

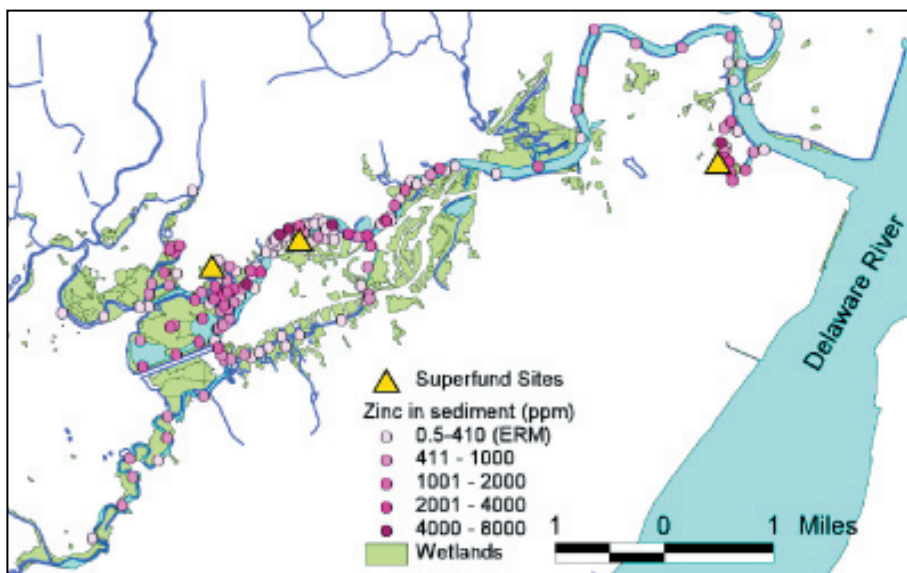
Watershed Database and Mapping Projects/Christina River (Delaware)

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). Sediment contaminant and toxicity and tissue data, natural resources, and potential

habitat restoration projects can be overlaid on a watershed's features and land uses, and displayed on maps at flexible spatial scales. This approach simplifies data analysis and presentation, provides valuable tools for complex decision-making, and improves our understanding of dynamic aquatic ecosystems.

NOAA has used this approach in several watersheds affected by contaminant releases from Superfund sites and other sources including Newark Bay, San Francisco Bay, Christina River, Sheboygan River, Puget Sound, and Calcasieu Estuary. These projects combine a standard database structure and the Query Manager database-mapping application with information tailored to the major objectives of each watershed. For example, the Newark Bay project supports decisions about remediation and disposal of contaminated sediment, while the San Francisco Bay 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 Christina River, a tributary of the Delaware River, formerly supported significant populations of anadromous sturgeon, shad and several herring species. The Christina project spatially integrates contaminant and bioassay data collected by the state



Zinc concentrations in Christina River sediment mapped in ArcView. Zinc from the Superfund sites has been distributed throughout the tidal reaches of the river. Concentrations are below the toxicity level (ERM) in south channel wetlands where tidal exchange is restricted. These wetlands are potential habitat restoration sites. Other contaminants can be mapped in the same way.

of Delaware and three Superfund site investigations with basemaps showing drainage basins, wetland types, fish species distribution, and landuse. These maps help identify contaminant sources, eliminate some suggested contaminant sources, and evaluate system-wide biological impacts. Using ArcView®, wetlands were evaluated for habitat restoration based on size, degree of contamination, proximity to ongoing sources, and fish usage. The Christina River project is both a successful model for other NOAA watershed projects and an outreach tool for public education.

NOAA's approach is 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 stored in the relational database include sediment chemistry, sediment toxicity, and tissue chemistry data. The base maps also display geomorphology, habitat characteristics, and land-use information. Integrating remedial investigation data with recent data in a single database-mapping (GIS) system helps investigators associate the distribution of contaminants with specific sources and evaluate the possibility of contaminant effects in potential habitat restoration areas. Combining restoration information and contaminant distributions across the watershed enhances the potential for successful restoration of wide-ranging populations.

The watershed projects have benefitted 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 ArcView GIS to enhance and simplify further data analysis and presentation.

Query Manager, the Assessment and Restoration Division's watershed database and mapping application developed for the NOAA watershed projects, runs on standard desktop Macintosh® and Microsoft Windows®-based personal computers. Query Manager is an important tool for all NOAA's watershed projects. It 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 the watershed 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 regulated industrial facilities and NOAA digital navigation charts. Custom imagery and other spatial data layers also are routinely used with sediment chemistry data from the Query Manager database.

NOAA's watershed database mapping system is 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.

For additional watershed database and mapping information:
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