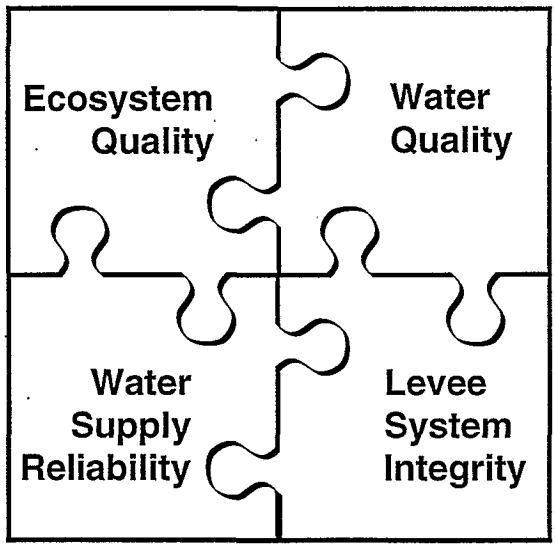
OVERVIEW
CALFED BAY-DELTA PROGRAM
ECOSYSTEM RESTORATION PROGRAM PLAN

The CALFED Bay-Delta Program is developing a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system. This program is critical to the future of California because the Bay-Delta system is the largest estuary on the West Coast, providing habitat for 120 fish and wildlife species, including many listed as threatened or endangered. The Bay-Delta system is also critical to California's economy, providing drinking water for two-thirds of Californians and irrigation water for 200 crops, including 45 percent of the nation's produce.

The Program is preparing a Programmatic EIR/EIS that will present and analyze three alternatives that each provide a comprehensive program to address Bay-Delta problems in ecosystem quality, water quality, levee system integrity, and water supply reliability. Based on the analysis, a preferred alternative will be selected in Fall 1998. To date the Program has focused on the development and refinement of *components* of the alternatives, including the Ecosystem Restoration Program described in this overview document. With the refinement of components that has now occurred, this focus on parts of the program will diminish. The three alternatives will be considered and analyzed as unified programs that are designed to simultaneously address resource problems in four areas.

The linkages among these resource areas make it impractical to focus on problems in any single area without considering the problems in the other areas. Likewise, solution of a problem in one area is likely to help resolve problems in other areas as well. Thus, this paper describes a component developed specifically to address problems of ecosystem quality, but when viewed in isolation it presents an incomplete picture. Some actions to improve water quality, increase water supply reliability, and bolster levees will also improve ecosystem health in the Bay-Delta system. Similarly, some actions to improve ecosystem health will simultaneously yield improvements in the other resource areas.



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PROBLEMS WITH THE BAY-DELTA ECOSYSTEM

The Bay-Delta system no longer provides a broad diversity of habitats nor the habitat quality necessary to maintain the natural processes that support healthy populations and communities of plants and animals. Much of the public focus on ecosystem problems has centered on fisheries, especially those populations which have been designated as threatened or endangered under Federal and State laws. Declining fish populations and endangered species designations have generated major conflicts among beneficial uses of water in the Bay-Delta system. The underlying problems, however, are much broader and more far-reaching than a decline in fish. The health of the Bay-Delta ecosystem has declined in response to a loss of habitat to support various life stages of aquatic and terrestrial biota and a reduction in habitat quality due to several factors.

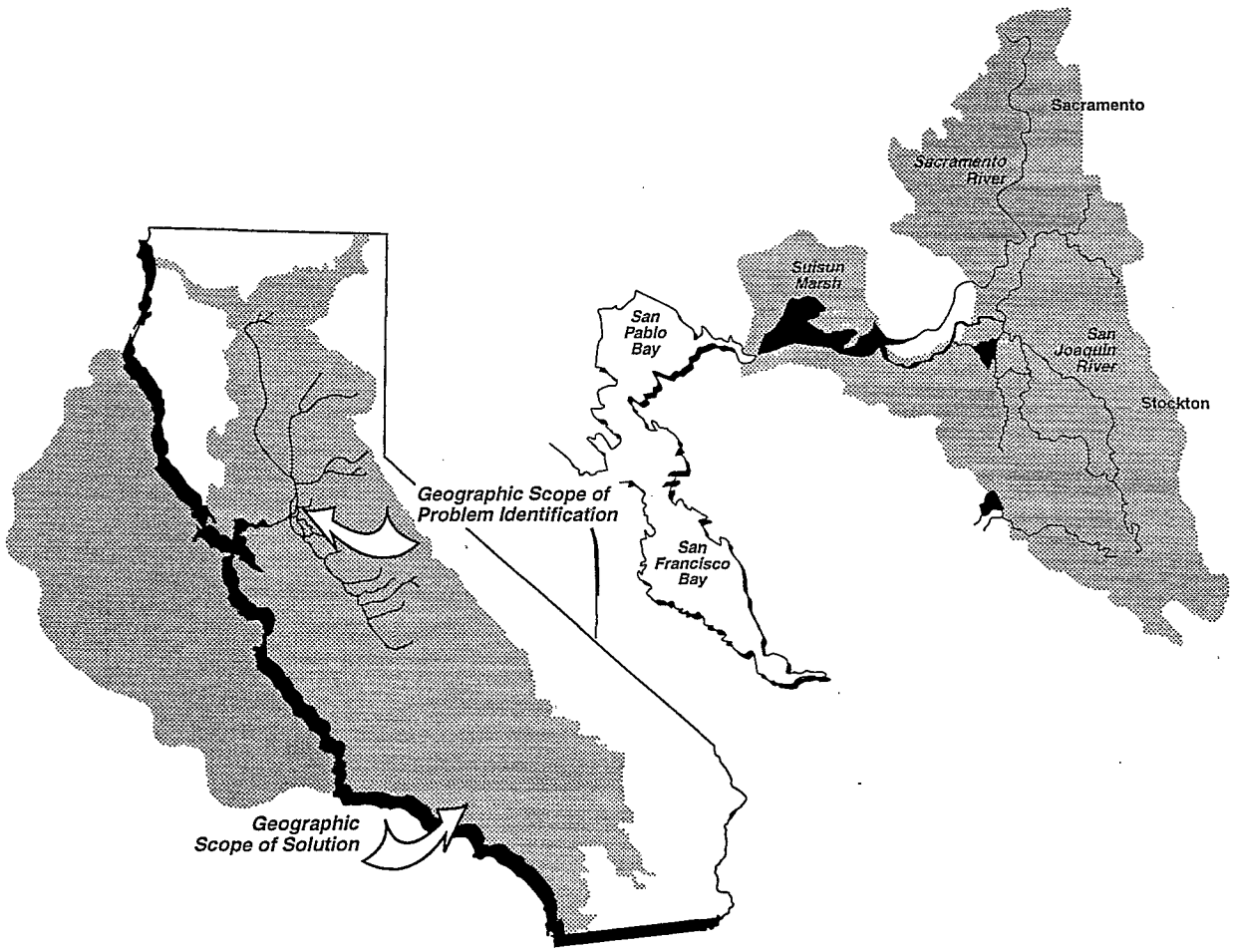
The steady decline in indicators of habitat quantity, quality, and diversity and the disruption of ecosystem process and functions has resulted from many activities both in the Delta and upstream. The earliest major damaging event, following the California gold rush, was the unrestricted use of hydraulic mining in the river drainage along the eastern edge of the Central Valley, which greatly increased the amount of sediment entering the river systems. The effect of hydraulic mining was twofold. First, habitat degradation occurred in Central Valley streams as channel beds and shallow areas filled with sediment. Then the reduced capacity of the sediment-filled channels resulted in an increase in frequency and extent of periodic flooding. This accelerated the need for flood control measures to protect adjacent agricultural lands. Levee construction to protect these lands eliminated fish access to shallow overflow areas, and dredging operations to construct levees eliminated tule bed habitat along the river channels. Since the 1850s, 700,000 acres of overflow and seasonally inundated land in the Delta have been converted to agriculture or urban uses. Many of the remaining stream sections have been dredged or channelized to improve navigation, increase stream conveyance during periods of flood, and facilitate water export.

Upstream water development, depletion of natural flows and the export of water from the Delta have changed seasonal patterns of inflow, reduced annual outflow and muted the natural variability of flows into and through the Delta. Facilities constructed to support water diversions cause straying or direct losses of fish (e.g. unscreened diversions) and increased unnatural predation. Entrainment and diversion of substantial quantities of food web organisms, eggs, larvae and young fish further exacerbate the impacts from overall habitat decline.

Habitat alteration and water diversions are not the only factors that have caused ecosystem problems. Water quality degradation caused by pollutants and increased concentrations of substances such as selenium may also have contributed to the overall decline in the health and productivity of the Delta. In addition, undesirable introduced species compete for available space and food supplies, sometimes to the detriment of native or economically important introduced species.

PHASE I PROGRAM DEVELOPMENT

In October 1995 the Bay-Delta Program established a geographic scope for the problem area and the solution area to be considered. The problem scope called for resolution of problems that exist within the legally defined Delta, Suisun Bay (extending to the Carquinez Strait) and Suisun Marsh, or are closely linked to this area. Because the Bay-Delta is part of a larger water and biological resource system, a much broader solution scope was defined, including at least the Central Valley watershed, the Southern California water system service area, and the portions of the Pacific Ocean out to the Farallon Islands. This broader solution area is necessary because many problems related to the Bay-Delta are caused by factors outside the Bay-Delta or can best be addressed with solutions outside the Bay-Delta. The solution area of the Ecosystem Restoration Program is smaller and a subset of the solution scope identified for CALFED. This area includes the watershed of the Central Valley Basin and the San Francisco Bay as well as the near shore area of the Pacific Ocean. The Program's geographic scope of problem and solution areas are shown below.



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During Phase I of the Program ecosystem problems in the Bay-Delta were identified. Based on these problems, a set of ecosystem objectives were identified and adopted. The Program's overall goal for ecosystem quality is to:

- Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species.

To achieve this goal there are three primary ecosystem quality objectives:

- Improve and Increase Aquatic Habitats so that they can support the sustainable production and survival of native and other desirable estuarine and anadromous fish in the estuary.

- Improve and Increase Important Wetland Habitats so that they can support the sustainable production and survival.

- Increase population health and population size of Delta species to levels that assure sustained survival.

Subordinate to these primary objectives are 18 secondary objectives and additional sub-objectives.

The objectives adopted in Phase I formed the foundation for the Ecosystem Restoration Program Plan and helped to guide subsequent program refinement. During Phase II additional detail was added to these objectives in the form of *implementation objectives*, as described below.

PRELIMINARY ECOSYSTEM VISION AND STRATEGY

One of the first tasks in Phase II of the Program was component refinement. In consultation with the BDAC Ecosystem Restoration Work Group, the Program developed a preliminary vision of a restored ecosystem and a strategy for achieving the vision. The vision is the picture of what the Bay-Delta ecosystem should look like and how it should function when it is restored and the problems are resolved:

> CALFED is working to achieve a healthy Bay-Delta ecosystem that provides for the needs of plants, animals, and people using the system. This healthy ecosystem will include a range of sustainable habitat types that provide environmental, recreational, and aesthetic benefits. It will support natural production of an abundance of resident and anadromous fish, including viable recreational and commercial fisheries. The restored ecosystem will also support sustainable production and survival of plant and wildlife species, including resident species as well as migrants such as the waterfowl that use the Pacific Flyway each winter.

If these populations of fish, wildlife, and plants are to be sustainable, their ecosystem must promote certain natural processes, also known as ecosystem functions. *(An ecosystem function is a process in an ecosystem that determines the ecosystem's ability to provide a corresponding benefit to the fish, wildlife, and plants. For example, one important ecosystem function is the ability of a river to mobilize, transport, sort, and clean fish spawning gravels.)* Though the Bay-Delta system will never be returned to the conditions that existed prior to human disturbance, ecosystem functions can be restored to levels needed to support Bay-Delta species at natural sustainable levels where they will not be threatened or endangered with extinction.

The Bay-Delta ecosystem, when restored, will include all the habitats necessary for survival of species that use the system including freshwater and brackish tidal marsh, shallow water, riparian woodlands, and shaded riverine areas. These habitats will be large enough in area to support the species, and will be interconnected to allow movement and prevent isolation of plant or animal populations. To the extent possible, natural processes of the system will be restored, including proper water flow to ensure appropriate salinity levels, meander belts that create necessary habitat while also generating sediments that are important to the system, and nutrients that support the food web of the system. Human pursuits that affect the Bay-Delta ecosystem need to be managed to complement ecosystem health, maintain water that is free of toxic contaminants, and encourage land uses that are compatible with wildlife.

The strategy is how the Ecosystem Restoration Program Plan will accomplish the vision:

The Program's strategy is to reverse the decline in ecosystem health by reducing or eliminating factors which degrade habitat, impair ecological functions, or reduce the population size or health of species. The Program will focus on those factors that cause direct mortality of plants and animals in the system, or cause indirect mortality by degrading habitat conditions or functions.

The strategy consists of seven parts:

1. Stressors and Limiting Factors When there is a single factor limiting an ecological function or species, remedial actions are often clear. However, there are many factors that reduce ecological functions or cause mortality of species in combination or at different stages in the species life cycle. Often the processes are complex and are not yet well understood. In the Bay-Delta system, some of these stressors include inadequate physical habitat for reproduction, foraging, or escaping from predators; inadequate water quality including temperature and toxic contaminants; fragmented habitat that impedes migration; inadequate or altered water flow regimes; direct and indirect mortality caused by water diversions from the system; the presence of undesirable introduced species that compete with or prey upon other species; recreational and commercial harvest; and/or even such factors as recreational boating. In cases where there are multiple factors

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affecting species, the strategy of the Program is to take a broad ecosystem approach, making incremental improvements in all the significant identified stressors that affect important species and their habitats.

The Program will start by addressing stressors which the fishery and wildlife biologists believe are limiting species of special concern such as winter and spring run chinook salmon, delta smelt, and Sacramento splittail. Subsequent efforts will work to protect or restore other ecosystem functions.

2. Natural Processes With stressors as the focus of the program, there will be need to select actions that favor those factors that take advantage of natural processes to achieve desired results. This will reduce the amount of effort necessary to sustain restoration benefits, and increase the likelihood of long-term success of the program.

3. Resilience Actions will be prioritized by their ability to restore some of the system's natural resilience to disturbance. Habitat restoration will be directed toward natural processes such as river meander belts that are self sustaining. Actions will also be spread throughout the system, to ensure genetic diversity will be protected for species with widespread distributions.

4. Multiple Benefits Efforts will be made to increase benefits by selecting or designing actions that improve habitat conditions or ecological functions for multiple species. Actions will also be favored if they improve other resource areas including water quality, system integrity, and water supply reliability as well as improving ecosystem quality.

5. Measurable Results Program results will be measured through monitoring and research. Actions will first be designed and implemented so that their effectiveness is measurable. The Program will include monitoring to assess the overall success of actions implemented. This will allow adaptive management of the restoration effort: adjustment of actions to make them more effective, and changes in emphasis as the condition of the ecosystem improves.

6. Adaptive Management Where uncertainty exists as to how to implement actions or on potential benefits, adaptive management will guide the program. Actions will be implemented first on a pilot scale and then refined if needed as more is learned on their successes. The Program will adjust as necessary to achieve objectives. In many cases natural variability in the ecosystem will also force Program adjustments as the biologists learn more about the system.

7. Overcoming Unavoidable Losses Where competing uses of Bay-Delta resources make it impossible to avoid indirect effects on species, habitats, or ecological functions, efforts will be made to compensate by reducing other causes of mortality or improving habitats and functions elsewhere in the Bay-Delta system.

ECOSYSTEM RESTORATION PROGRAM PLAN

The Ecosystem Restoration Program Plan (ERPP) is a comprehensive, landscape level plan for restoration and management of the Bay-Delta ecosystem. A draft of the plan is being prepared as the foundation for defining the proposed ecosystem restoration program. There are five basic tasks to developing the ERPP:

- Definition of the ecosystem elements (processes, functions, habitats, stressors, and species).
- Development of implementation objectives and targets for restoration for each ecosystem element.
- Development of restoration actions and implementation levels to meet objectives and targets.
- Development of visions of what improvements in ecosystem health we hope to accomplish with the restoration program for ecosystem elements.
- Development of an implementation strategy for the program.

The basic features of the ERPP are *implementation objectives*, *targets*, *actions*, and *visions* for ecosystem elements. These terms are described below.

Ecosystem Element. An ecosystem element is a basic component or function which, when combined with other ecosystem elements make up an ecological process. The sum of the ecological processes is the ecosystem. An ecosystem element can be categorized as a function, stressor, habitat, or species or species group.

Implementation Objective. An implementation objective is the most specific and detailed description of what the program will strive to maintain or achieve for an ecosystem element. Implementation objectives are not intended to change over the life of the program.

Target. A target is a qualitative and quantitative statement of an implementation objective. Targets are something to strive for but may change over the life of the program with new information and progress. Targets may also vary with storage and conveyance alternatives. Targets can be set for the level of process or function to be achieved, the amount a stressor is to be reduced, the amount of specific habitat to be restored or the abundance or distribution of a species. Targets are typically oriented readily toward actions and can be measured to assess whether they are successfully achieved. Targets may include a range of values or a narrative description of the proposed future value of an ecosystem element. Targets are to be set based upon realistic expectations, must be balanced against other resource needs and must be reasonable, affordable, cost effective, and practicably achievable.

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Action. An action represents a physical, operational, legal, or institutional change intended to maintain or achieve a desirable function or condition (target) of the Bay-Delta system.

Vision. A vision is what the ERPP hopes to accomplish with the stated objectives, targets, and actions for a process, function, stressor, habitat, species or species group, or geographical unit. The visions are essential to the ERPP for two principal reasons. First, the Bay-Delta ecosystem--like any ecosystem--is extremely complex. The visions provide extensive technical background to increase understanding of the ecosystem and its elements. The visions then provide detailed descriptions of the ecosystem and its elements as they will look and function after restoration is accomplished.

Second, there are different perspectives for viewing the ecosystem depending upon one's particular interests. Some people may be most concerned about a particular region or part of the ecosystem, others may be interested in a specific habitat type throughout the ecosystem, while still others are most concerned with a particular species. The visions accommodate different perspectives and provide information on the ERPP based on these perspectives.

The primary focus of the ERPP is protection, enhancement, and restoration efforts organized by geographic areas called ecological zones. The plan is organized around 14 ecological zones tributary to the Bay-Delta system. The zones that compose the focused study area for the ecosystem restoration planning effort are the areas where actions would most likely result in a improvement in ecosystem health. They are areas where most of the direct impacts to ecosystem functions and processes have occurred and where species dependent on the Bay-Delta system spend an important part of their life cycles.

There may also be opportunities to develop solutions outside of the focused study area, but still within the solution area. An example would be watershed improvements above dams. Water shed management could restore a more natural flow regime or improve water quality; therefore, the figures include a delineation of the water shed boundaries as part of the solution areas.

In addition, the plan's information including vision statements are organized by habitat type, by species, and by the factors that limit population size or health for those readers wanting to find that specific information. In total, the plan contains 84 specific vision statements covering over 800 pages of information.

PRELIMINARY IMPLEMENTATION OBJECTIVES AND TARGETS

For each ecological zone and ecosystem element, the ERPP includes implementation objectives and targets for restoration. These, in turn, form the basis for proposed restoration actions and implementation levels to meet objectives and targets. The objectives and targets presented in the ERPP represent the broad views of many technical experts, but may not yet meet the two primary criteria stated by CALFED: 1) that objectives be acceptable to all stakeholders and fixed for the

program, and 2) that targets need to be reasonable and practical and can be accomplished through the planned adaptive management process of the ERPP. Implementation objectives and targets will be refined so that they meet these criteria before inclusion in the final ERPP.

ACTIONS AND IMPLEMENTATION LEVELS

In summary form, the plan includes the following broad restoration ranges of actions combined for all 14 ecological zones:

- 75,000 to 120,000 acres of freshwater and brackish tidal marsh and shallow water habitat.
- 100 to 200 miles of riparian woodland and shaded riverine areas.
- 300,000 to 500,000 acre-feet of increased critical period flows to restore physical processes and ecological functions. The proposed flows in each ecological zone will be developed through a variety of means including reoperation of existing reservoirs, new storage, conjunctive management, and water transfers. A portion may be able to be recaptured for other uses.
- 40 to 100 tons of gravel replacement annually to enhance spawning.
- Provide new or improved fish screens at selected diversions totaling 4000 to 8000 cubic feet per second capacity.
- Development of floodways on the San Joaquin and Cosumnes Rivers.
- Provide improved fish passage through new fish ladders or removal of barriers that limit access to habitat.
- Management of undesirable introduced species that interfere with native or economically important species.
- Management of water quality that degrades ecosystem health.

AN EXAMPLE ECOLOGICAL ZONE

One of the fourteen ecological zones included in the ERPP is the Sacramento River Ecological Zone. It is a long narrow zone encompassing the Sacramento River and its active floodplain from Keswick Dam downstream for 242 miles to the American River at Sacramento. Following is an abbreviated overview of the vision for this ecological zone.

The CALFED vision for the Sacramento River Ecological Zone includes restoration of its important fish, wildlife, and plant communities to a condition of health, as defined by physical processes, ecological functions, and habitat and population parameters. Health will be attained when the status of these resources contributes measurably to the recovery of the Sacramento-San Joaquin Delta ecosystem. CALFED will realize this vision by protecting, restoring, or reactivating important physical and ecological processes and functions which create and maintain habitats for the plant, wildlife, and fish communities along and in the Sacramento River. CALFED's vision

strongly focuses on restoration of the Sacramento River winter-run chinook salmon and protecting juveniles of all chinook salmon stocks, steelhead, and other anadromous fish as they rear and migrate downstream. CALFED's vision in protecting and increasing the survival of juvenile salmonids will emphasize the maintenance and restoration of a healthy riparian zone between Keswick Dam and Sacramento. This includes the preservation and restoration of functioning river ecosystems which will ensure adequate levels of shaded riverine aquatic habitats, woody debris, and biologically productive gravel beds for spawning and invertebrate production. It also includes the creation of a mosaic of complex aquatic habitats in the Sacramento River below Verona to provide escape cover. The vision also anticipates reducing the input of heavy metals and other contaminants and the installation of positive barrier fish screens on water diversions.

Within this ecological zones are primary and secondary processes, stressors, and habitat resources that are described in the ERPP. An important primary physical process in this zone is stream flow, including a hydrograph that periodically inundates floodplains, transports and redeposits gravel, creates new substrate for riparian forest, and so forth. An important secondary ecosystem process is stream meander, which allows the natural recruitment of sediments, the creation of new habitat, and natural riparian succession. Another secondary process is gravel recruitment which provides spawning substrate, maintains stream channel gradients, and dissipates stream energy to prevent deep scour. An important stressor in this zone is water management, which can result in entrainment of juvenile fish into water diversions. Another stressor is gravel mining, which reduces the natural process of gravel recruitment to the river. Additional stressors include harvest of fish and wildlife, predation and competition, and artificial production of fish which can reduce genetic diversity or result in genetic mixing of distinct salmon stocks. An important habitat type in the Sacramento river Ecological Zone is shaded riverine aquatic habitat. This habitat type provides shade, food, and cover to support juvenile salmon rearing, provides spawning substrate for other fish such as Sacramento splittail, and provides refuge for juvenile fish during periods of high water.

For each stressor and each deficient physical process and habitat resource the ERPP includes one or more implementation objectives, targets, and programmatic actions. For example, the following implementation objective, target, and actions are included for artificial fish production:

Implementation Objective: Protect and restore the genetic diversity of naturally producing populations of salmon and steelhead in the Sacramento River in order to sustain long-term viability of the populations.

Target 1: Minimize the likelihood that hatchery reared salmon and steelhead in the upper Sacramento River will stray into non-natal streams in order to protect naturally produced salmon and steelhead.

Programmatic Action 1a: Limit stocking of hatchery reared salmon and steelhead in upper Sacramento River. Stocking may be reduced in years when natural production is high in selected populations. Some stocking of hatchery reared fish may be necessary in the short-term to rebuild

naturally spawning populations; however, there is a lack of consensus among agencies and stakeholders as to the degree of stocking that is detrimental or necessary to sustain sport and commercial fisheries. This action will necessarily be conducted on a short-term and experimental basis with subsequent efforts dependent on results and effectiveness.

Target 2: Limit hatchery stocking to populations that cannot be sustained through natural production.

Programmatic Action 2a: Augment winter-run, spring-run, and late-fall run chinook salmon and steelhead with hatchery produced smolts during the short-term rebuilding phase of restoration efforts and only when alternative measures are deemed insufficient to provide recovery of the populations. Stocking of hatchery reared fish will be undertaken as experiments and adjusted or terminated as necessary depending on results.

Target 3: Employ methods to limit straying and loss of genetic integrity of wild and hatchery supported stocks.

Programmatic Action 3a: Rear hatchery salmon and steelhead in hatcheries on natal streams to limit straying. If hatchery augmentation of Sacramento River populations of salmon and steelhead is necessary, then hatcheries should be built on the Sacramento River for that purpose.

Programmatic Action 3b: Limit stocking of salmon and steelhead fry and smolts to natal watersheds to minimize straying that may compromise the genetic integrity of naturally producing populations.

Target 4: Minimize further threats of hatchery fish contaminating "wild" stocks of salmon and steelhead.

Programmatic Action 4a: Where hatchery production is underway and continues, methods should be adopted and improved for the selection of an appropriate cross-section of the adult population for spawners for the hatchery.

Programmatic Action 4b: Select adult spawners of appropriate genetic makeup to minimize genetic contamination of existing hatchery and naturally producing stocks of salmon and steelhead. Given the present difficulty of determining genetic makeup of spawners selected for hatcheries, this action will necessarily be of an experimental nature. Hatchery reared adults may be preferentially selected or not selected if they are adequately marked or tagged, or have other identifiable feature. Other methods may be developed to genetically categorize naturally produced or hatchery fish.

Rationale: *In watersheds like the Sacramento River where dams and habitat degradation have limited natural spawning, some hatchery supplementation may be necessary to sustain fishery harvest at former levels and to maintain a wild or natural spawning population during adverse*

conditions such as droughts. However, hatchery augmentation should be limited in extent and to levels that do not inhibit recovery and maintenance of wild populations. Hatchery reared salmon and steelhead may directly compete with and prey on wild salmon and steelhead.

Straying of adult hatchery fish into non-natal watersheds may also threaten the genetics of wild stocks. Hatchery fish may also threaten the genetic makeup of stocks in natal rivers. There is presently a lack of consensus among agencies and stakeholders as to the scientific foundation and the effects of stocking hatchery reared fish on wild populations. There is some general scientific information and theory from other river systems that indicates hatchery supplementation may limit recovery and long-term maintenance of naturally producing populations of salmon and steelhead. Further research and experimentation are necessary to determine the degree to which this issue is addressed.

The ERPP also includes vision discussions for primary physical processes, secondary ecosystem functions and processes, habitat types, and for some prominent species or species groups. These supplement, reinforce, and overlap with the visions for the ecological zones.

PLANNING FOR IMPLEMENTATION

As the ERPP is implemented, several management activities must occur to ensure that the program is implemented efficiently, economically, and successfully. These include phasing, monitoring of actions and indicators, focused research, and adaptive management.

Implementation of the full range of actions and achievement of all of the objectives proposed in the ERPP will require as many as thirty years. A schedule or *phasing* plan will guide implementation over that time span. During each time unit of the phasing plan, CALFED will address factors which cause direct mortality to species of special concern, constraints on ecological processes and functions and pilot programs which advance our understanding of the ecosystem and effective means to restore its vitality.

The budget, mandates of complementary restoration programs, progress toward resolution of the other CALFED problem areas and the vagaries of nature will affect the schedule. The results of monitoring and the data provided by indicators will cause changes in both the focus and magnitude of implementation targets.

A comprehensive list of environmental indicators is being prepared. These indicators will be used to measure progress toward ecosystem restoration and to inform and engage the public in achieving the restoration objectives. These gauges of ecosystem health will be data driven. A *monitoring* program is being refined from the existing efforts of the Interagency Ecological Program and the Comprehensive Assessment and Monitoring Program of the Central Valley Project Improvement Act. Where these existing programs leave gaps in data needed to carry out the CALFED Bay-Delta Program, we will facilitate inclusion of the appropriate element. The

primary function of the monitoring program will be to measure and report the levels of the various indicators so that progress toward the desired levels of ecosystem health is disclosed.

The Bay-Delta ecosystem is one of the most heavily studied systems in the world. For one-third of a century researchers from agencies, universities and the consultant community have been studying various problems of the Bay-Delta system. Unfortunately, much of the work has been focused on species which presented a special concern or projects which required mitigation. The source of funds often drives the area of investigation. In the Bay-Delta, those projects which may be the cause of perturbation or impacts and thus may require mitigation for their specific impacts have been the largest source of funds and the focus of study. CALFED acknowledges the constraint on our knowledge and will develop a *focused research program* designed to fill gaps in our knowledge. A major area of study will investigation ecosystem processes and functions and how species interact with and vitalize habitats.

Adaptive management has been suggested as an approach to Bay-Delta ecosystem management because of the difficulties and uncertainties associated with changing social, economic and ecological information. Adaptive management is the process of incorporating information that is acquired from the actions undertaken in this program in an iterative manner to improve ongoing management decisions concerning targets and actions. It is essentially learning from our actions and utilizing that knowledge to improve the program. This process helps to minimize risks and provides flexibility in the program to respond to the current situation. It also requires an active evaluation program, and can provide a measurement of the success of an action and possibly a means to compare benefits of several actions.

Some potential uncertainties that might occur in the project area that require such a management approach include changes in land use, increased water demands, demographics, economy, social values, weather, rainfall, global warming, and further invasions of exotic species.

COORDINATION WITH OTHER PROGRAMS

Restoration of Bay-Delta ecosystem health is already occurring. There are many programs currently focusing on specific aspects of the ecosystem. Many of these programs are already funded, which will reduce additional expenditures necessary to implement the ERPP. The CALFED restoration program will be coordinated with other long-term restoration programs in the Central Valley such as the federal Central Valley Project Improvement Act (PL102-575) and the state's Upper Sacramento River Fisheries And Riparian Habitat Management Plan (SB 1086).

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