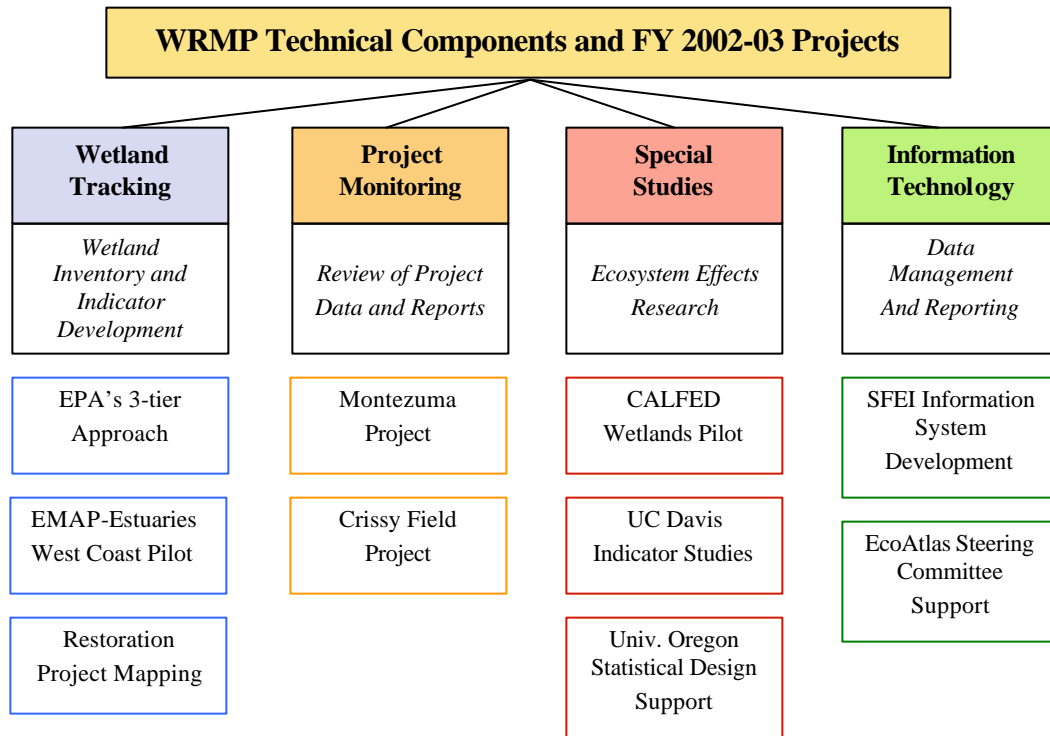


Major Technical Components of the WRMP

The WRMP will eventually include four major technical components for the development and dissemination of original information about wetlands: wetland tracking, project monitoring, special studies, and information technology. The chart below shows the anticipated WRMP projects for each of the four major components of the WRMP for FY 2002-2003. Most funding at this time is for program development. During FY 2003-04, wetland tracking will shift in focus from indicator development to data collection, and Information Technology will shift from system development to reporting.



Wetland tracking

The wetland tracking component is needed to (1) understand the prevailing conditions, processes, and functions of different types of wetlands and the large-scale or cumulative effects of wetland management actions, including the effects of restoration and mitigation projects; and (2) enable project sponsors and managers to assess the performance of wetlands projects relative to the variability among comparable wetlands. The wetland tracking component will initially focus on tidal baylands.

Wetland tracking will need to answer questions about wetlands at many scales of time and space, from local habitat patches and mosaics of patches within subregions to the regional wetlands ecosystem as a whole. The Steering Committee has compiled a list of management questions that should be answered through wetland tracking. The list of management questions is provided as Appendix A (the criteria for selecting questions are presented on page 19 of this Plan).

A conceptual framework for wetland tracking has been drafted to address the wetlands management questions. The framework can evolve over time, as experience is gained and new questions arise. The framework includes generalized conceptual models that represent the known and expected ecological, hydrological, and geomorphic functions of the major types of wetlands in the Region. The framework is presented as Appendix B (a summary of the framework is provided on pages 20-31 of this Plan).

The wetland tracking program will have a tiered approach to data collection and wetland assessment. Tier 1 involves regional mapping and characterization of wetlands. Tier 2 involves a regional rapid assessment of randomly selected wetlands sites of each major kind. Rapid assessment involves brief surveys of each selected wetland by expert assessment teams. Tier 3 involves intensive monitoring to calibrate and validate rapid assessment methods along gradients of environmental stress. To the extent possible, wetland tracking will involve standardized protocols for data collection and centralized data management.

The wetland tracking component of the WRMP is intended to be a primary source of information needed to develop predictive models for the performance of wetland restoration projects and the evolution of the wetland ecosystem, as affected by natural processes and the actions of people. The results of the program should be used in an ongoing way to define and quantify the ecological risks and uncertainties of wetland management. The WRMP will help convey this understanding to the public in the form of annual reports on the status and trends of wetlands in the region.

Project Monitoring

The project-monitoring component of the WRMP is needed to assess the performance of local wetland projects relative to regional habitat goals and ambient variability. The project-monitoring component will initially focus on the performance of tidal marsh restoration and mitigation projects. There is no provision at this time for any project evaluation that is conducted by the Restoration Program to replace or influence the regulatory evaluation by the permitting agencies.

The Management Group of the Restoration Program envisions that the Design Review Group will provide advice and review of the habitat concepts and engineering designs of selected projects of special importance (see Step A of Operational Scenario 1 on p.10). After this initial review, project-specific goals and objectives are finalized, and indicators of performance and stress are selected. Standard protocols are used to collect data that are comparable to wetland tracking data. The data that pass through quality control and assurance procedures are used by the project sponsors and the Management Group to evaluate project performance, relative to the regional habitat goals and project goals. If necessary, the project goals and objectives, the project designs, and the monitoring plan are adjusted to accommodate lessons learned. The evaluations are provided to the public and to the project sponsor.

It is anticipated that the project-monitoring component of the WRMP will be initiated with the review of monitoring data and reports for a few selected projects (i.e., the Montezuma Project and the Crissy Field Project; see diagram on page 13).

Case studies of wetlands projects are also being used to help guide the selection and development of indicators for wetland tracking and thus increase the likelihood that wetland tracking will complement project monitoring. Appendix C includes an overview of parameters and indicators used to monitor wetland projects in San Francisco Bay and elsewhere).

The project-monitoring component will progress with the dissemination of data collection protocols, management of data and information for projects, and annual summaries of project status, as the WRMP is woven into a process of project planning and regulatory review.

The use of standard protocols to monitor projects as well as ambient conditions will enable the Steering Committee and the public to compare wetlands projects over time and to one another, relative to ambient conditions. Project monitoring and wetland tracking will co-evolve, as experience is gained.

Special Studies

The special studies component of the WRMP is needed to advance the science and engineering of wetlands restoration and monitoring, to improve the scientific understanding of natural wetland form and function, and to improve the information technology used to communicate the findings of the Program.

In the near term, special studies will mostly involve development of conceptual models of wetlands form and function, development of indicators of ambient conditions of wetlands, and the development of an information management system. As data are collected and analyzed, they will yield important hypotheses about the causes and effects of the observed conditions, and special studies will be needed to test these hypotheses.

The WRMP is unlikely to develop its own research program. Instead, the WRMP will need to build on the research programs and projects of academic institutions, science NGOs and government agencies that are already well-established research organizations. The WRMP will work with the Management Group of the Restoration Program to define the needs for research and special studies. The WRMP will endeavor to help sponsor the research that is needed.

Much has been said about the scientific and economic advantages of using restoration projects as opportunities to improve restoration approaches and techniques. The WRMP will continue to work with wetlands managers and restoration practitioners to define the questions that might be answered through a process of field tests at project sites. It may be appropriate and useful to build special studies of restoration techniques and monitoring methods into some restoration project designs.

Information Management

The WRMP will include a dedicated information management system. Information management involves data formatting and entry, quality assurance and quality control (QA/QC), storage and retrieval, analysis and interpretation, review and reporting. None of these aspects of information management have been planned in detail. Their general characteristics are outlined below.

Data Formatting and Entry

The heart of the information system will be authoritative data collected with standard protocols, subject to standardized QA/QC, and accessible in standard formats to many user groups. Access to the data should only require common, commercial software and not require custom or proprietary technology.

The Steering Committee anticipates that many different organizations will collect monitoring data, with advice and review by scientific Focus Teams. Special studies and project monitoring might be conducted through the WRMP in some cases.

The database manager will provide standard templates for data formatting. At a minimum, the templates will be designed to allow data users to retrieve and sort data by indicator, habitat type, sampling site, sampling stratum, plot number, data collection method, date, and data collector. Additional data fields or classes will be defined as necessary, subject to review by the Focus Teams and the data authors. Data authors will be responsible for data entry using the formatting templates. It is anticipated that the data authors will remotely upload data into the information system. The data authors will retain all original data sheets and copies of the electronic datasets. The WRMP data managers will work with the authors of GPS data (i.e., data that are appended to geographic coordinates using a Global Positioning System) to create data dictionaries for organizing and labeling data fields in the GPS data loggers.

QA/QC

Data authors provide the first and best level of data protection. They must take full responsibility for the data they collect. They are responsible for using the correct protocols for data collection protocols and for formatting the data correctly for the data managers. They must review the data for numerical and clerical errors, and they must provide the necessary metadata that document the sources of the data and any change in custody of the data.

After the data are carefully reviewed by the data authors and entered into the WRMP information system, the data are subjected to a second level of QA/QC by the data managers. The WRMP data managers will survey each field of data for formatting errors, omissions, incorrect units, and entries that are below known limits of methodological detection or that fall outside acceptable ranges. The data will be plotted as requested by the data authors, who will then examine the plots for evidence of any remaining erroneous or missing data. The data authors upon request by the data managers will provide any missing metadata.

Storage and Retrieval

Data will be stored with the data authors and in the WRMP information system. Data within the system will be backed-up weekly, and the backup copies will be stored away from the data authors and away from the information system at a secured third-party depository that is safe from fire and natural hazards.

Data retrieval or access will be facilitated by a dedicated web site maintained by the WRMP data managers. It is envisioned that the web site will provide access to data and related information through text menus and interactive maps. There may also be active links to sources of other data important to the WRMP but that are collected and managed through other programs. Government agencies and the community of professional scientists will have access to all WRMP data that pass through the QA/QC procedures. To the extent possible, the information system will be compatible with other public-access systems that manage wetland information. The WRMP data managers will strive for a level of compatibility that allows data to move between users without undo delay and without corrupting any datasets. Users will always be able to have their data compared to the original archival datasets that are stored in the WRMP information system.

GIS

A regional geographic information system (GIS) will be a key element of the data management system. The GIS will enable map-based retrieval of spatial data and ongoing accounting of changes in habitat distribution and abundance due to restoration projects and other sources of habitat change. The existing GIS coverages for the baylands that were produced for the Bay Area Wetlands Goals Project will be updated and maintained by the WRMP data managers. These maps are based on the typology of wetlands that the Steering Committee has selected for the WRMP. The Landscape Ecology Team of the WRMP will play a central role in the design and development of the GIS.

Analysis and Interpretation

Once the monitoring data from any given monitoring period are made available to the public, they will be subject to many different analyses and interpretations. However, the Steering Committee and/or Management Group will strive to provide a set of analyses and interpretations according to the authoritative advice and review of the data authors, the Focus Teams, and the Science Review Group. The data authors should participate in the data analyses and interpretations that are conducted through the WRMP. The analyses should be planned before the data are collected. The plans for data analysis should be reviewed by the Focus Teams to assure that the protocols for data collection are followed. The Focus Teams and the Science Review Group should also review any proposed innovations to data analyses. The Steering Committee and/or the Management Group will work with the Science Review Group to help assure that the analyses are interpreted as answers to important management questions.

Review and Reporting

Scientific review will occur in at least five ways. First, informal review of the performance of the WRMP will occur in the normal course of WRMP operations. Focus Team members will share their products within and among their Teams before the products are released to the Steering Committee and/or Management Group. Second, the WRMP will establish an independent system of refereed peer review for any technical products that are intended for public distribution or use. Data collection protocols and summary reports of scientific findings are examples of such products. Third, data authors and others who conduct original analyses of data that are produced through the WRMP will be encouraged to publish their findings in refereed scientific journals. It is anticipated that the program will help pay for publication costs. Fourth, the WRMP will publish its annual summaries of technical findings, subject to review by the Steering Committee and/or Management Group and the Focus Teams. Fifth, the Management Group will arrange for regular science audits of the program through the Science Review Group. The purpose of these audits is to review and improve the design and functions of the WRMP, pursuant to its mission statement. The data user groups of the WRMP should be involved in the review and revision of the WRMP.

The authoritative interpretations of the data will be the foundation of annual public reports about the findings of the WRMP. One hallmark of the WRMP will be timely, inter-disciplinary interpretations of data to improve the WRMP and to inform wetland management decisions. Data authors and Focus Teams will collaborate on the interpretation of findings. The public will have access to the reports via the Internet. The following chart shows the expected typical schedule of reporting for wetland tracking, project monitoring, and special studies.

WRMP Component		Reporting Frequency
Wetland tracking	Tier 1: Landscape Characterization of all tidal wetlands and related habitats	3 to 5 years (GIS will enable landscape scenario planning as needed but summaries of actual change might only be useful every three-five years, depending on the rate of land use change and the rate of implementation of restoration projects).
	Tier 2: Rapid Assessment of randomly selected sites	Annual (additional reporting may occur as special studies and indicator tests).
	Tier 3: Intensive Assessment	Seasonal (additional reporting may occur when intensive wetland tracking is used in project monitoring to show background variability).
Project Monitoring	Progress Reports	Seasonal or Annual (frequency will differ between indicators)
	Performance Evaluations	Annual (overall progress will be assessed annually for each indicator).
Special Studies	Progress and Completion Reports	Quarterly and Annual (final reports may occur irregularly as technical reports of the WRMP or refereed journal publications)