Draft Goals and Objectives for Covered Fish Species

Note to Reviewers: *The BDCP consultants most recently provided preliminary covered fish species goals and objectives in July 2009. Those objectives are being refined and revised using the logic chain process, which has been informed by independent science review. The logic chain process is intended to inform plan development and implementation. It is not intended to identify regulatory requirements nor will every objective developed using the logic chain be incorporated into the BDCP conservation strategy. The objectives below reflect the current work in progress from the consultants. The level of detail for longfin smelt, for example, represents the level of detail the logic chain process will ultimately develop for other species. The objectives below do not represent a consensus position of the Steering Committee regarding the objectives of the BDCP.*

Ecosystem- and natural community-level goals and objectives, which were not addressed by the Logic Chain Group, are provided below the covered fish species goals and objectives and are included to provide context. These goals and objectives were derived from the July 2009 draft Conservation Strategy and the November 2010 Terrestrial Conservation Strategy, as applicable to aquatic resources.

Next Steps for Completing Goals and Objectives

The following outlines recommended steps for continuing and completing the development of objectives and metrics in accordance with the Logic Chain process as revised per input from the August 2010 Logic Chain independent review panel. These next steps are intended to build on the discussions and subsequent work products from the logic chain workshop held on October 26-27, 2010.

1. ***Complete Logic Chain Objective Worksheets*** *– convene additional technical workshops to complete specific species worksheets.*
    a. *Convene subteam for focused meetings to discuss and finalize the worksheets.*
    b. *Where existing information is insufficient to establish numeric targets, the subteams will identify specific study needs to develop such information, including a timeframe for conducting such.*
    c. *Where there is disagreement regarding an objective, or metric, the details of the disagreement will be documented for resolution at a policy level.*

    Timeframe: *To be done by end of January 2011.*

2. ***Revise Community Goals –****review and revise ecosystem and natural community goals as necessary to be consistent with the species objectives.*

    Timeframe: *To be done by end of January 2011.*

3. ***Review Proposed Conservation Measures in Light of Consensus Objectives*** *– once objectives have been agreed to, review existing conservation measures to identify gaps or refinements needed.*

Timeframe: *To be done by end of February 2011.*

4. ***Refine Proposed Metrics*** *– based on # 1,#2, #3 above, refine or revise the draft metrics proposed in section 3.6.*

   Timeframe: *To extent possible, refinements should be complet**e by the end** of February in order to allow inclusion in the complete draft plan. It has not been determined at this time the level of detail necessary prior to BDCP authorization/permitting and the additional refinements that could be developed after the plan has been authorized/permitted.*

5. ***Develop Recommendations for the Monitoring and Adaptive Management Program*** *– based on all of the above.*

   Timeframe*: Some changes may be recommended after February for inclusion in the draft plan in 2011, but it is also likely that additional refinements in both programs would be made after the BDCP authorization/permitting.*

COVERED FISH SPECIES GOALS AND OBJECTIVES

DELTA SMELT

[***Note to Reviewers:*** *Draft goals and objectives for delta smelt have not been discussed by the logic chain team and therefore are not included herein. Goals and objectives for delta smelt will be developed in accordance with the next steps noted above]*

LONGFIN SMELT

Stressor: Physical Spawning Habitat Loss and Modification

BDCP Objective: *Increase extent and availability of quality longfin smelt physical spawning habitat*

Relation to Global Objectives: Increasing the extent/availability and quality of spawning habitat for longfin smelt may have positive effects on productivity and abundance.

Indicator: Spatial extent of quality habitats available for longfin smelt spawning. Attributes of "quality spawning habitat (i.e. what makes a habitat "quality spawning habitat") remain to be defined as they are largely unknown at this time. The position and extent of spawning habitat is believed to track the position of the low salinity zone.

Locations: Suisun Bay, Suisun Marsh, West Delta, lower Sacramento River, lower San Joaquin (historical spawning area)

Timing (e.g. seasonality) of stressor reduction: Spawning season roughly ~December - April

Attribute: Spatial Extent: Acreage of accessible habitat

Quality: Undefined as micro-habitat requirements are unknown. Further research in this ecosystem needed.

Quantity or State: Maintain/improve existing, and increase the areal extent of longfin smelt spawning habitat that meets certain quality specifications (may be divided into "high", "medium" and "low" quality or accessibility) by _____% or by ___ acres

Confidence that "Quantity or State" are sufficient to attain objective Unknown as the hypothesis that longfin smelt are limited by physical spawning habitat substrate is undocumented and attributes of spawning micro-habitat are undefined.

Time Frame (defined herein as the time from implementation of CM's or suites of CM's until Objective may reasonably be attained). Use of newly created or improved spawning habitat substrate by spawning adults and larvae could be assessed within a few years. Attainment of Objective would be assessed after implementation of habitat restoration and following several years (~5) years in which conditions would have been expected to limit spawning habitat prior to restoration.

Stressor: Degraded pelagic habitat for larval and early life stage longfin smelt

BDCP Objective: *Increase the extent (overlap of acceptable parameters of key habitat variables) and improve quality of the physical/chemical attributes of longfin smelt pelagic habitat.*

Relation to Global Objectives: Increasing the extent and improving the quality of the physical/chemical attributes of longfin smelt pelagic habitat (including transport/retention dynamics) will increase longfin smelt abundance and productivity.

Indicator(s): 1) Volume of longfin smelt's preferred pelagic habitat conditions (e.g. temperature, depth, turbidity, salinity) during critical winter and spring periods

2) Magnitude and duration of flows that promote transport and retention of longfin smelt (e.g. gravitational circulation) in the LSZ.

These are well-indexed by the variable "X2" (the 2ppt bottom isohaline) – the frequency distribution of X2 values in different months indicates the state of longfin smelt pelagic habitat over time.

Locations: Low Salinity Zone (i.e. location changes depending on hydrology of a given year).

Timing (e.g. seasonality) of stressor reduction: Winter-Spring (December-June)

Attribute: TBD

Quantity or State: TBD

Confidence that "Quantity or State" are sufficient to attain Objective: TBD

Time Frame: TBD

Stressor: Increased food Limitation due to food web suppression

BDCP Objective: *Increased density of longfin smelt preferred prey*

Relation to Global Objectives: Abundance and productivity are expected to increase with an increasing longfin smelt food supply

Indicator: 1) longfin smelt preferred prey items (mysids, Eurytemora, amphipods, *Psuedodiaptomous*, etc)(additional system-wide indicators include: 1) individual growth rates or condition index to understand extent of food limitation and 2) diet studies -- to determine if the longfin smelt diet has been affected by restoration-related impacts to food supplies).

Locations: the low salinity zone (0-6psu)

Timing (e.g. seasonality) of stressor reduction: TBD

Attribute: Density of prey and at least one of the following

1) individual growth rates or proportion of maximum ration attatined (Pmax)
2) condition index and
3) diet studies -- to determine if the increase in food translates to decrease in food limitation

Quantity or State: A 10x increase in prey density would be required, at a minimum, on the basis of rough approximations of trophic transfer relationships found in many food webs. [Importantly, the committee did not determine what level of increase in the longfin smelt population would be required].

Alternative basis for quantity/state of this objective might be to identify prey density during historical period of desired longfin smelt abundance (e.g. 1967-1984) and establish this as the objective.

Time Frame: Expectation of time required to attain objective varies with type of conservation measure employed.

Confidence that "Quantity or State" are sufficient to attain Objective:

Differs depending on the conservation measures employed

Potential covariate in unmanaged stressors: unimpaired hydrology (food abundance sensitive to outflow). In other words, effectiveness of non-flow related measures is evaluated against expectation of food web productivity given the relationship between prey density and hydrology in a given year (modifications to actual hydrology as well as other physical habitats are both expected to play a role in food web productivity).

Stressor # __: Increased toxin concentrations (pyrethroids, Organophosphates, surfactants)

BDCP Objective: *Reduce toxic compound concentrations to below identified thresholds that impede productivity of the longfin smelt food supply (ie, that produce detectable effects on those things that longfin smelt eat)*

Indicator: Concentrations of identified toxins and zooplankton bioassays

Locations: Will vary by toxin. They should be measured where they would potentially effect longfin smelt. Pyrethroids would be measured in sediment, organophosphates in the water column, etc. Some (but not all) potential toxins might be measured as concentration in fish tissues; in this case it would be necessary to correlate body-burden with fish condition, performance, and fertility.

Timing (e.g. seasonality) of stressor reduction: Step 1: determine when/where food limitation is occurring. Step 2: evaluate water toxicity indicators at those times/places relative to other areas

Attribute: Intentionally left blank [unknown]

Quantity or State: Intentionally left blank [unknown]

Time Frame: Intentionally left blank [unknown]

Confidence that "Quantity or State" are sufficient to attain Objective: The current effect of toxins on the populations of organisms that longfin smelt eat is unknown.

Stressor # __: Increased nutrient concentrations (ammonium) and/or altered N:P ratios

BDCP Objective: *Reduce nutrient concentrations to below identified thresholds that impede productivity of the longfin smelt food supply (ie, that produce detectable effects on those things that longfin smelt eat) and/or that support levels of toxic organisms (e.g. microsystis) that inhibit attainment of longfin smelt distribution objectives.*

Relation to Global Objectives: Limitation of the food supply potentially constrains longfin smelt abundance and productivity. If the limitation is regionally specific, foodweb limitations may constrain longfin smelt distribution as well.

Nutrient levels that encourage growth of toxic organisms like *microcystis* may be limited longfin smelt distribution.

Indicator: Concentrations of identified nutrients; intensity of Microcystis bloom? Restoration of spring-summer diatom blooms…

Locations: Suisun Bay in the late spring-fall. .

Timing (e.g. seasonality) of stressor reduction: May-October

Attribute: Diatom blooms, zooplankton population responses

Quantity or State: Intentionally left blank [unknown]

Time Frame: May-Octoberish [unknown]

Confidence that "Quantity or State" are sufficient to attain Objective: The current effect of nutrients on the populations of organisms that longfin smelt eat is unknown. Some research has indicated levels of ammonium that may inhibit production at the base of the food web (phytoplankton), though if/how improving phytoplankton growth in certain years will transfer to longfin smelt is unknown. The ammonium threshold (~4 umolar?) is fairly certain; concentrations below this are not expected to inhibit primary production.

Stressor # __: Entrainment

BDCP Entrainment Objective (A): *For winter protection of reproductive adults: combined SWP and CVP December through February salvage of juvenile and adult longfin smelt shall not exceed ___ times the value of the Fall Midwater Trawl longfin smelt index (all ages) from the previous September through December.*

For winter spring protection of larvae and early juveniles: Larvae entrainment modeled by surface oriented particles (DSM2 particle tracking model) shall not exceed ___ of surface oriented particles from the sampling stations ___, while longfin smelt larvae are being detected at ___ of ___ sampling locations in the San Joaquin River and south Delta .

Relation to Global Objectives: Reducing entrainment of reproductive, larval, and early juvenile longfin smelt will increase productivity (survival and total egg production)

Indicator: See above

Locations: Salvage measured at Project Diversions and impingement (or relevant measure) at Mirant Power Plant. Stock of spawning aged fish measured by FMWT and/or other survey at existing survey stations.

Timing (e.g. seasonality) of stressor reduction: Dec-June. longfin smelt entrainment is a greater concern during low outflow periods when X2 is nearer the south Delta export facilities.

Attribute: X2 OMR and other flow variables

Quantity or State: See above.

Time Frame: Measure efficacy should be detectable in first few years after implementation in which low outflow conditions would make longfin smelt susceptible to entrainment. Attainment of objective would be evaluated after several years of "susceptible conditions".

Confidence that "Quantity or State" are sufficient to attain Objective: Needs further documentation – see K. Newman Life Cycle model? In particular, pre-screen mortality estimates for longfin smelt should be studied.

BDCP Entrainment Objective (B): Spawning and larval migration spatial extent will not be limited by entrainment mortality or diversion-related impacts to habitat

Relation to Global Objectives: Reducing entrainment of spawning, larval, and early juvenile longfin smelt in the lower San Joaquin River will allow for increased spatial distribution of spawning

Indicator: X2 and OMR flows

Locations: Old and Middle River flow gauges on either side of Bacon Island and QWEST – the flow estimate for the San Joaquin River at Jersey Point in the DAYFLOW database (where flow is currently measured)

Timing (e.g. seasonality) of stressor reduction: Dec-June. longfin smelt entrainment is a greater concern in years when outflow conditions place X2 close to the south Delta export facilities.

Attribute: Net average flow in Old and Middle River and at Jersey Point

Quantity or State: OMR Flows not to be more negative than ___ cfs December – June (spawning-larval period)

Time Frame: Measure efficacy could be modeled prior to plan implementation. Ground-truthing this estimate in the field requires some substantial new sampling/monitoring. Effect would be expected to materialize in concert with restoration efforts in the south Delta including improved flows and reduction in *Egeria*.

Confidence that "Quantity or State" are sufficient to attain Objective: Conceptual model for longfin smelt indicates that continued entrainment-related mortality in the South Delta could be a factor in declining detection for spawning activity in that region. Research needs re: longfin smelt reproductive site fidelity.

CHINOOK SALMON

Stressors Addressed: Habitat loss; flow alterations; predation;; impingement and entrainment; passage impediments; and illegal harvest

Stressors Not Addressed: Contaminants; ocean conditions; and access to historic spawning habitat.

Goal CHSA1: Contribute to conditions that will support increased abundance, increased spatial extent of key lifestages, restore genetic diversity and increase productivity of all runs of Chinook salmon.

Objective CHSA1.1: Increase habitat extent, availability, and quality for juvenile Chinook salmon of all runs, including presence of suitable food resources.
Stressor: Habitat loss, food limitation, and passage impediments.

Objective CHSA1.2: Increase growth rates of juvenile Chinook salmon of all runs while rearing in the Plan Area.
Stressor: See CHSA1.1

Objective CHSA1.3: Help to maintain adequate dissolved oxygen levels in the Stockton Deep Water Ship Channel to avoid blocking migration of adult fall-run Chinook salmon and spring-run Chinook salmon once a viable run is established in the San Joaquin River.
Stressor: Low dissolved oxygen concentrations on the San Joaquin River near Stockton

Objective CHSA1.5: Increase immigration success by __% and reduce migratory delays by __%
Stressor: Altered flow conditions, poor water quality, exposure to unscreened water diversions, entrainment

Objective CHSA1.6: The total percentage of juvenile Chinook salmon entrained at the CVP and SWP pumps shall not exceed __% of the Juvenile Production Estimate (JPE) (methods for determining JPE and target entrainment percentages to be determined for each run including an analysis of data by water year type to scale the targets accordingly)
***Stressor*:** Entrainment of juvenile salmon at unscreened water diversions and CVP and SWP pumping plants.

Objective CHSA1.7: Reduce illegal harvest of adult Chinook salmon (all runs).
Stressor: Illegal take of covered species.

Objective CHSA1.8: Reduce susceptibility to, and impact of predation by non-native predatory fish on juvenile outmigrants by _%.
Stressor: High densities of non-native fish that prey on outmigrating salmon (NMFS 2009).

Objective CHSA1.9: Manage salmonid hatchery operations to minimize genetic affects on all naturally producing Chinook salmon run.
Stressor: Threats of hatchery programs in the Central Valley to spring-run Chinook salmon stock genetic integrity.

CENTRAL VALLEY STEELHEAD

Stressors Addressed: Habitat loss; flow alterations; predation;; impingement and entrainment; passage impediments; and illegal harvest.

Stressors Not Addressed: Contaminants; access to historic spawning habitat.

Goal STEE1: Contribute to conditions that will support increased abundance, increased spatial extent of key lifestages, restore genetic diversity and increase productivity of Central Valley steelhead.

Objective STEE1.1: Increase extent, availability, and quality of migration habitat for juvenile steelhead.
Stressor: Flow alterations, predation, poor water quality, habitat loss

Objective STEE1.2: Increase growth rates of juvenile steelhead while rearing in the Plan Area.
Stressor: See STEE1.1

Objective STEE1.3: Improve upstream and downstream passage for steelhead. Increase immigration success by __%.
Stressor: Passage impediments, flow alterations, low dissolved oxygen concentrations on the San Joaquin River near Stockton

Objective STEE1.4: Increase survival of outmigrating smolts by __%
Stressor: Flow alterations

Objective STEE1.5: The total percentage of juvenile steelhead entrained at the CVP and SWP pumps shall not exceed __% (methods for determining the percentage of

entrainment and target entrainment levels to be determined with targets scaled according to water year type)
Stressor: Entrainment at unscreened water diversions and CVP and SWP pumping plants

Objective STEE1.6: Reduce illegal harvest of adult steelhead
Stressor: Illegal take of covered species.

Objective STEE1.7: Reduce susceptibility to, and impact of predation by non-native predatory fish on juvenile outmigrants
Stressor: Predation caused by high densities of non-native predatory fish

Objective STEE1.8: Manage salmonid hatchery operations to minimize genetic effects on all naturally producing steelhead run.
Stressor: Threats to natural steelhead posed by hatchery programs, including: (1) mortality of natural steelhead in fisheries targeting hatchery-origin steelhead; (2) competition for prey and habitat; (3) predation by hatchery-origin fish on younger natural fish; (4) genetic introgression by hatchery-origin fish that spawn naturally and interbreed with local natural populations; and (5) disease transmission (NMFS 2009).

SACRAMENTO SPLITTAIL

Stressors Addressed: Habitat loss and food limitations, entrainment, predation by non-native predators;

Stressors Not Addressed: Toxins and Contaminants

Goal SASP1: Contribute to conditions that will support the increased abundance and productivity of of Sacramento splittail in the Plan Area.

Objective SASP1.1: Increase access to, and availability of suitable spawning, rearing and foraging habitat for splittail. Increase the total surface area of inundated floodplain habitat by ___% when Delta inflow is __ cfs. [**Note to Reviewers**: *Look at the acreage to flow curve relationship. Look for opportunities to maximize the flooding for 30 days.]*
Stressor: Habitat loss, particularly loss of floodplain and channel margin habitat

Objective SASP1.2: Increase food availability for all life stages of Sacramento splittail by ___%.
Stressor: Food limitation

Objective SASP1.3: Help to maintain multiple spawning cohorts of Sacramento splittail as part of the breeding population.

Objective SASP1.4: The total percentage of splittail entrained at the CVP and SWP pumps shall not exceed __% (methods for determining the percentage of entrainment and target entrainment levels to be determined with targets scaled according to water year type)
Stressor: Entrainment

Objective SASP1.5: Reduce predation of splittail by centrachids and other predators. [**Note to Reviewers**:
Stressor: Predation by non-native fish

GREEN STURGEON

Stressors Addressed: Habitat loss; flow alterations; passage impediments; entrainment; dredging and illegal harvest.

Stressors Not Addressed: Contaminants, invasive species.

Goal GRST1: Contribute to conditions that will support the increased abundance, productivity, distribution and life-history and genetic diversity of green sturgeon in the Plan Area.

Objective GRST1.1: Improve rearing habitat for green sturgeon. [***Note to Reviewers:*** *Logic Chain Objective* #5)
Stressor: Habitat loss.

Objective GRST1.3: Improve upstream passage success for adult green sturgeon through the Fremont Weir and other operational gates/barriers. [***Note to Reviewers:*** *Logic Chain Objective #2]*
Stressor: Passage impediments.

Objective GRST1.4: The total percentage of green sturgeon entrained at the CVP and SWP pumps shall not exceed __% (methods for determining the percentage of entrainment and target entrainment levels to be determined with targets scaled according to water year type)
Stressor: Entrainment.

Objective GRST1.5: Determine through targeted studies the significance of poaching to the population and based upon study results, reduce poaching of adult green sturgeon in the Plan Area.
Stressor: Poaching green sturgeon

Objective GRST1.6: Avoid and minimize adverse effects of construction or maintenance dredging related to BDCP activities on green sturgeon.
Stressor: Construction or maintenance dredging related to BDCP activities.

WHITE STURGEON

Stressors Addressed: Habitat loss; flow alterations; passage impediments; entrainment; dredging and illegal harvest.

Stressors Not Addressed: Contaminants, , invasive species

Goal WHST1: Contribute to conditions that will increase the abundance, productivity and distribution of white sturgeon in the Plan Area.

Objective WHST1.1: Improve rearing habitat conditions for white sturgeon.
Stressor: Habitat loss, invasive plant species *[**Note to Reviewers:** Tidal marsh allocanthous support of clams and other macro-crustaceans contribute to the prey base of sturgeon]*

Objective WHST1.3: Improve upstream passage success for adult white sturgeon through the Fremont and Lisbon weirs and other operational gates.
Stressor: The Fremont Weir is a documented barrier to white sturgeon (Z. Matica, Department of Water Resources, pers. comm.).

Objective WHST1.4: The total percentage of white sturgeon entrained at the CVP and SWP pumps shall not exceed __% (methods for determining the percentage of entrainment and target entrainment levels to be determined with targets scaled according to water year type) [***Note to Reviewers:** Entrainment is a low magnitude stressor for sturgeon, currently. This should be addressed during real-time operations*]
Stressor: White sturgeon entrainment from agricultural operations, power plants, and the state and federal water project facilities

Objective WHST1.5: Reduce poaching of adult white sturgeon in the Plan Area
Stressor: Poaching of adult white sturgeon.

Objective WHST1.6: Avoid and minimize adverse effects of construction or maintenance dredging related to BDCP activities on white sturgeon.
Stressor: Construction or maintenance dredging related to BDCP activities

RIVER LAMPREY

Stressors Addressed: Habitat loss; flow alterations; passage impediments; and illegal harvest.

Stressors Not Addressed: Contaminants, predation by non-native species, and dredging

Goal RILA1: Contribute to conditions that will support the maintenance and restoration of river lamprey distribution and abundance to higher levels than present.

Objective RILA1.1: Restore and/or enhance river lamprey rearing habitat.
Stressor: Habitat loss.

Objective RILA1.3: Identify impediments/barriers to upstream passage of adult river lamprey and implement lamprey-specific passage and protection measures.
Stressor: Passage impediments. **Objective RILA1.4**: Help maintain flow conditions that facilitate outmigration of juvenile river lampreys.
Stressor: Flow alterations.

PACIFIC LAMPREY

Stressors Addressed: Habitat loss; flow alterations; passage impediments and illegal harvest.

Stressors Not Addressed: Contaminants, predation by non-native species and dredging

Goal PALA1: Contribute to conditions that will support the maintenance and restoration of Pacific lamprey distribution and abundance to higher levels than present.

Objective PALA1.1: Restore and/or enhance Pacific lamprey rearing habitat.
Stressor: Habitat loss.

Objective PAILA1.2: Reduce stranding of Pacific lamprey ammocoetes
Stressor: Passage impediment caused by dewatering of channels

Objective PALA1.4: Help maintain flow conditions that facilitate outmigration of juvenile Pacific lampreys.
Stressor: Flow alterations.

ECOSYSTEM GOALS AND OBJECTIVES

Goal ECSY1: Protect and restore large landscapes representing a range of physical and biological attributes (e.g., hydrology, soil, and plant associations) necessary to sustain viable populations of covered species, and to preserve native species biodiversity.

Objective ECSY1.1: Protect 25,000-41,000 acres of existing natural communities that support covered species.

Objective ECSY1.2: Protect a range of environmental gradients (e.g., hydrology, elevation, and soils) across a diversity of natural communities.

Objective ECSY1.3: Restore or create up to 65,000 acres of tidally influenced habitat consisting of subtidal, mudflat, tidal marsh, and transitional upland habitat for sea level rise accommodation that supports a gradient of natural communities and habitat for covered species.

Objective ECSY1.4: Restore or create up to 10,000 acres of seasonally inundated floodplain and 20 miles of channel margin habitat.

Objective ECSY1.5: Manage protected and restored or created habitats to enhance habitat functions for associated covered and other native species over the term of the BDCP.

Goal ECSY2: Provide hydrodynamic conditions within Delta waterways that are more reflective of natural patterns of flow within the BDCP Plan Area and Suisun Marsh.

Objective ECSY2.1: Support the movement of larval and juvenile life stages of native fish species to downstream rearing habitats.

Objective ECSY2.2: Support the movement of adult life stages of native fish species to natal spawning habitats.

Objective ECSY 2.3: Promote water quality conditions within the Delta that help restore native fish habitat.

Objective ECSY2.4: Maintain or increase life history diversity of native fishes and a diversity of rearing conditions for native fishes over time.

Objective ECSY 2.5: Promote greater connectivity between low salinity zone habitats and upstream freshwater habitats, and availability of spawning habitats for native pelagic species.

Goal ECSY3: Provide for connectivity among protected lands to provide for the movement of native organisms among habitat areas and to facilitate genetic exchange among populations.

Objective ECSY3.1: Protect corridors of habitat that provide linkages among protected habitat areas within and adjacent to the Plan Area.

Objective ECSY3.2: Improve habitat corridors that allow covered and other native species to move into protected habitats from adjacent areas and to move among habitat areas within protected lands.

Goal ECSY4: Promote ecosystem processes that support natural communities, covered species, other native species, and the habitats of those species.

Objective ECSY4.1: Maintain and improve disturbance regimes and other processes that support functioning natural communities.

Goal ECSY5: Increase aquatic primary and secondary production in the Delta, Yolo Bypass and Suisun Marsh to increase the abundance and availability of food for native aquatic organisms.

Objective ECSY5.1: Over the term of the BDCP, increase the abundance and productivity of zooplankton that provide food and support food production for covered fish species in Delta waterways.

Objective ECSY5.2: Over the term of the BDCP, increase the abundance and productivity of aquatic invertebrate species that provide food and support food production for covered fish species in Delta waterways.

Goal ECSY6: Reduce the adverse predation effects of non-native species on covered fish species.

Objective ECSY6.1: Manage the distribution and abundance of established non-native predators in the Delta to predation on native covered fishes.

Objective ECSY6.2: Manage the distribution of covered fish species to minimize movements into high predation risk areas of the Delta.

Goal ECSY7: Protect lands with a sufficient range of habitat conditions to accommodate anticipated shifts in the distributions of covered species and natural communities in response to climate change.

Objective ECSY7.1: Protect sufficient upland transitional habitat area adjacent to restored brackish and freshwater tidal emergent wetland to permit the future upslope natural establishment of tidal emergent wetland communities with sea level rise.