

**Final Report  
28 February 2003**

**Grant # C-2002-0688  
Wetland Project GIS Mapping and On-Line Access**

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1. Objectives Achieved

There were two objectives for this project, both of which were met or exceeded, as described below

A. *Prepare a GIS-based map of South Bay wetland projects.*

We exceeded this objective by including projects from Central Bay as well as from South Bay, and by filling some information gaps in the pre-existing North Bay database. We contacted 37 people representing the scientific, governmental, and advocacy sectors of the community of wetland interests and developed extensive information for 99 separate projects. This is the most extensive and authoritative set of wetland project maps ever developed. The contents and design of the maps and their database were reviewed by staff of the regulatory and management agencies that are most responsible for wetland protection in the Bay Area (US Army Corps of Engineers, Bay Conservation and Development Commission, California Department of Fish and Game, US Environmental Protection Agency, and the Regional Water Quality Control Board) to help ensure that the maps would help meet their information needs. The individual project maps with nametags have been compiled on an attractive colored shaded relief map of the region, showing major roads and other common landmarks, and formatted for plotting from the internet or from a CD. The North Bay Map and South Bay Map overlap slightly to provide a clear picture of their individual and combined coverages.

B. *Provide Internet access to the South Bay Map and North Bay Map.*

We greatly exceeded this objective. As intended, the North Bay Map and South Bay Map can be viewed as thumbnails and downloaded for free as electronic files or ordered as hardcopy-paper maps for the cost of reproduction and mailing from SFEI at [www.wrmp.org](http://www.wrmp.org) or [www.ecoatlas.org](http://www.ecoatlas.org). In addition to providing this Internet access to the South Bay and North Bay Maps, we developed an interactive “zoomable-pannable” on-line map that allows the public to access and upload information about any mapped wetland project. To facilitate this capability, we electronically linked the information about each project to its unique map through the GIS at SFEI. Users of this interactive map can choose between a variety of base maps, including standard topographic quadrangles and the historical (ca 1800) wetland habitats of the region. One or more wetland projects can be selected on the interactive

map at one time to reveal a list of all the component sites that comprise each project selected. Summary information about each selected project and its component sites is also listed automatically. The user can easily access the complete database for each project, and can upload original information about any project they selected. This uploaded information can include reports, comments, maps, photos, video, or any other digital file. SFEI is now working with the Steering Committee of the Wetlands Regional Monitoring Program to develop guidelines for the review and public release of information that is uploaded into the interactive map from outside SFEI.

## 2. Objectives Not Achieved.

We exceeded our objectives for this project, as described above.

Since this project started, we have broadened our audience by hiring a Native American of a Bay Area Tribe who can help us bring Traditional Ecological Knowledge and the land use practices of the first indigenous peoples of this region into the modern community of environmental scientists and managers. This is a significant new aspect to the SFEI agenda. To advance this agenda, staff at SFEI have helped plan and hold workshops and seminars about the historical ecology of the Bay Area and the role of Native Americans in shaping local ecosystems. We have recently submitted a proposal to the US Fish and Wildlife Service to map the Indian Shellmounds of the region as places of extreme value to the whole cultural heritage of the region. We have also begun working with the San Francisco Estuary Institute and the San Francisco Bay Joint Venture to broaden our partnerships and the audience for our scientific information.

## 3. Lessons Learned and How they Might be Shared

We intend to share our lessons learned on this project by including them in our professional talks and lectures over the next few years. For example, staff at SFEI are already scheduled to transfer their experience to wetland interests in Southern California, Maryland, Washington State, and Rhode Island this year and next. SFEI also intends to present the interactive wetland project map to all the agencies and NGOs involved in the new San Francisco Bay Wetlands Restoration Program, and to the public at this year's State of the Estuary Conference. Some of the key lessons are described below.

### A. *Have a clear sense of objectives and audience.*

It is essential to know what you want to do and for whom. The objectives must be achievable given the constraints of the budget and schedule. Opportunities for added value through collaborations or other relationships, no matter how certain they seem, should not be built into project objectives. The target audience should be contacted before the project is designed so that the project has the best possible chance of meeting the needs of the audience.

*B. Be personable but persistent.*

A project of this kind requires iterative communication with many people who then must devote significant time to gather together the needed information. The project schedule must allow for repeated contacts and return visits to people who have key information but not enough time to assemble it during a single effort. Information sources need to be encouraged through understanding of the significance of their participation. In some cases, people need to get permission through their chains of command to release information or to take time away from other duties to participate. An effort is required to identify and then resolve these obstacles.

*C. Be flexible.*

The initial design of a database or map is rarely if ever correct. Information needs will evolve as data are assembled and opportunities emerge. There is therefore an ongoing need to be able to adjust the contents and format of the database and the attending maps. To achieve this flexibility, the initial products should only include the most basic or fundamental information that is likely to be commonly needed by a large majority of the audience. The maps and database can then be elaborated in additive ways, with accurate estimates of cost and time. Each topic of information, such as name of project, size of project, contact person, project completion data, and so forth must be assigned to a separate field of information in the database, such that the contents within each topic can be independently revised, and so that the database can be searched through or queried topic-by-topic.

*D. Vocabulary matters.*

In a project of this kind, the database must include the names of places and some technical jargon for which there are synonyms. In some cases, there may be two or more places with the same name. Care must be taken to ensure that dominant place names and their synonyms are given, and technical terms that lack obvious meanings should be defined. For this project, the names of different habitat types would be confusing if a convention had not been established to which the user can be referred. The choice of naming convention must be made with regard to future applications of the database. For example, we used the habitat typology that was developed for the Bay Area Wetlands Ecosystem Goals Project because it will enable us to track progress toward the Goals based on the acreages of restored habitat that are reported in the database. It is also very important to list the names of contact people as they wish to have their names appear. Many people prefer to use the forms of their names that match the citations used in indexing services for authors of publications or reports. Project sponsors should be listed in decreasing order of their roles and responsibilities for project planning or completion, depending on the status of the project. These are important details that can encourage or discourage audience participation.

*E. See through the project to further responsibilities.*

In this age of information technology, one good database can lead to another, and audiences for good information can grow. As the data are assembled to meet the initial objectives, the information sources should be interviewed about their addition needs for information and data base support. A list of possible next steps and new projects should be maintained, with annotations that indicate future partnerships and participants.

*F. Provide the right expertise.*

Flexible database design and development that serves a client audience well requires two kinds of technical expertise. It requires expert understanding of databases and the kind of data that are being assembled. In the case of this project, we required expertise in both database and in wetland science. Without both kinds of expertise, the objectives may have been unrealistic, and the needed flexibility and vocabulary would have been lacking. A technical team approach is probably required to meet the needs for expertise. The team should include a scientist who is a recognized expert in the resource being mapped, one or more data collectors who also understand the resource but who have the skills to encourage outside participation from data sources, a database designer who understands the scientist, and a GIS expert who understands the database designer and the scientist. The scientist plays the central role of deciding what gets mapped, what information is included in the database, how the map and database should and should not be used, and when the products are complete.

4. Grant Significance beyond Objectives.

This project has generated more participation and interest within the wetland conservation community than we had expected at this time. The interactive map and uploading capability seem to be especially important to the key wetland regulatory and management agencies. The San Francisco Estuary Project has decided to use the database and on-line map to track progress toward the Bay Area Wetland Habitat Goals. The National Marine Fisheries Service is working with SFEI to determine the costs of using the interactive map to track dredging projects in the San Francisco Bay. Perhaps most importantly, the San Francisco District of the U.S Army Corps of Engineers and the San Francisco Bay Regional Water Quality Control Board are working with SFEI to develop a protocol for updating and maintaining the database and on-line GIS through the regulatory permitting process for new wetland projects. Coupling the database to the environmental regulatory processes of State and Federal government will help ensure its relevance and ongoing support. This arrangement may also show how the database might be expanded to include information about stream and sub-tidal habitat restoration, environmental research, and regional monitoring in the Bay Area.