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Developing a Strategic Plan for Ecosystem Restoration. Programmatic EIS/EIR Technical Appendix

CalFed Bay-Delta Program

CALFED
BAY-DELTA
PROGRAM

Developing a Strategic Plan for Ecosystem Restoration

Programmatic EIS/EIR Technical Appendix March 1998

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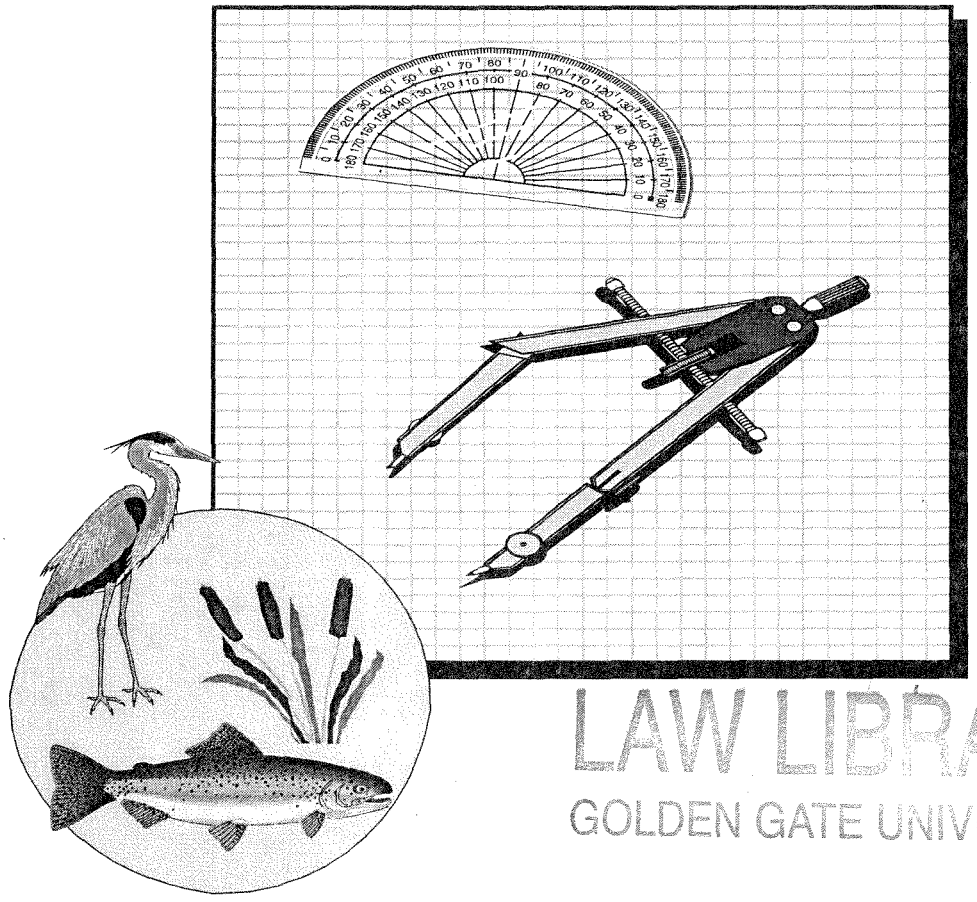


Draft: March 1998

For Discussion

CALFED
BAY-DELTA
PROGRAM

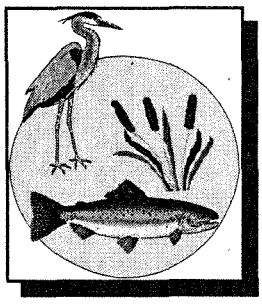
DEVELOPING A STRATEGIC PLAN FOR ECOSYSTEM RESTORATION

Overview

The mission of the CALFED Bay-Delta Program is to develop a long-term comprehensive plan that will restore ecosystem health and improve water management for beneficial uses of the Bay-Delta system. The draft Ecosystem Restoration Program Plan (ERPP) was developed to contribute to restoration actions and ensure attainment of ecosystem health. The foundation of the draft ERPP is restoration of ecological processes that are associated with streamflow, stream channels, watersheds, and floodplains. These processes create and maintain habitats essential to the life history of species dependent on the Delta.

This document is companion to the March 1998 ERPP draft volumes I and II (Visions for Ecosystem Elements and Ecological Zone Visions). Its purpose is to describe the status and process for developing a Strategic Plan for the Ecosystem Restoration Program (ERP) and revising volume III. The *Strategic Plan* is a work in progress which, when complete, will articulate an integrated planning and scientific framework to guide the implementation of the ERP. The *Strategic Plan* will build on *Volume III, Vision for Adaptive Management* (Draft working paper, August 28, 1997). That volume was prefaced by the following:

> *The importance of adaptive management to the ERPP has become increasingly apparent in recent months as we developed Volumes I and II and as we worked to provide this draft of Volume III. We firmly believe that an effective ecosystem restoration program is one that has the support of the participating agencies, stakeholders, interested individuals, and local landowners. We view the refinement of Volume III and the development of an effective adaptive management program as the glue which will hold the ERPP together during the next 25 years and guide our ecosystem restoration plan implementation.*
>
> *Therefore, we present Volume III as our very first cut at describing the adaptive management process with important sections that address implementation, monitoring, indicators, and research. We have much work to do in refining this volume and during the refinement process we need to make certain it reflects the needs and desires of the participating*



agencies and our urban, agricultural, and environmental stakeholders as well as affected landowners and interested individuals.

The perception of the value and importance of strategic planning and adaptive management has not lessened, and based on interest and suggestions by a wide variety of interests, has greatly increased. The Scientific Review Panel, CALFED agencies and stakeholders strongly recommend that CALFED prepare a clear, easily understood document that describes the planning and implementation methodology. Consistent with our earlier determination and these recommendations, we are moving forward with a process to develop a holistic and broad-based *Strategic Plan.* The *Strategic Plan* effort will be an important adjunct to the ERP, and will provide the introductory and background materials not present in the ERP. The *Strategic Plan* will meld all the components into a rigorous adaptive management program. The *Strategic Plan* will provide concise ecological problem statements, present a group of ecological principles to be applied to the ERP, and provide a revised landscape ecosystem classification and descriptions to overlay existing descriptions of ecosystem elements and ecological zones presented in Volumes I and II.

A plan is nothing; planning is everything.

--Sir Winston Churchill

The *Strategic Plan* development process will enable CALFED staff, agencies, stakeholders and other interested parties to work collaboratively to address outstanding issues, refine the ERPP, and successfully implement the ERP. The *Strategic Plan* will be developed with assistance from a Core Team of consultant scientists, CALFED staff, agency experts, advising scientists, stakeholders, and members of the public.

The *Strategic Plan* is the guidance document for CALFED ecosystem restoration programs including the ERPP, Near-Term Restoration, and the CALFED State and Federal Endangered Species Act Compliance Strategy. The *Strategic Plan* will enable the development of an implementation strategy for the ERPP.

All of the elements of the CALFED long-term solution will have implementation strategies which will be integrated into a master implementation strategy.

Purpose of the Strategic Plan

The purpose of the *Strategic Plan* is to clearly articulate an integrated planning and scientific framework by which to successfully implement and evaluate restoration of the large and complex Bay-Delta ecosystem. The *Strategic Plan*

will provide a comprehensive plan of action that will guide proposed restoration actions during development, revision, implementation, and post-implementation periods. The urgency to rehabilitate the ecosystem can be met by addressing scientific uncertainty and proceeding with a scientifically defensible *Strategic Plan.*

Strategic Plan Purposes

- Develop a clear and concise ecological planning framework for goals and actions.
- Develop a rigorous scientific framework to evaluate, support, revise and implement proposed actions.
- Ensure consistency with other CALFED programs, especially Restoration Coordination and the Conservation Strategy for species and habitats .
- Provide an avenue to incorporate the concerns and input of agencies, stakeholders and the general public.

One of the primary criticisms of the draft ERPP by the public and the Scientific Review Panel is that the plan did not present a clear restoration strategy integrated across the proposed implementation objectives and programmatic actions. The *Strategic Plan* is designed to rectify this inadequacy by providing a clear restoration strategy supported by improved scientific information that will be tested and modified through adaptive management and ultimately presented in a programmatic implementation plan.

Preparation of the Strategic Plan

CALFED staff and a group of interested stakeholders have begun preliminary work to develop a process for strategic planning. This joint stakeholder-agency effort has prepared a draft outline for the *Strategic Plan.* We are also working on a process to coordinate an Ecosystem Science Program, a formal, long-term scientific review program for CALFED Bay-Delta restoration efforts. We have begun recruiting a team of scientists from the Science Program to assist in the preparation of the *Strategic Plan.* This core team of scientists will also participate in public, technical workshops to address some of the complex scientific issues that must be resolved in the *Strategic Plan.* In consultation with the BDAC Ecosystem Restoration Work Group (ERWG), a scope of work has been written and will be further discussed with ERWG at various stages along the way.

Who Will Be Involved

A broad spectrum of participants is required in the planning, evaluation, and implementation of the *Strategic Plan*. Stakeholders are invited to participate through the meetings of the BDAC ERWG. There will be periodic meetings of this Work Group to solicit input and report progress on the plan. There will also be issue-specific technical workshops with a variety of scientists and technical experts in attendance.

When Will the Strategic Plan Be Completed

The objective is to have a review draft of the *Strategic Plan* available by June 1998, and a target date for completion is August 1998. Draft chapters of the report will be available for public review throughout the next six months.

Strategic Planning Workshops

The development of the *Strategic Plan* must take place in an open forum with full access to all agencies and stakeholders who desire to contribute to the design of the plan. We plan to host several Strategic Planning workshops to fully scope the issues and concerns regarding the structure and content of the Strategic Plan. This process will be under the guidance of the Bay-Delta Advisory Committee, a formal committee established under the auspices of the Federal Advisory Committee Act (FACA). This venue will further insure that this important element of the overall CALFED program is consistent with Federal law.

Regional Strategic Plans

The *Strategic Plan* is envisioned as providing the broad landscape setting for attaining the targets presented in the ERP. This will be accomplished by the combined efforts of the Ecosystem Science Program and Adaptive Management.

Implementation of the specific actions will be further guided by locally developed strategies for implementation.

Components of the Strategic Plan

Development of the *Strategic Plan* will require resolution of many issues related to the selection and implementation of restoration actions presented in the ERP. The major issues and areas of concern follow:

- Scientific Uncertainty
- ERP Science Program
- Conceptual Ecosystem Models
- Testable Hypotheses
- Adaptive Management
  - Indicators of Ecological Health
  - Focused Research
  - Ecosystem Monitoring
  - Implementation Phasing
- Implementation Management

Scientific Uncertainty

One of the main difficulties facing ecosystem restoration is failure to adequately address scientific uncertainty prior to implementing actions. That is to say, restoration actions are designed and implemented with the inherent (but often unstated) assumption that an action will provide the ecological benefit for which it is being implemented.

Class	Description
◆	Target for which additional research, demonstration, and evaluation is needed to determine feasibility or ecosystem response.
◆◆	Target which will be implemented in stages with the appropriate monitoring to judge benefit and success.
◆◆◆	Target that has sufficient certainty of success to justify full implementation in accordance with adaptive management, program priority setting, and phased implementation.

The ERP presents a formidable number of restoration actions, designed to improve the ecological health of the Bay-Delta system, and has made an attempt to assign levels of scientific certainty to targets presented in Volume II: Ecological Zone Visions. The target

classification system used in Volume II is in the text box to the left.

In this context, the ERP attempts to address scientific certainty by identifying actions that have a sufficiently high certainty of success that they should be implemented. At a lower level, some actions have been identified as feasible for implementation on a small-scale and then evaluated on the results of monitoring to determine if the project provided the anticipated ecological benefits. At the lowest level, many actions have been proposed which may provide an ecological benefit, but which have little data to support the benefits assumption.

Ecosystem Science Program

The Ecosystem Science Program is a long-term program that will provide technical and scientific input for Bay-Delta restoration activities. This three-tiered ecosystem science program will provide a conduit for multiple levels of scientific input needed to address complex scientific issues in order to develop, implement, and assess CALFED ecosystem restoration activities.

In the first tier of the Science Program scientists and experts will be recruited to assist CALFED in the development of the *Strategic Plan*. This team will include experts in a wide variety of scientific disciplines including ecological modeling, landscape ecology, conservation biology, Endangered Species Act compliance, and hydrology/fluvial geomorphology. This core team of scientists will facilitate work groups and technical workshops with CALFED staff, agency experts, advising scientists, stakeholders, and the public.

The second tier is a standing science group. The standing science group is an informal assemblage of independent, agency, and stakeholder scientists who work within and outside the Bay-Delta system. The members of the standing science group will be recruited for specific experience applicable to the CALFED restoration efforts. The tier two experts will participate in focused, technical workshops facilitated by tier one scientists and CALFED staff. The scientists will review and provide input on monitoring and research findings, indicators, models and testable hypotheses, ESA compliance strategies, the adaptive management strategy, and other work prepared by the Core Team.

The third tier is the wholly-independent Scientific Review Panel. We will host another workshop of the Scientific Review Panel this Summer or Fall to review the *Strategic Plan*.

Scientific Review Panel

In October of 1997, a Scientific Review Panel was convened to assess and evaluate the scientific validity and rationale of the scientific concepts contained in the draft ERPP. The Scientific Review Panel recommended the incorporation of conceptual models early and prominently into the draft ERPP. The Panel emphasized the need for large-scale qualitative models, models that are focused geographically and also simulation models of processes such as fluvial geomorphology. A whole series of integrated physical and biological models is essential to a science-based adaptive management program. Because there is uncertainty whether restoring a given physical process will achieve the draft ERPP's restoration or rehabilitation goals, conceptual models need to include alternative hypotheses and alternative management actions. The Panel recommended a management procedure be developed to test the conceptual models and improve our understanding of ecosystem functions.

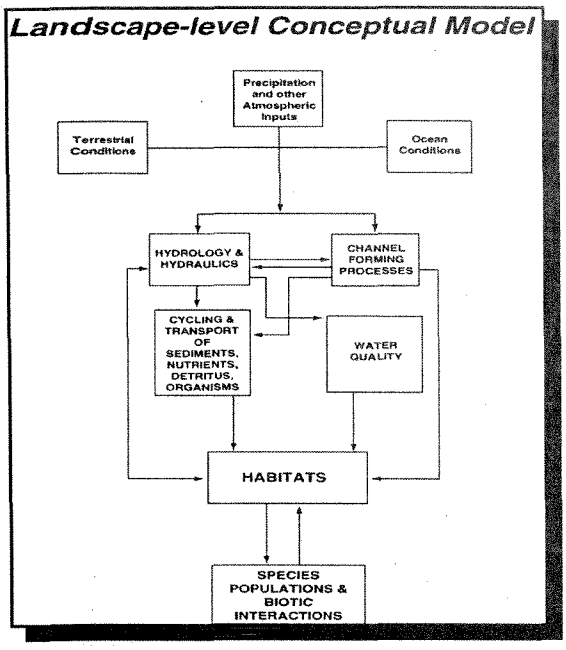
Conceptual Ecosystem Models

The ERP Indicators Work Group has begun work on conceptual models pursuant to the recommendations of the Scientific Review Panel. Ecological attributes for the Bay-Delta-River System are organized by broad elements which include: upland river-riparian systems, lowland river-floodplain systems, Delta, and Greater San Francisco Bay. These elements each encompass three or more ecological zones as described in the draft ERPP. General categories of attributes were identified (hydrologic, geomorphic, habitat, biological community, and community energetics) which reflect essential aspects of ecosystem structure and function. Understanding the ecological attributes of the Bay-Delta-River system provides a basis for developing conceptual models.

The conceptual models are designed provide as much consistency across both ecological hierarchy and geography as possible so that information can be aggregated in a variety of ways. Input by technical experts will be more easily integrated using a common format.

Landscape-scale Conceptual Model

The landscape-scale conceptual model globally depicts large-scale attributes of the Bay-Delta-River system and associated watershed. This model depicts the



structural and functional attributes which generally apply across ecosystems. Indicators developed at this scale will be based on ecological attributes such as habitat, areal extent and connectivity, habitat diversity and representativeness, and hydrologic and sedimentation regime. This model will be used to integrate the ecosystem-scale models and to convey to the public the general ecological concepts and hypotheses which are the underpinnings of restoration ecology.

Ecosystem-scale Conceptual Models

Ecosystem-scale models include the Upland River-Riparian Systems, Lowland River-Floodplain Systems, and Bay-Delta Conceptual models. The attributes for the Greater San Francisco Bay and Delta have been incorporated into one conceptual model called the Bay-Delta Conceptual Model by CALFED staff. As the iterative review process unfolds it may be deemed necessary to have separate conceptual models for the Greater San Francisco Bay and Delta.

The ecosystem-scale models are based on distinctive geomorphic and hydrologic features which warrant the development of separate conceptual models. For example, upland river-riparian systems are characterized by steep confining topography with bedrock-controlled stream channels in a narrow floodplain. These systems generally occur in upper elevation watersheds above major dams in both the Sacramento and San Joaquin Valley. Hydrologically these areas are characterized by seasonal shifts in stream levels with periodic flooding. The lowland river-floodplain systems are characterized by flat, non-confining topography with a wide floodplain area which allows for active channel migration and floodplain development. These systems have seasonal shifts in stream levels with periodic flooding but also have greater hydrodynamic complexity and large groundwater basins, particularly in the Sacramento Valley.

For undammed tributaries the 300 foot contour was chosen as the dividing line between upland-river riparian and lowland- river floodplain systems. This is the approximate boundary where alluvial soils begin. Often, the location of dams and reservoirs coincides with this boundary. The difference in hydrologic attributes above and below dams warrant using this as a boundary. The uppermost extent of tidal influence was chosen as the boundary between lowland-river floodplain systems and the Delta. Finally, Chipps Island, to coordinate with the legal definition of the Delta, was selected as the boundary between the Delta and the Greater San Francisco Bay.

Indicators developed at the ecosystem-scale will include an assessment of ecological attributes such as habitat, areal extent and connectivity, habitat diversity, and hydrologic and sedimentation regime. For example, in lowland river-floodplain systems the integrity of fluvial geomorphology will be evaluated using indicators of processes such as channel meander, channel/floodplain interactions and surface/groundwater exchange.

Habitat-scale Conceptual Models

Conceptual models of habitats need to be developed to depict our current understanding of habitat structure and function. Habitat models could be used to assess technical feasibility and desirability of proposed restoration projects and to evaluate the results of restoration and management actions. A detailed riparian forest habitat model might include such attributes as hydrologic and sedimentation regime; plant composition, diversity and cover; faunal diversity; and reproduction of neotropical migrant birds. Such a model could be used to construct alternative hypotheses regarding, for example, the ecological effects of a levee setback.

Specialized Conceptual Models

Specialized conceptual models include models of individual tributaries, stream reaches, sections of rivers, biological communities, species populations and ecological processes. The Lower American River Conceptual Model is an example of a tributary model that could be used to track local system health and demonstrate the contribution of a particular waterway to landscape-level ecological integrity. The lower American River is essential to the migration, spawning, rearing and outmigration of chinook salmon. Conceptual models and indicators for the lower American River will be developed with the assistance of technical specialists having expertise on this system. For example, the Department of Fish and Game's Stream Evaluation Program, the Water Forum, and Sacramento Area Flood Control Agency technical specialists will likely be contributors to this process. While the general ecological attributes of tributaries in a particular geographic area may be the same, the individual tributary indicators and stressors will likely vary to reflect the different areas of concern for each tributary.

A Bay-Delta food-web model is an example of a biological community model which may be developed. Species population models that may be developed include population models, life-history and fish loss models.

Quantitative models of hydrology, sediment transport, and carbon budget are examples of specialized conceptual models of ecological processes.

Testable Hypotheses

Many problems arise in science where a decision must be made to accept or reject a statement regarding the ecological relationship of a specific parameter or condition. This is particularly true in ecosystem restoration. The statement in these situations is referred to as a *hypothesis*. For example, the ERP has recommended the restoration of tidally influenced aquatic habitats in the Delta to provide habitat for delta smelt. A very simple hypothesis related to this action could be stated as follows: "The delta smelt population will benefit from increased habitat for spawning."

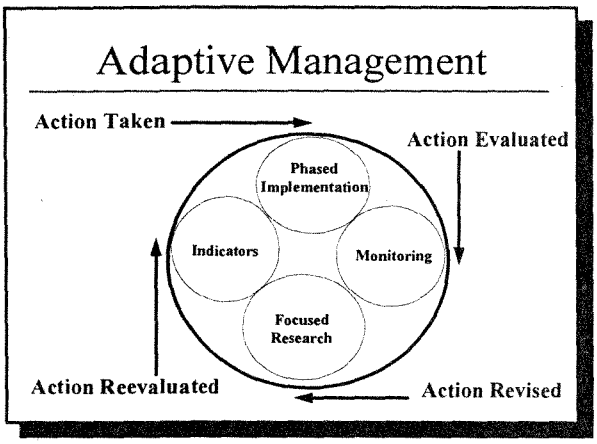
The decision-making process about the hypothesis is termed hypothesis testing. This testing would likely require the collection of data regarding delta smelt abundance, habitat preference, habitat utilization, and other environmental factors. Analysis of these data would indicate if the hypothesis was true (delta smelt benefit from additional spawning habitat) or false (delta smelt do not benefit from additional spawning habitat). In actual application, the example hypothesis is probably too simple to be evaluated and the need for scientifically testable hypotheses will drive the restoration program to very clearly articulate perceived problems and potential means by which to remedy the problems. In any case, the hypothesis must but be structured in a manner that will allow the collection of scientific data to evaluate whether the hypothesis is true or not.

Adaptive Management

No long term plan for management of a system as complex as the Bay-Delta can predict exactly how the system will respond to Program efforts, or foresee events such as earthquakes, climate change, or the introduction of new species to the system. Adaptive management acknowledges that we will need to adapt the actions that we take to restore ecological health and improve water management. These adaptations will be necessary as conditions change and as we learn more about the system and how it responds to our efforts. The Program's objectives will remain fixed over time, but our actions may be adjusted to assure that the solution is durable.

The concept of adaptive management can be illustrated as applied to the Program. A critical step of the ecosystem restoration component is to construct a comprehensive adaptive management framework that includes policy and management decision-making based on existing and newly developed scientific and technical information. To be effective, this process also needs to consider the ecological, economic, and social goals of communities, agencies, and interested parties and incorporate these distinct values into the design of the adaptive management process.

Adaptive management of ecosystem restoration has a dual nature. First, adaptive management is a philosophical approach toward restoration that acknowledges we need to better understand the Bay-Delta watershed if we are to succeed in restoring ecosystem health. It acknowledges that we will proceed with restoration efforts using existing information while we gather the knowledge that we lack. Although we know much about the Bay-Delta system (its ecological processes, habitats, and species), we do not know everything we need to successfully restore ecosystem health. The adaptive management philosophy accommodates the status of knowledge and provides an avenue to obtain the necessary knowledge (and experience) through the duration of the implementation period.



Second, adaptive management is a structured decision-making process that includes important components to identify 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 (focused research); a process to optimize the implementation projects through time (phased implementation); a feedback process to integrate knowledge gained from monitoring and research; and the flexibility to change the program in response to new information.

The concept of adaptive management is an essential part of other program elements as well. In every part of the program, new or more intensive actions are proposed. Along with these proposed actions comes uncertainty. What actions work best to achieve program objectives? How can these actions be modified to work better, cost less, or be simpler to implement? How should the emphasis among actions change over time? Are there new or different actions that should complement or replace those that are being implemented? An adaptive management approach helps to answer these questions.

Even within the area of adaptive management there are linkages among Program elements and opportunities for more effective action. This is especially true for the ERP and the Water Quality Program. There is a lack of conclusive information about cause and effect relationships and how much restoration is needed for a "healthy" ecosystem and good water quality. An effective adaptive management program requires the continuous examination of monitoring data to measure progress and redirect activities where necessary. The Program is currently identifying the monitoring, assessment and research needs for CALFED-related projects, actions, and activities. A Comprehensive Monitoring, Assessment, and Research Program (CMARP) is a critical component of the CALFED adaptive management strategy.

The concept of adaptive management will be developed more fully for all program components as implementation plans are developed later in Phase II of the Program.

Indicators of Ecological Health

Ecological indicators are a means to evaluate the success of restoring ecological health to the Bay-Delta-River system. Within the framework of adaptive management the indicators program will serve several important functions. Indicators will provide a relative measure of the efficacy and durability of restoration projects and management actions, in contributing to ecological rehabilitation. Evaluation of indicators program data will improve our technical understanding of the interrelationships and interdependence of processes, habitats and species within the Bay-Delta-River system. Indicators, with conceptual models, will help identify information gaps and research needs.

The ERP Indicators Work Group has now begun engaging technical experts having knowledge of particular species, habitats, and ecological processes. Technical experts will assist in the iterative process of developing conceptual models and indicators of ecological integrity for the Bay-Delta-River system.

There may be two or more sets of indicators depending on the intended purpose and audience. Because the indicators will be utilized by the public, management, and technical experts, the indicators will have varying degrees of complexity. For example, a set of indicators suited for the public may consist of just a few overarching measures of ecological health that are easily understood by the general reader whereas, a set of indicators used by the scientific community could be more esoteric and require a technical background to understand.

Once indicators are selected, a range of target values will be developed for each indicator. The targets will define levels that achieve ecological integrity or health based on our best estimate of historic states, reference conditions or other information. Indicator targets will be revisited and refined based on new information generated by the adaptive management process. Such information could include: analysis of historical conditions and processes; presence of introduced species; incorporation of natural fluctuations; and future growth and development.

Focused Research

Focused research is the use of experimental methods to answer specific questions. Consistent with scientific uncertainty and adaptive management, focused research programs will be developed to evaluate restoration opportunities and assist in directing restoration actions to areas where it will provide the greatest ecological benefit.

Ecosystem Monitoring

A comprehensive monitoring program is being developed by IEP/USGS/SFEI to assure the indicators will be measured. Evaluation of the results of the monitoring and indicators programs will require specific expertise, particularly in the early years of the restoration program. An integral portion of the evaluation should be provided by those area- and species-specific experts that helped developed the indicators. As the restoration program proceeds the linkages between attributes and the effects of stressors on the Bay-Delta-River system will become more clearly understood, providing knowledge upon which to base ecosystem management decisions. Monitoring data and the evaluation of indicators will be incorporated into the adaptive management process.

Implementation Phasing Plan

Phased implementation is an approach to implement actions identified in the ERPP. Phased implementation is comprised of a multistage priority strategy

which assists in identifying and sequencing the implementation of the ERPP restoration actions.

At the programmatic level, phased implementation provides a snapshot of potential implementation emphasis over time. A 25-year implementation period is selected to display one potential variation in emphasis grouped within five 5-year increments. 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.

Phased implementation within the shorter term 5-year implementation programs will be modified on a recurrent basis as a result of adaptive management and the collection and evaluation of new or improved information. The shorter-term implementation programs developed within the framework of adaptive management may vary significantly from the programmatic snapshot of implementation. This is consistent with the theme of adaptive management and reflects the feedback and evaluation loops needed to refine and adjust the implementation program in the short-term.

Assumptions

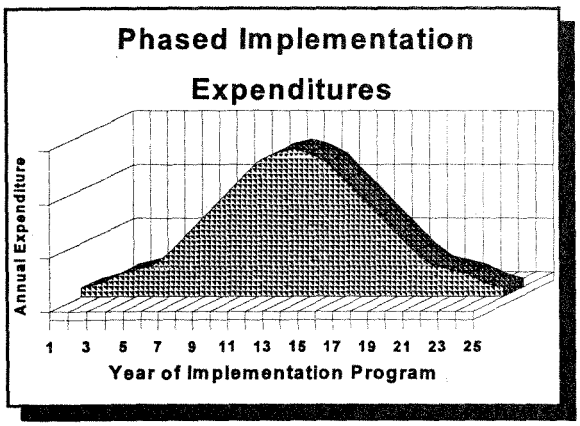
A number of assumptions are required to develop the programmatic level phased implementation program for the 25-year period after the programmatic Environmental Impact report/Statement is certified. These assumptions are important elements of the *Strategic Plan* and will guide and assist in the development of a process for implementing the ERPP. The assumptions include: the assurances package for the ecosystem restoration, funding and financial strategy, ERPP implementation strategies, focus area and tiered emphasis for implementation, preferred alternative for storage and conveyance, integration with the other common programs and development of a conservation strategy.

Funding

The total for implementing the ERPP has been very roughly estimated at $1.5 billion. About half of that is available through Proposition 204 bond and expected federal appropriations. These funds will be used to provide the initial infusion of capital to move the implementation program forward. In later years, the magnitude of the annual implementation program may be constrained by the annual availability of funding. Phasing, and the overall adaptive management program, is ultimately influenced by the availability of restoration funds throughout the duration of the program, individual and cumulative costs to

implement the ERPP, and priority strategies that select for specific actions to reach specific targets.

This ERPP assumes that the $390 million identified in Proposition 204 will become available after the CALFED Bay-Delta Program's final EIR/EIS is formally adopted by the CALFED agencies through the filing of a Record of Decision for the federal EIS and certification of the EIR by the California Resources Agency by late Fall 1998. It is assumed that these funds will be encumbered and spent during a 25-year period which provides a pro-rated fund availability of approximately $15 million per year. The projected expenditure of funds will likely follow a bell-shaped curve (see inset). This is necessary to develop the infrastructure needed for implementation, monitoring of indicators, focused research, and post-project evaluations.



It is also assumed that expenditures in any single year will not be limited if suitable projects exist for implementation. Category III is assumed to complete the expenditure of $180 million during the first five years on actions identified for early implementation.

Other sources of funding available during the early implementation phase include $429 million which may be available through a series of federal appropriations.

It is also assumed the CVPIA will continue to be implemented and that an estimated $20 million to $35 million per year for 25 years ($500 million to $875 million estimated total) will be spent on restoration actions, most of which will be closely related or identical with actions in the ERPP.

Implementation Focus Areas

The geographic scope of the ERPP is defined by the interdependence and linkage of watersheds, streams, rivers and the Bay-Delta and the complex life histories of the dependent fish, wildlife and plant communities. The restoration of ecological processes requires implementation of actions throughout much of the Central Valley, its upper watersheds, the Bay-Delta, and near-shore ocean. The primary geographic focus is the Bay-Delta, the Sacramento River, the San Joaquin River, and their tributary watersheds directly connected to the Bay-Delta system below major dams and reservoirs. Secondarily, the ERPP addresses, at a programmatic level, the near-shore ocean, South San Francisco Bay, lower San Joaquin Valley, and the upper watersheds above the major dams.

The primary geographic focus area for the ERPP is divided into 14 zones, each characterized by a predominant physical habitat type and species assemblage. These 14 ecological zones constitute the geographic areas in which the majority of restoration actions will occur.

Tiered Emphasis

The CALFED approach to the development of ecosystem restoration targets and programmatic actions in the ERPP study area varies by area. These areas receive varying levels of specificity and emphasis.

Example of Phased Implementation for Ecological Processes

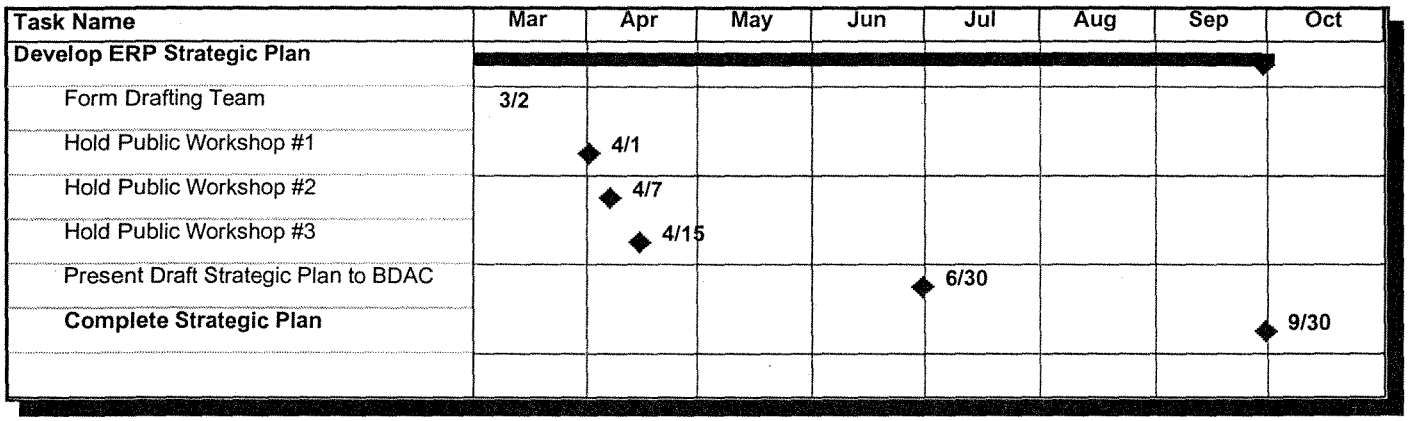
Ecosystem Element	Implementation Interval (Years)				
Ecological Processes	1-5	6-10	11-15	16-20	20-25
Streamflow					
Sediment Supply					
Meander Corridor					
Floodplains and flood processes					
Stream Temperatures					
Bay-Delta Hydraulics					
Bay-Delta Aquatic Foodweb					
Upper Watershed Support					

Key		
Level of Effort	Code	Description
High		High level of implementation, monitoring, or focused research.
Medium		Medium level of implementation, monitoring, or focused research.
Low		Low level of implementation, monitoring, or focused research.

Implementation Management

One of the most difficult challenges in the administration of the ERP is the potential design of the necessary institutional arrangements to ensure implementation of a large program over a long time period (25-30 years). Although the nature of the implementation entity for the ERP is not a focal point in developing this Strategic Plan, it is an important activity occurring outside of the ERP. Some of the important issues to be addressed include fostering a regional perspective, utilizing a "Problemshed" orientation, clearly defining the function of the implementation entity which will then define its structure, integrating strong mechanisms for full accountability of the program, and avoiding a fixed approach to implementation by promoting flexibility and creativity.

Timeline for Developing the Strategic Plan



DRAFT OUTLINE OF THE STRATEGIC PLAN

This preliminary draft outline was prepared by a group of interested stakeholders and CALFED staff. We recognize that successful implementation would only occur if the agencies, stakeholders, and local interests share the same vision for implementation. We also utilized the many insightful comments from reviewers of the ERPP and the Scientific Review Panel. This plan will be further refined and implemented with the input and guidance of stakeholders, agencies, and all interested parties.

1. **Executive Summary**

2. **Introduction**
   a. Problem Statement
      i. Scientific uncertainty, urgency of restoration
   b. Mission Statement
      i. Outline the principles that CALFED and the core team will follow in developing the plan, with an emphasis on public and scientific input
   c. Purpose and Overview of Strategic Plan
      i. Relation to other volumes of the ERPP
   d. Integration with other CALFED Bay-Delta Program components
      i. Restoration Coordination Program, Conservation Strategy
   e. Definition of Terms
      i. This step is necessary to address, in part, the scientific review panel's first recommendation: "In revising the ERPP, CALFED should clearly state whether the goal of the project is restoration or rehabilitation and name the document accurately . . . The decision to restore or rehabilitate need not be made on a system-wide level – it could be made for individual watersheds or ecological zones. . . This distinction between "rehabilitation" and "restoration" is one among several examples of the need for refining the use of phrases and terms in the ERPP. . ."

3. **Ecosystem Strategy**
   a. This is the overarching ecological planning framework for the ERP. Describe the general structure of the plan, specifically the stair step concept of moving from:
      - ecological principles; to
        - goals; and
          - objectives; supported by
            - analytical tools; which ultimately guide the selection of
              - strategies.

i. Guiding Ecological Principles
   (1) Briefly present the key ecological principles used to guide the selection of goals and strategies to attain the goals. They form the underpinnings of the restoration/rehabilitation plan. These are purely scientific, not management principles.

ii. ERPP Goals and Objectives
   (1) Revise existing ERPP goals and identify two to five overarching program goals. (This step is necessary to address the second recommendation of the scientific review panel: "Simplify and focus the presentation of the program and its goals on the basis of conceptual models. The goals should be explicitly, quantifiable, and attainable." This step is intended to set explicit, quantifiable goals. Section IV of this outline addresses presentation of the program and its goals through conceptual models.)
   (2) Each goal should be supported by several specific, quantifiable objectives. Quantifiable objectives are the end points which define success of the restoration effort. Goals have not yet been identified but will be discussed and agreed upon by the CALFED Policy Group and BDAC Ecosystem Restoration Work Group.

Example ERPP Goals

Goal A	Maintain and Restore Ecological Function
Goal B	Protect and Restore Native Species
Goal C	Maintain and Enhance Viable Populations of Selected Species for Safe and Sustainable Consumptive Use
Goal D	Maintain and Restore Fully Functioning, Self-Sustaining, Representative Habitats and Ecosystems
Goal E	Conserve Naturally Functioning Ecosystems

4. Bay-Delta Ecosystems: Descriptions, History, and Conceptual Models

a. This Chapter will provide a picture of the system (past and present) and present a series of conceptual models that describe current theories on how the system functions and how various factors (including stressors) influence the system. The conceptual models combined with the guiding ecological principles described in Chapter 1 will form the rationale, or logic, for how specific strategies and actions are expected to help in achieving the ERPP goals. This chapter will provide the scientific framework for the ERPP. The chapter synthesize and provide additional scientific support for the ecosystem descriptions presented in Volumes I and II.

i. Ecosystem Classification
   (1) Provide a description and ecosystem classification of the Bay-Delta system. Include major structural characteristics, processes, and organizational features. Describe specific habitats and linkages between habitats at a landscape level.

ii. Key Attributes
   (1) Identify key system attributes including hydrology, geomorphology, habitat types, biological communities, and energetics/nutrients. A draft ecological attributes paper was prepared by the Indicators Group.

iii. Historical Conditions and Human Interventions
   (1) Provide a description of the watershed and its ecosystems as they existed prior to massive human intervention; circa 1800. Discuss major human interventions over time.

iv. Current Status and Trends
   (1) Describe the present system. Clearly identify the difference between existing conditions and ERPP goals. Discuss causative factors creating and/or maintaining these differences including documented cause-effect relationships, suspected cause-effect relationships, and controllable vs. uncontrollable factors.

v. Hypotheses and Conceptual Models
   (1) Describe conceptual models that explain the current theories regarding how the system works and how various strategies will achieve the restoration goals. Flesh out the specific testable hypotheses implicit in the conceptual models. Cite the evidence or assumptions underlying these hypotheses. (This step is necessary to address the fourth recommendation of the scientific review panel: " In order to utilize science as a basis for the adaptive management system, there is a need for the development and use of models of physical and biotic ecosystem processes with links to key biotic components.")
   (2) Preliminary conceptual models for the ecosystem were developed by the Indicators Group.

b. Analytical Tools
   i. Describe the analytical tools that have been, or should be, used for refining specific objectives and designing strategies and treatments proposed for ecosystem rehabilitation and restoration. These tools should be based on the ecological principles established in Chapter 1 and should be used to develop and justify quantified endpoints.

c. Strategies For Restoration and Rehabilitation
   i. Describe the strategic approach(es) and individual strategies types of actions for achieving program goals. Describe how and where these strategies will be employed in the various ecosystem types (i.e. delta vs. alluvial river) throughout the planning area. Identify key themes to convey ERPP goals and approach in layperson's terms.

5. Adaptive Management Strategy

a. Adaptive Management
   i. General Description of Adaptive Management
      (1) Define adaptive management and explain the need for adaptive management in the ERPP. To the extent appropriate, management actions should be designed as experiments.

   ii. Components
      (1) Describe the science components of the plan, including: focused research; modeling; and monitoring and how the adaptive management program will be developed from testable hypotheses. (This step is necessary to address the fifth recommendation of the scientific review panel: ". . . the adaptive management framework should be developed from testable hypotheses.")

b. Ecosystem Science Program / Scientific Review
   i. (This step is necessary to address the sixth recommendation of the scientific review panel: Accommodate "continual interaction of agency managers, agency scientists, and independent scientists" through the "creation of a scientific and technical advisory board, composed of agency scientists, stakeholder scientists, and scientists independent of the program.")
      (1) - Standing Science Body - Describe the form and function of a scientific and technical advisory body composed of agency scientists, stakeholder scientists, and scientists independent of the program. Activities to be carried out by the science body would include generation and reviewing hypotheses, formulating monitoring schemes, reviewing and interpreting data, and more.
      (2) - Independent Scientific Review Panel - Describe how outside scientific expertise will be embedded in the adaptive management process. Describe role of current Scientific Review Panel. (This step is necessary to address the third recommendation of the scientific review panel: "From the outset, the program should embed outside scientific expertise in the adaptive management process.")

c. Assessment Criteria and Performance Indicators
   i. Describe the designation, monitoring, and use of performance indicators to evaluate success of implementation measures in attaining program goals and objectives.

6. Implementation

a. Priority Setting
   i. Explain a process for prioritizing potential restoration actions due to biological urgency, feasibility, cost, and other criteria.

b. Conflicts and Constraints
   i. This section should include recognition of known or potential conflicts and constraints, including resource conflicts, socio-economic factors, and others.

c. Implementation Strategies and Conflict Resolution
   i. implementation strategies for each resource type and for geographic region; strategies for conflict resolution, such as only working with willing sellers, mechanisms for water transfers, financial incentives, and public involvement.

d. Implementation Plan
   i. Present an implementation plan framework with guidelines and considerations. The implementation plan will include the following items:
      (1) - 3 Year Action Plans (1st Action Plan prepared by Integration Panel/Ecosystem Roundtable);
      (2) - 25 Year Programmatic Implementation Plan

e. Institutional Structure and Decision Making Process
   i. Describe how decisions will be made regarding implementation of specific restoration actions, including the institutional structure that will be established to facilitate decision making. Describe the role of advisory bodies including the standing science body and independent scientific review panel discussed under the Ecosystem Science Program above. This chapter should be developed in coordination with the Assurances Work Group and others working on potential future institutional arrangements. Specific items covered should include:
      (1) - Implementation Entity(ies) and organizational structure
      (2) - Staffing expertise needed
      (3) - Funding requirements
      (4) - Legal authorities
      (5) - Endangered species compliance