results
- river bathymetry
- aerial photography
- outfall locations
- shoreline types
- habitat features
- property owners along the river
- location of dredging projects
- location of cleanup projects

Many of the data layers in the project were developed by the Lower Willamette Group, a group of ten potentially responsible parties that are funding and carrying out a detailed investigation of the site under the direction of the US EPA. The project contains information from several other sources, including the US Geological Service, Oregon Fish & Wildlife, and NOAA Fisheries.

CRPD will continue to add new data to the watershed project as it becomes available. We will use the project to help estimate ecological risks, define areas that may require cleanup or further investigation. The project has already been used to design the 2004 field sampling plan for sediment, toxicity, and surface water, and to identify hot spots for early action.

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. 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.

CPRD'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 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.

Query Manager, MARPLOT and the current Portland Harbor database may be downloaded for free from our web page. For additional information, contact

Rob Neely at 206-553-2101 or

Ben Shorr at 206-526-4654

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

For further information about NOAA's Office of Response and Restoration, please visit our Web site at

http://response.restoration.noaa.gov or call (301) 713-2989.