EPA

GENERAL COMMENTS

1. Terminology

We had difficulty interpreting and using the terms "implementation objective" and "target" as we understood the definitions and examples in the Draft.[2] In many cases, the implementation objectives and targets provided in the Draft seemed not to respect the definitions. We have attempted to clarify our understanding of the logic of objectives, targets, and actions below, and have tried to adhere to these meanings in our comments. Overall, the Draft needs significant revision of objectives and targets for consistency and comprehensiveness.

Implementation objectives

An implementation objective should take the form of an introductory statement of intent with respect to protection, restoration, or enhancement of ecosystem elements needed to maintain health in the Bay-Delta system. Ultimately, the implementation objective establishes the "ecosystem purpose" for an action or series of actions which lead to specified desired conditions, or "targets." For example "Restore delta smelt abundances to levels that represent recovery by ...[target 1] [target 2] etc.

In general, an objective does not need to include quantitative measures but should identify appropriate indicators and levels of those indicators that would signal success. Thus, an objective might be to restore a fishery to the level of the 1960's with a recognition that indicators about catch per unit effort (CPUE), body burdens of mercury, and other indicators will all bear on the achievement of the objective. Where a member agency's plan has adopted numeric goals in terms of the size of the population, habitat, and so forth, CALFED should reflect these goals in the operational objectives. The CALFED Program should also recognize that, as ecosystem restoration is implemented, there may be opportunities to exceed objectives based on these goals.

Indicators

Indicators are the measurable aspects of implementation objectives. Each implementation objective must have at least one indicator that reflects its status and which can be expected to respond to changes at the level aimed at by CALFED actions. For example, a healthy striped bass

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[2] An implementation objective is the most specific Program-level statement in the hierarchy of goals and objectives for the Program (see page 4 "Implementation Objectives and Targets"). These objectives would not change "over the life of the program." A target is characterized as a measurable statement, based on observable outcomes or levels of effort, relating to the implementation objective.

fishery of at least 2.5 million striped bass might have indicators associated with it derived from DFG's mark-recapture program, CPUE measures from party boats, and laboratory measures of mercury exposure through striped bass consumption. Endangered species will likely have indicators associated with distribution as well as abundance.

Targets

Numeric or qualitative targets should describe desired effects of CALFED-sponsored activities. Transformation of degraded habitat to higher value habitat in order to assist in restoration of a particular endangered species, waterfowl population, etc., would be examples of targets. The targets should form the basis of the requests for proposals that CALFED expects to issue and guide changes in activity by the member CALFED agencies and other entities participating in the Program. To the extent that our understanding allows, targets should comprehensively identify the changes needed to achieve an objective. Where more than one target is specified to meet an objective, a suite of targets should be adequate to meet the objective; if a single target is identified, that target should be set at a level adequate to meet the goal. As stated earlier, for any given implementation objective, several targets representing phased levels of achievement may be appropriate. It is understood that, whereas the implementation objectives are intended to be statements which would not change over the life of the Program, targets may be adjusted based on experience gained through adaptive management, changed circumstances, and so forth.

2. Full range of objectives and targets

The Program's overall ecosystem goals embrace protection, enhancement, and restoration. The objectives and targets should provide similar range, recognizing, for example, need for protection of important ecosystem elements which may be at risk. However, the discussion of ecosystem elements in Table 3 and the implementation objectives in subsequent tables rarely identify those aspects needing protection. For example, protection of functions which depend on peak flows during times when unimpaired flows peak (e.g. support of habitats and species populations) must be included in the objectives. Additionally, interannual and monthly variability of conditions, such as flows upstream and into the Bay-Delta, is an important naturally occurring condition which has been overlooked in the ERPP.

We also recommend adding ecosystem implementation objectives which characterize needed interrelationships of elements on a subregional or landscape level. For example, we recommend the following:

> "Integrate large-scale preservation and restoration of habitat mosaics (e.g., vernal pools, grasslands, oak woodlands, and riparian corridors) and foster their connectivity to increase site defensibility and to conserve migratory routes and genetic exchange." *(Note: Generally, the larger a site, the better its "defensibility." Other things being equal, a*

larger site is likely to be more intact biologically and less vulnerable overall to the environmental intrusions of human activities, such as urban runoff, pesticide drift, waste dumping, and exotic species. Also, a larger site often affords more cost-effective and flexible management options.)

3. Related programs

The list of programs provided in the Introduction to Targets, "Developing the ... Plan" (p. 12) should include the San Francisco Bay Area Wetlands Ecosystem Goals Project, which is an outgrowth of the San Francisco Estuary Project and is supported by a wide range of agencies and non-governmental groups. By spring of 1997 the Project hopes to release quantified protection and restoration goals for "baylands" within a geographic area extending from Suisun Marsh/Bay in the east to San Pablo Bay and the Bay to the south . (Baylands include mudflats, existing tidal marsh, tidal marsh channels, and seasonal and other wetlands within diked historical tidal marshlands.) As EPA is helping to lead this effort, we would like to assist coordinating the Project with the CALFED Program.

4. Land use

The following comments concern implementation objectives and targets primarily associated with the "land use." While the discussion of "land use" in Table 5, page 25 identifies urban and industrial development as activities that may harm the ecosystem (that is, may be stressors), the subsequent implementation objectives and targets associated with land use in Table 10, page 49 do not adequately address these activities.

The Bay/Delta estuary region continues to be one of the most popular and rapidly developing areas in the United States. Pressure for expansion is being applied particularly to areas outlying existing urban centers. This population growth and the corresponding changes in land uses could have detrimental effects on the estuarine ecology. The most notable impacts could be the increased discharge of pollutants, and the continued alteration of critical habitats such as wetlands and riparian corridors (The Effects of Land Use Change and Intensification on the San Francisco Estuary, SFEP 1992).

Over 10 million people now live on the lands that drain into the Delta and the Bay. By 2005 this number is expected to increase to 12 million. San Joaquin, Solano, and Sacramento counties are expected to experience among the greatest amount of growth. Urban land within the Central Valley is projected to increase by about 450 square miles during this same time period. These changes will likely reduce the acreage of valuable farmland, while altering wetlands and riparian areas, and increasing pollutant loadings to the estuary (State of the Estuary, SFEP June 1992) .

In California, local government has the primary authority to regulate land use, and therefore

possesses the capacity to minimize impacts associated with land use change. State law provides the authority for local land use decisions, and establishes the framework for those decisions. Each city and county must prepare a comprehensive General Plan containing state-specified elements oriented toward meeting local goals and needs. All local ordinances, development plans, and activities are required to be consistent with that plan. Clearly, current land use planning laws provide an excellent framework that could be more fully utilized to help protect estuarine resources in a manner that is consistent with the primary goals and objectives of the CALFED program.

CALFED should promote land use management arrangements that maintain local control but increase consistency with federal and state estuary protection efforts. It is important that we recognize and encourage better coordination and integration of various governmental functions to maintain sustainable ecosystems within an increasingly urbanized environment. Such an approach would reflect a more equitable balance of responsibility among urban and agricultural uses, will enhance efforts to streamline regulatory programs, and will address current interest in watershed management that reflects a growing consensus that existing water quality problems can be most effectively addressed by a more integrated, comprehensive, community-based environmental protection approach.

COMMENTS ON TABLES

1. Table 3: Basis for selection of primary physical process ecosystem elements

Hydrograph

At the end of the paragraph, we suggest adding: "It is also important to identify and preserve those aspects of the current hydrograph which are providing necessary support for fisheries and ecosystem functions and helping emulate the natural hydrograph."

2. Table 8: Primary Physical Processes Implementation Objectives and Targets

Note: Unless otherwise stated, comments on Tables 8-12 provide only suggested changes or additions to the Draft document. We do not claim that these targets and objectives are comprehensive; they are intended to be illustrative of approaches we consider necessary and appropriate. Other objectives and targets in the Draft should be revised as needed to conform to our general comments, such as considering several target levels (recovery versus restoration, for example).

Hydrograph

Implementation objective *(modify current wording)*:

A. Restore ~~some of the~~ basic features of the hydrograph by shifting flows seasonally and across years to better represent natural flow patterns. Sediment loads and channel morphometry will need to be considered in the effects of hydrograph structure and ecosystem response.

A1. Restore those features of the hydrograph that do not support ecological processes at desired levels.

Targets: *revise Draft targets 1, 2; add 3-6*

1. More closely emulate the pattern of the natural hydrograph in tributaries that have existing large storage reservoirs in most year types ~~(with the exception of critical drought years)~~ by providing initial fall pulses and natural late-winter or spring flow pulses for anadromous fish attraction and transport, flows necessary for riparian vegetation succession, channel maintenance, and nutrient transport. (Note: The targets here should be used to develop to ecosystem protection recommendations for the storage and conveyance component, and should include prescriptions for enhancing dry period fish flows and interannual variation of flows.)

2. In tributaries with little or no storage capacity, ~~the natural hydrograph exists but~~ manage storage and diversions to improve the hydrograph. (Note: Since diversions and return flows can substantially alter flow patterns, it is incorrect to presume that the natural hydrograph exists.)

3. Improve sediment transport downstream in the lower San Joaquin River into the delta.

4. Protect or better reflect historical variability in springtime flow patterns, particularly during extended periods of controlled conditions.

5. Restore an initial high pulse flow on appropriate tributaries to improve attraction of anadromous fish to the better spawning sites. (This target should be linked to targets for salmon, steelhead, and American shad).

6. Manage diversions to minimize impacts on ecological functions of the hydrograph.

Natural hydraulic regime

Implementation objective: *rewrite A*

A. Improve approximation of natural hydrodynamics in order to restore ecological functions of variable streamflows.

Target: *add*

3. Operate barriers on natural waterways to disruptions of unaltered flow patterns at ecologically important times.

4. Provide operable barriers on artificial waterways so that flows through natural waterways can be emphasized when needed.

Geomorphology

Rewrite target 2 under implementation objective A to emphasize natural processes:

2. Consistent with flood control requirements, modify cross sections and channel configurations in mainstem rivers, tributary streams and the Bay-Delta to provide a more natural, self-sustaining configuration. Reliance on "bio-engineering" methods to shape and stabilize channels should be emphasized wherever possible.

Tides

From the standpoint of actions that could be taken, Implementation Objective B, Target 1 ("restore net downstream flow in the south and central Delta") relates more to hydraulics and natural freshwater flow patterns than tides and should at least be cross-referenced to sections on these processes.

3. Table 9: Secondary Ecosystem Processes and Functions

Current velocities

Implementation objective: *add*

B. Increase diversity of flow velocities in channels of the Bay/Delta to provide diversity of habitat for various species and life stages of aquatic organisms.

C. Improve sediment retention abilities in suitable areas by providing channel geometries that allow low velocities to occur at times of high, sediment-laden river flows.

Targets: *add*

1. Replace U-shaped channels with more natural slopes and sculpting of channel edges, particularly in areas used for refuge by young fish.

2. Construct inundatable areas where portions of the natural floodplain can be wetted during high flow periods. Ensure suitable drainage patterns to avoid stranding of aquatic organisms as inundation ends.

Nutrient inputs

Implementation objective: *add*

B. Protect nutrient sources to ensure that desirable future ecosystem processes remain unconstrained by nutrient concentrations.

Targets: *add*

1. Develop monitoring and adaptive management plans to ensure that nutrient inputs from upstream are in balance with needs of present, and planned, ecosystem production rates.

2. Protect (and enhance as needed) nutrient linkages between upland areas and waterways.

3. Protect (and enhance as needed) present balance of nutrient uptake and release rates among various components of the aquatic ecosystem.

Aquatic primary productivity

Implementation objective: *replace "A" with the following*

A. Maintain, enhance or restore aquatic primary productivity to permit desired level of abundance of ecosystem's higher products.

Targets: *Replace the Draft targets with the following*

1. Improve regulation of transport of introduced species.

2. Monitor condition and abundance of various trophic levels to identify where food limitation may be limiting ecosystem production. Develop an adaptive management plan to reduce food limitation to appropriate levels.

3. Construct physical habitats and manage flows to optimize primary productivity at times of likely impacts on higher trophic level abundance.

4. Manage flow and salinity in such fashion as to minimize impacts of undesirable species on ecosystem processes.

Aquatic secondary production

Implementation objectives: *replace "A" with the following*

A. Maintain, enhance or restore aquatic secondary productivity to permit desired level of abundance of ecosystem's higher products.

B. Ensure appropriate levels of mid-trophic levels to guard against population collapses due either to excessive or inadequate baseline abundances.

Targets: *replace Draft targets with the following*

1. Improve regulation of transport of introduced species.

2. Monitor condition and abundance of various trophic levels to identify where food limitation may be limiting ecosystem production. Develop an adaptive management plan to reduce food limitation to appropriate levels.

3. Construct physical habitats and manage flows to optimize secondary productivity at times of likely impacts on higher trophic level abundance.

4. Manage flow and salinity in such fashion as to minimize impacts of undesirable species on ecosystem processes.

4. Table 10: Stressors

Land use

Implementation objectives: *add*

E. Promote development patterns that protect wetlands, riparian corridors, and prime agricultural lands, and minimize pollutants in runoff.

Targets: *add*

1. Encourage local governments to adopt land use policies and regulations which protect Bay-Delta resources, including locating and configuring new development to protect these resources. Direct urban growth away from resource protection areas, such as wetlands, streams, prime agricultural lands, and wildlife corridors.

2. Undertake local watershed planning to implement land use practices which are geographically targeted, cost effective, and locally tailored.

3. Encourage implementation of Best Management Practices through improved education, incentives and financial assistance.

F. Promote forest management practices that are consistent with maintaining high-quality habitat conditions and control watershed erosion.

Exotic species

Implementation objective A ("reduce populations of harmful introduced plants") and related targets would apply to removal and control of Arundo donax. With respect to Arundo (and perhaps other invasive plants as well), target #3, as worded, could lead to ineffective Arundo removal and control. In areas targeted for Arundo reduction, effective action typically requires total removal and subsequent ongoing control. An overall target of 10% is not meaningful.

Contaminants

Minimizing contaminant loadings associated with existing and future urban development (nonpoint source pollution) should be identified as it is for agricultural activities. We suggest adding:

Implementation objective: *add*

B. Prevent toxic contaminants at the source, as a priority. Where this is not possible, control and reduce contaminants from entering the estuary.

Targets: *add*

1. Implement measures to reduce pollutants in runoff to the maximum extent practicable from commercial, residential, industrial and agricultural areas.

2. Implement measures to eliminate illicit connections and illegal discharges into storm drain systems.

3. Implement measures for operating and maintaining public highways and roads to reduce contaminants in runoff.

4. Implement measures to reduce pollutants in discharges associated with the application of pesticides, herbicides and fertilizers.

5. Table 11: Habitat Implementation Objectives and Targets

General observations:

A.. As stated earlier, the objectives should establish "purpose," while targets specify desired outcomes of actions. Quantities can be used as part of either objectives or targets. In this discussion about habitat objectives and targets we provide a series of principles that we believe should be included, suggestions for additional habitat categories, specific comments about certain habitat objectives, and an example (for riparian scrub, woodland, and forest) of the kinds and objectives and targets which would be useful for the ERPP. Our comments are illustrative, not comprehensive. Objectives for other habitat types should follow this model, as should objectives other ecosystem elements, such as species or guilds (Swainson's hawk, yellow-billed cuckoo, neotropical migrants, and so forth). Although these objectives are aimed at identifying a set of objectives and targets at a programmatic level, it is necessary to be as specific as possible about ecosystem functions and habitat needs. Integration of this information will provide a sound scientific basis for setting priorities and making decisions.

B. We agree that inclusion of specific, quantified or quantifiable, target outcomes (for example, acreage) is a useful and necessary part of the Ecosystem Restoration Program Plan. Quantified targets will provide specific guidance and reduce misunderstandings about the scope and extent of the restoration and protection effort. However, it is very difficult to comment on the numbers now included without knowledge of the rationale for choosing them. This rationale should be clearly linked to the implementation objectives, in that the objective should be formulated in a way which can be translated directly into targets. One example is: "Provide flows necessary for successful reproduction of striped bass." (Page 57, D)

Where other programs and plans have provided the basis for numerical targets, these sources should be documented. For example, we are uncertain as to the basis for acres of "tidal perennial aquatic" habitat in Suisun Bay and San Pablo Bay and believe that such targets should complement work being done by the Wetlands Goals Project.

The targets should also be clear regarding the uses of the terms "restore," "create," "enhance," and "maintain": What baseline resource conditions are assumed, and what levels of improvement are intended? Under what circumstances might creation of certain habitat types entail conversion from other types which have habitat value?

C. We suggest that the specified habitat quantities (e.g. acreage or stream or slough miles) should take into account the following:

(1) The historical mosaic of habitat types, especially aquatic habitat available to fish, and both historical and future loss rates. For example, floodplain habitat connected to the river and available as habitat for fish has been almost entirely lost. Seasonal wetlands which restore both fish habitat and habitat for wildlife should be a higher priority. Seasonal wetlands unavailable to fish and managed primarily for birds will not provide as high habitat value for those species more directly impacted by water development.

(2) The need to preserve or restore large contiguous areas with a diversity of habitat. Scattered smaller areas of habitat, for example narrow riparian bands, dead-end sloughs, and vernal pools, will be consistently threatened and provide poor habitat unless part of larger preserved or restored areas. Objectives should be included which identify the importance of protecting or restoring a mosaic of contiguous habitat types (for example, for species utilizing different habitats for different purposes, or as protection for smaller ecosystem elements). We recommend that these objectives give priority to restoration of large contiguous areas of diverse habitat.

(3) The results of the San Francisco Bay Area Wetlands Ecosystem Goals Project. The Wetlands Goals Project will be recommending restoration goals, integrating habitat needs for both flora and fauna, for all embayments of San Francisco Bay (including Suisun Bay). These recommendations will be available in the spring of 1997. Because this effort will be the result of a comprehensive information gathering and analysis process by a large group of knowledgeable scientists, we recommend that the CALFED program wait to assign specific acreage or mile values until the wetland goals project has made their recommendations.

(4) A range of targets associated with a range of future circumstances. Restoration of Delta islands and tidal shallows and mudflats will depend on constraints such as sediment supply, wave fetch, methods available to restore peat soils, ability to sustain current agricultural use, and depth below sea level. The program should gather as much information as possible on these factors, and use them to help set the targets. However, as more information becomes available, it is likely that targets may need to be changed. Therefore we recommend that assumptions for objectives and targets be clearly stated.

(5) Both short and long-term targets to meet objectives. The Program has the opportunity to implement activities which, if carried out over ten or more years, will result in major environmental benefits which cannot be achieved with shorter-term projects. For example, the smaller channel islands are vulnerable to continued loss, and while important to preserve in the short-term because they are the only tidal wetlands left in the Delta, should be incorporated into

larger restoration projects in the long-term so that the Program's resources will not be wasted. We recommend that targets be divided into short and long-term lists, and that the short-term targets help realize the longer-term objectives.

D. Riverine or stream habitats have only been included as shaded riverine aquatic. There are other aspects of natural stream and river habitat in the solution area which should be included, such as suitable flow conditions, spawning habitat, low-velocity stream habitat, and pool habitat. Since river and stream habitat varies substantially by size, it would be useful to partition the objectives by size of watercourse.

Because the habitat needs of many of the native resident fishes are not well understood, especially in managed streams and in competition with introduced species, a series of habitat objectives for this assemblage should be included, such as "protect and enhance current habitat supporting native stream fishes, and restore native stream fish populations by restoring habitat and reintroducing populations throughout the watershed."

Comments specific to the habitat types of Table 11:

Tidal perennial aquatic habitat

> Implementation objective A. Target 1: *Clarify* whether the action is to "create" or restore habitat.

Nontidal perennial aquatic habitat

> Implementation objectives regarding flows (as in D, striped bass) should be provided for other fish species as well. We have generally recommended aiming to provide flows based on the Anadromous Fisheries Restoration Plan. These objectives may be placed in the ecosystem element relating to fish species (Table 12) rather than this habitat category.

Dead-end sloughs

> Targets should concern more than giant garter snake: Add other ecosystem values.

Open-end sloughs

> Targets should concern more than giant garter snake: Add other ecosystem values.

Seasonal aquatic

> Implementation objective: *rewrite*

C. Protect the full range of variability of vernal pool ecosystems.

Note: The "range of variability" includes the vernal pool habitats that are the **richest** in the diversity and abundance of biota; and the **rarest** in terms of imperiled species, soil properties, wetland functions, or other characteristics related to "habitat type."

Scientific, planning and regulatory actions for vernal pool protection should be integrated in a manner consistent with the Framework Agreement for the Interagency Vernal Pool Stewardship Initiative (attached). We recommend several steps to improve planning for vernal pool protection:

Develop a unified scientific classification system for vernal pool habitats.

Conduct GAP analyses which inventory the types of vernal pool habitat that are formally protected, identify locations and describe management programs of the protected habitats, identify habitats threatened by existing and anticipated human activities (for example, land conversions), set priorities for conserving the full range of habitat variability.

One promising strategy for securing protection of vernal pool ecosystems is to establish replicate preserves (that is, pairing a preserve with at least one other which provides the same habitat, but is not subject to the same stresses and risks).

Shaded riverine aquatic

Implementation objective: *modify A*

A. Increase the length and coverage of stream channels bordered by riparian vegetation and reduce fragmentation of riparian corridors.

Riparian scrub, woodland and forest

Implementation objectives: *add.* Clarify the basis for Draft objectives A-C.

D. Provide fully diverse native riparian plant communities with a natural successional cycle.

Targets:

1. Manage hydrology or restore flows to provide flooding and channel movement

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essential to the natural plant successional cycle.

2. Control exotic species.

3. Protect and restore long reaches (at least ____ miles).

E. Provide corridors for fish and wildlife movement, especially at watercourse junctions.

Targets:

1. Protect and restore linked or adjacent habitats which provide refugia from human activities.

2. Reduce fragmentation of riparian habitat by restoring vegetation between patches.

3. Give high priority to restoring or protecting continuous high quality riparian habitats at watercourse junctions.

F. Support resident species and migrants dependent on riparian vegetation.

More specific implementation objectives related to "F" should be developed. For example:
F1. Provide for high salmon survival near stream and river banks.

Targets:

1. Protect and restore large woody debris near banks.

2. Protect and restore overhanging banks.

3. Provide temperature refugia with adequate shade and deep pools.

4. Provide conditions supporting abundant insects for forage.

6. Table 12: Species and Species Group Implementation Objectives and Targets

General comments:

A. The quantitative targets cited below for fish species are based in large part on species recovery plans. It is likely that a fully restored system should exceed the target levels specified in these

plans. However, it is not certain at this point what appropriate targets beyond recovery should be. In some cases we have also suggested indicators to measure attainment of an objective.

B. It would be useful to cross-reference species-specific issues, objectives, and targets with entries under other "ecosystem elements" (physical processes, habitats, stressors, etc.). In some cases we have indicated appropriate cross-referencing.

C. Implementation objectives and targets set the non-native resident species-- largemouth bass, striped bass, white catfish, threadfin shad, and American shad-- should be pursued only to the extent consistent with objectives for native species and habitat. In other words, priority should be given to measures needed for native species.

Salmon and steelhead

A. The objectives listed in the Draft are incomplete for these species. Declining or threatened populations indicate that existing habitat is not adequate to maintain self-sustaining populations. The level of restored habitat necessary for population maintenance in the short-term and restoration in the long-term is not indicated in the objectives. Better Delta conditions/habitat is particularly important to restoration of these populations.

B. Objectives identifying a specific or general level of increase in smolt survival rates, number of spawners, or natural production should be included and related directly to both Delta and upstream conditions. Specific objectives and targets can be found in recent California Department of Fish and Game (DFG) plans, the Central Valley Project Improvement Act Anadromous Fish Restoration Plan, and the Draft USFWS Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes.

C. In regards to targets, we believe that the target for a minimum spawning population of 200 is too low. The USFWS Recovery Plan for Sacramento-San Joaquin Delta Native Fishes identifies 500 as the minimum spring-run spawning population size for each tributary.

D. The cohort replacement rates as targets are confusing. A cohort replacement rate of 1.0 indicates no improvement, while greater than 1.0 should have a finite time associated with it, as well as either a specific rate or a final goal.

Delta smelt

Implementation objective: *rewrite*

A. Restore abundance and distribution to levels that represent recovery, as described in the Delta Native Fishes Recovery Plan of USFWS.

Targets:

1. Maintain or improve estuarine habitat of 1 - 6 ppt over a broad and varying geographic range.

2. Protect and improve transport flows for smelt larvae out of the delta (related issue under ecosystem processes).

3. Reduce toxic inputs into northern delta during times of delta smelt spawning (related issue under stressors).

4. Reduce entrainment of newly spawned smelt at agricultural and other water diversion structures (related issue under stressors).

5. Protect and develop shallow spawning and rearing habitat in the delta (related issue under habitat).

6. Protect and develop shallow rearing habitat in Suisun Bay (related issue under habitat).

7. Reduce impacts of inland silversides on newly spawned smelt larvae (related issue under stressors).

Indicators

September & October fall midwater trawl

Longfin smelt

Implementation objective: *rewrite*

A. Restore abundance and distribution to levels that represent recovery, as described in the Delta Native Fishes Recovery Plan of USFWS.

Targets:

1. Protect and develop shallow spawning and rearing habitat in the delta (related issue under habitat).

2. Protect and improve transport flows for smelt larvae out of the delta (related issue under ecosystem processes).

3. Protect and develop shallow rearing habitat in Suisun Bay (related issue under habitat).

4. Maintain or improve estuarine habitat of 1 - 6 ppt over a broad and varying geographic range (related issue under habitat and ecosystem processes).

Indicators

September & October fall midwater trawl.

Distribution of longfin smelt in San Francisco Bay as measured by DFG Bay Study.

Green sturgeon

Implementation objective: *rewrite*

A. Restore abundance and distribution to levels that represent recovery, as described in the Delta Native Fishes Recovery Plan of USFWS. A sustained population of green sturgeon of at least 1000 adults (> 1 m). Populations larger than that will allow better fishery harvest.

Targets:

1. Reduce number of green sturgeon accumulating in Clifton Court and develop program to transport those in Clifton Court to downstream sites (related issue under stressors).

2. Restrict harvest until population is determined to be self-sustaining. Limit harvest until population achieves desired level (related issue under stressors).

3. Reduce bycatch with white sturgeon through educational efforts of recovery needs.

4. Modify operations of Red Bluff Diversion Dam as necessary as knowledge of timing of green sturgeon spawning is better understood (related issue under stressors).

Indicators

Tagging program of DFG for adult abundance.

Flesh and egg concentrations of various contaminants.

Starry flounder

Implementation objective: *add.* Document the basis for Draft implementation objective A.

B. Achieve harvest rates in San Pablo Bay (CPUE and number of anglers) comparable to those of the 1960's and 1970's.

C. Reduce contaminant loads in bodies of adults harvested in fishery.

Targets:

1. Restoration of shallow freshwater inputs to San Pablo and Suisun Bay to attract and maintain newly settling starry flounder larvae. [related issue under habitats]

2. Protection of occasional high flow events to trigger immigration of larvae into estuary. [related issue under flood flows in ecosystem process]

White sturgeon

Implementation objectives: *add.* Document the basis for Draft objectives A and B.

C. Maintain a self-sustaining population and fishery in the estuary at levels similar to those of the 1960's.

D. Reduce contaminant loads in bodies of adults harvested in fishery.

Targets:

1. Evaluate use of stocking program as short-term tool to boost spawning stock size.

2. Reduce exposure of adults and young to benthic contaminants.

Sacramento splittail

Implementation objectives: *rewrite A and B.*

A. Restore abundance and distribution to levels that represent recovery, as described in the Delta Native Fishes Recovery Plan of USFWS.

B. Reduce contaminant loads in bodies of adults harvested in fishery.

Targets:

1. Improve abundance and access to suitable spawning areas in each year.

2. Reduce concentrations of contaminants in food organisms, including foraging over flooded fields prior to spawning.

3. Reduce entrainment of young splittail at diversion points in the delta.

Striped bass

Implementation objectives: *rewrite*

A. Restore adult population while supporting sport fishery at levels of 1960's.

B. Reduce contaminant loads in bodies of adults harvested in fishery.

Targets:

1. Protect and improve spawning salinity conditions in the lower San Joaquin River

2. Protect and improve transport flows for striped bass larvae out of the delta (related issue under ecosystem processes).

3. Protect and develop rearing habitat in Suisun Bay (related issue under habitat).

4. Maintain or improve estuarine habitat of 1 - 6 ppt over a broad and varying geographic range (related issue under habitat and ecosystem processes).

5. Maintain and improve concentrations of biocides and metals in spawning areas.

Largemouth bass

Implementation objectives: *rewrite*

A. Ensure that fishery characteristics of CPUE, angler hours, etc. are maintained at recent levels.

B. Reduce contaminant loads in bodies of adults harvested in fishery.

Targets:

1. Protect areas within delta that offer suitable habitat for largemouth bass.

2. Reduce concentrations of contaminants in environment and in food items.

White catfish

Implementation objective: *rewrite*

Reduce contaminant loads in bodies of adults harvested in fishery.

Targets:

1. Reduce concentrations of contaminants in environment and in food items.

2. Reduce entrainment of young fish at delta diversion sites.

3. Other targets to restore abundance await evaluation of factors limiting population

Threadfin shad

Implementation objective:

Maintain population consistent with forage needs of other desirable species with minimal impact on larvae of other desirable species.

Target:

No action needed at this time.

American shad

Implementation objective: *rewrite*

Ensure that fishery characteristics of CPUE, angler hours, etc. are maintained at recent levels.

Targets:

1. Protect shallow rearing areas near upstream spawning sites.

2. Manage reservoir releases to attract spawning adults toward most suitable spawning and rearing sites.

Other native resident fishes

Implementation objectives: *add*

B. Ensure sustainable populations of all native species of the estuary. In many cases this will entail improved distribution of the species so that the population is less at risk to local impacts.

C. For harvested native species, populations should be kept large enough to allow for harvest consistent with current CPUE and angler satisfaction, or better.

Targets

Protect habitats currently supporting the spawning and rearing of these species.

Where habitat availability limits the successful recruitment of these species to desired levels, appropriate habitats at appropriate times should be ensured.

Other non-native resident fishes

Implementation objectives: *rewrite*

A. Reduce impact of these, and other introduced species, on the implementation objectives of other species.

B. Species in this group that support a fishery should be managed for populations that will allow harvest consistent with the other implementation objectives.

Targets

Provide habitat diversity to allow greater escape by young fish from predation by members of this group.

Within the habitat mosaic of the ERPP, habitats necessary for the sport fishes in this group should be maintained at current levels.