

## SUMMARY OF THE PROPOSED ERPP ADAPTIVE MANAGEMENT FRAMEWORK

An important step in the CALFED Ecosystem Restoration Program Plan (ERPP) is the development of a comprehensive adaptive management framework that includes policy and management decision-making based on existing and newly developed scientific and technical information. Adaptive management is an approach to restoration that acknowledges our limited understanding of the interactions between physical processes, habitats and species and our need to better understand these relationships before implementing the entire program. Adaptive management applied to the Bay-Delta ecosystem allows the CALFED Program to proceed with portions of the restoration program using existing information while gathering the scientific and technical data that we lack to implement effective restoration measures on a broader scale. It is an interactive approach to decision making that involves implementing the actions most likely to achieve ecosystem management goals given today's knowledge while incorporating feedback loops to evaluate and monitor actions and inject new information as it becomes available to modify restoration actions.

Due to uncertainty about the causes of the problems in the Bay-Delta ecosystem and the inability to fully predict responses to proposed actions, the Program will begin using available information and will test these theories through controlled experiments and pilot studies, rather than the wholesale implementation of actions. However, adaptive management is not a prescription to conduct a series of very modest restoration projects and monitor results until all uncertainty is dispelled. A system as large, complex, and troubled as the Bay-Delta demands that we begin to pursue large-scale implementation of actions most likely to achieve ecosystem management objectives. With limited resources (e.g. funding, land, water, time) a careful approach is necessary for success. With many possible directions toward restoration, those routes with the most promise and equity must be found. The challenge will be to find an effective solution that is equitable, balanced, and least costly.

An adaptive management approach will mean the program will proceed on a broad front with many pilot and experimental projects at the watershed level that test the effectiveness and technical feasibility of actions. As the program matures, larger-scale projects will be pursued as information is gained from early pilot studies and experiments. This approach will not preclude early implementation of large-scale projects that address identified needs and have a sound technical basis.

### COMPONENTS OF THE ADAPTIVE ECOSYSTEM MANAGEMENT PLAN

Adaptive management for the ERPP is a structured decision-making process that includes the following components:

- development of implementation objectives, restoration targets, and programmatic actions and the hypotheses regarding those elements (**planning approach**);
- indicators of ecosystem health (**indicators**);
- a program for monitoring indicators of ecosystem health (**monitoring**);

- a program for implementing research to gather new or additional information, test new data collection methods and develop ecosystem models to predict ecosystem responses (**focused research**);
- a process to optimize the implementation of projects through time using implementation strategies for each component of the ERPP and a system for establishing and reviewing long-term and short-term priorities (**phased implementation**);
- a process for reporting programmatic and special information to the public (**public information**);
- a program for technical and scientific review of the ERPP targets, programmatic actions and site specific actions and the monitoring and focused research programs (**review**);
- a feedback process to integrate knowledge gained from monitoring and research; and
- the flexibility to change the program in response to new information.

### **Planning Approach**

A vision for the future, expressed as ERPP implementation objectives, is needed to guide the adaptive management program. Targets designed to meet the implementation objectives are the basis for experiments to test mechanisms for achieving the implementation objectives. Implementation objectives are fixed through time and will not change. Targets, however, have been designed to accommodate new information and successes in reaching the implementation objectives. Targets can change through time and can be reached in a variety of ways. Programmatic actions are very flexible and require prefeasibility studies and option analyses to identify site-specific actions for implementation.

### **Indicators of Ecosystem Health**

The ERPP uses a suite of indicators to track the effectiveness of the implementation objectives and assess ecological performance at several ecological scales. Indicators are direct measures of ecosystem performance for each ecological process, habitat and species identified in the implementation objectives. The ERPP describes each indicator with a metric (what will be measured) and how the metric relates to the implementation objective parameter. An important secondary role of these metrics is to help develop descriptive "indicators" that can be used to keep public and policy makers informed of the success of restoration actions. Indicators will be evaluated through results from the adaptive management process and recurrently evaluated through formal scientific review.

### **Phased Implementation**

Phased implementation is comprised of a multistage priority strategy and an evaluation of critical pathways and action dependencies which assist in identifying and sequencing the implementation of the ERPP restoration actions. At the programmatic level, phased implementation is a snapshot of potential implementation emphasis over time. This program will develop a 25-year implementation plan and will display the likely variations in emphasis within five 5-year increments. Site-specific actions will be based on plans which are developed

annually. The present assessment of emphasis over the life of the program is based on existing knowledge and assumptions regarding the need for certain types of actions, but will ultimately change when results from monitoring and focused research suggest changes to the priority strategy.

*Implementation Strategies* - For each component within the adaptive management process, CALFED and the participating agencies and stakeholders need to develop implementation strategies to provide the pathway to successful implementation. For some elements, implementation programs exist. For others, implementation programs have not yet been developed. A basic strategy for each component will likely be to build on existing programs, bring these programs up to a level to meet CALFED objectives, and augment program staffing levels and funding for implementing projects. Likewise, in areas where no implementation program has been developed, the CALFED strategy may be to encourage the most responsible agency to establish an implementation program and to provide funding for projects. The overall strategy for implementation, however, will influence the shape of the assurances package and be shaped by the decision to create an independent ecosystem management entity which may have full authority to implement the ERPP. Implementation strategies will be analyzed and modified through annual peer review.

*Setting Implementation Priorities* - The programmatic priority plan will consider the 25-year implementation period, projected availability of funding, needs of endangered species, assurances, and the preferred alternative for storage and conveyance. The 5-year implementation priorities have not been set but may be based on the CALFED mission and ecosystem quality goal; ranking of ecosystem elements (ecological processes, habitats and species); threatened and endangered species; and species status (species that produce a conflict with water and fisheries management, species likely to produce a conflict with water and fisheries management, and species which contribute to overall ecosystem health and provide resilience to water and fisheries management). The priority plans will be reviewed and modified through annual peer review.

## Monitoring

Two general types of monitoring will be required to support the restoration program. First, "General Ecosystem Monitoring" entails system-wide monitoring of all important components and processes of the ecosystem to evaluate the overall success of actions, and factors influencing that success. This type of monitoring is most closely associated with the programmatic objectives, indicators, and targets of the ERPP. The General Ecosystem Monitoring program is divided into numerous subprograms. Two examples are the Estuary Zooplankton Monitoring Sub-Program, and the "Real-Time" Monitoring Sub-Program. Second, "Action-Specific Monitoring" is detailed evaluation required for every individual restoration actions or projects (large and small scale).

*Monitoring Strategy* - The only economically feasible way to implement a comprehensive ecosystem monitoring program is to fully integrate and coordinate the program with existing and proposed monitoring activities of several State and federal agencies, universities and local entities that provide essential baseline data needed to assess the Bay-Delta system. In order to appropriately coordinate the collection and storage of data, refinement of the data and

dissemination of the data and results, these duties must be centralized into an agency or entity. This agency or entity will be charged with the following:

- working cooperatively with individual entities and investigators conducting general ecosystem and action-specific monitoring elements to ensure that data is available in a form and time frame useful to program analysis,
- conducting data analysis and preparing reports (or coordinating analysis and reporting) specifically addressing restoration objectives, indicators, and targets, and
- formulating recommendations for management regarding ongoing and proposed restoration efforts.

*Monitoring Funding* - One of the difficulties in ecosystem management is allocating sufficient funding to research and monitoring efforts. Too often, it is difficult to secure funding for actions like these which do not produce immediate, tangible benefits. The ERPP acknowledges the importance of research and monitoring and commits significant funding, but assessing specific research and monitoring funding needs is difficult at the current programmatic level of planning. Also, requirements for a percentage of total cost to be allocated to research and funding is arbitrary. Specific funding needs will be evaluated on a case-by-case basis through adaptive management.

### **Focused Research**

The selection and implementation of focused research activities will be closely tied to the adaptive management process. As the implementation or restoration actions move forward, evaluation feedback linkages will identify critical areas where additional scientific data are required. This will trigger an evaluation process to identify the best approach using the scientific method to collect and evaluate the desired information.

### **Public Information**

The data and results gained from focused research and monitoring will be made available for public dissemination. Information available to the public will include: monitoring results for individual indicators; focused research studies; and annual special reports which detail general ecosystem and indicator progress, the annual implementation plan and implementation priority scheme and the process and rationale for actions implemented.

### **Review**

To ensure the scientific validity of the ERPP targets, actions, monitoring and focused research, the adaptive management process may include a recurrent formal scientific review. The first scientific review will occur in October 1997 to assess the general concepts and approach of the ERPP. In subsequent years, the scientific review may focus more on detailed analyses and specific actions of the ERPP and evaluate the scientific data feedback loop of the adaptive management process. Focus of the review may be on critiquing the annual progress reports and recommending changes to the implementation plan.