

BDCP Covered Fish Species Goals and Objectives Summary

<i>Species:</i>	Pacific & River lamprey
<i>BDCP Species Goal:</i>	<ol style="list-style-type: none"> 1. Suitable and productive larval rearing habitat for Pacific and river lamprey within the Plan Area. 2. Increased scientific understanding of Pacific and river lamprey within the Plan Area.
<i>BDCP Larval Habitat Objective:</i>	<p>Protect and enhance existing tidal mudflat and channel margins with habitat characteristics necessary to support larval settlement and development. Jacobs’ electivity index of Pacific lamprey juvenile habitat suitability on the Columbia River identified (see Close et al. 2003):</p> <ul style="list-style-type: none"> • Silt, sand or organic (≥30 mm depth) substrates; and • Water velocity of 0-19 cm/s. <p>Avoiding sudden changes in water levels is also an important attribute to reduce stranding</p>
<i>BDCP Juvenile survival Objective:</i>	Reduce entrainment risk of juvenile Pacific and river lamprey at project diversions.
<i>BDCP Science-Based Knowledge Objective:</i>	Support regional lamprey monitoring and research programs with specific emphasis on factors directly related to the Plan Area.

<i>Species/life stage:</i>	Sacramento Splittail: Spawning and Rearing
<i>BDCP Species Goal:</i>	Self-sustaining population of Sacramento splittail in the Study Area.
<i>BDCP Juvenile Growth Objective:</i>	<p>Increase the quantity and quality of spawning and rearing habitat, including floodplains with the following criteria (beginning in the near term and continuing through the late long-term):</p> <ul style="list-style-type: none"> • Floodplain inundation occurs at least once every five years • Floodplain inundation persists for at least 30 days (Sommer, pers. comm.) • Areas of floodplain habitat with water depths <2m (Moyle et al. 2004, Sommer et al. 2008) • Flooded terrestrial vegetation (Crain et al. 2004, Sommer et al, 2008) <p>Enhance channel margins with floodplain benches, native riparian and emergent vegetation, large woody debris (habitat complexity), and removal of riprap and other bank protection measures (beginning in the early long-term and continuing through the late long-term).</p>

<i>Species:</i>	Green sturgeon
<i>BDCP Species Goal:</i>	<ol style="list-style-type: none"> 1. Improved survival and increased the abundance of southern DPS green sturgeon within the Plan Area. 2. Increased spatial distribution and life history diversity (i.e. migration patterns) of green sturgeon in the Plan Area.
<i>BDCP Early life stage Survival Objective:</i>	Increase survival, by maintaining optimal incubation and rearing conditions in the Bay-Delta and its tributaries, to achieve increased estimated spawner adult abundance-to-juvenile abundance ratio compared to existing condition CVP/SWP regulatory requirements.
<i>BDCP Early life stage spatial distribution objective:</i>	Increase the spatial distribution of optimal incubation and rearing conditions in the Bay-Delta and its tributaries compared to existing condition CVP/SWP regulatory requirements, by reducing flow and temperature alterations during spawning and rearing period.
<i>BDCP Juvenile Growth Objective:</i>	Increase the extent (i.e. access to and quality) of Bay-Delta habitats producing benthic invertebrates, including shrimp, amphipods, isopods, annelid worm, and crabs to 50% pre-corbicula invasion levels.
<i>BDCP Adult Survival Objective:</i>	Develop early quantification of impacts from construction or maintenance dredging on food resource, water quality, and sediment quality, as well as potential direct effects, related to BDCP activities on green sturgeon and minimize adverse effects thereafter.
<i>BDCP Life History Diversity and Spatial Distribution Objective:</i>	<ol style="list-style-type: none"> 1. Provide unimpeded connectivity between the Sacramento River and Yolo Bypass to ensure safe and timely passage of adult Southern DPS green sturgeon between January and May. 2. Provide safe and timely passage related to BDCP operational gates, barrier, and diversions.
<i>BDCP Poaching Objective:</i>	Determine through annual targeted studies the significance of poaching to the population and based upon study results, reduce poaching of subadult and adult green sturgeon in the Plan Area by the previous year’s observed quantity.

<i>Species:</i>	White Sturgeon
<i>BDCP Species Survival and Abundance Goal:</i>	Improved white sturgeon survival and abundance within the Plan Area.
<i>BDCP Early Life Stage Survival Objective:</i>	Increase estimated spawner adult abundance-to-juvenile abundance ratio compared to existing condition CVP/SWP regulatory requirements by maintaining optimal incubation and rearing conditions in the Bay-Delta and its tributaries.
<i>BDCP Species Survival Objective:</i>	Determine impact of entrainment to the white sturgeon population and reduce it by 50%.
<i>BDCP Species Survival Objective:</i>	Quantify indirect and direct impacts on white sturgeon from construction or maintenance dredging related to BDCP activities on food resources, water quality, and sediment quality and minimize adverse effects thereafter.
<i>BDCP Adult Abundance Objective:</i>	Reduce illegal harvest of subadult and adult white sturgeon in the Plan Area by the previous year's observed quantity.
<i>BDCP Species Productivity Objective:</i>	Increase the access to and quality of Bay-Delta prey which includes crustaceans, annelids, mollusks, fish, and midges to 50% pre-corbula invasion levels.
<i>BDCP Species Distribution and Diversity Goal:</i>	Increase spatial distribution and life history diversity (i.e. migration patterns) of white sturgeon in the Plan Area.
<i>BDCP Subadult and Adult Distribution Objectives:</i>	Provide unimpeded connectivity between the Sacramento River and Yolo Bypass to ensure safe and timely passage of adult white sturgeon between January and May. Provide safe and timely passage around or through BDCP operational gates, barriers, and diversions.
<i>BDCP Early Life Stage Distribution Objective:</i>	Increase the spatial distribution of incubation and rearing areas in the Bay-Delta and its tributaries compared to existing condition CVP/SWP regulatory requirements by providing optimal flow and temperature regimes during the spawning and rearing periods.

<i>Species:</i>	Delta Smelt
<i>BDCP Species Goal:</i>	Enhanced environmental conditions that support increased abundance and distribution of Delta smelt in the Study Area.
<i>BDCP Juvenile Growth Objective:</i>	<p>Increase fall mean body length of juvenile delta smelt by 10% (to about 65 mm in December rather than 60 mm) by increasing summer growth rates within 10 years of implementation.</p> <p>Increase summer-time growth rates by increasing the density of zooplankton in the lower Sacramento, lower San Joaquin, and confluence areas in low outflow years, and confluence and below in high flow years. The average daily summer zooplankton production should increase in quantities and quality such that Delta smelt growth rates become similar to their growth rates in 1970's and 1980's.</p>
<i>BDCP Adult Entrainment Objective:</i>	Maintain the proportion of the adult delta smelt population that are entrained in the CVP and SWP facilities during December to March below a level that is consistent with values estimated for years with historically low entrainment and relatively high delta smelt population growth ¹ .
<i>BDCP Juvenile Entrainment Objective:</i>	Maintain the proportion of delta smelt juveniles lost to entrainment at the project diversions (during the spring and early summer) below a value based on historical entrainment relative to the FMWT or Kodiak population indices.
<i>BDCP Low Salinity Habitat Objective:</i>	<p>Increase the distribution of juvenile and pre-spawning adult Delta smelt by increasing the area of suitable low salinity zone habitat in the Study Area from mid-July to mid-December to ____% of historic (benchmark) conditions.</p> <p style="background-color: #ffffcc;">THIS OBJECTIVE IS PROVIDED HERE PRIMARILY AS A PLACE HOLDER. NEED TO RESEARCH POTENTIAL BENCHMARKS FOR LSZ HABITAT TO QUANTIFY OBJECTIVE.</p>

¹ Preliminary analysis completed by the Independent Science Advisors for setting numerical objectives, used modeling to determine that the level was 5% (and no higher than 10%). These percentages are based on a preliminary analysis using an unpublished individual-based life cycle model. They are presented to illustrate how models can be used to generate such numbers. Additional analyses will be needed to refine these numbers and develop final BDCP objectives.

<i>Species:</i>	Winter-run Chinook salmon
<i>BDCP Species Goals:</i>	Improved survival of emigrating and immigrating Chinook salmon within the Plan Area.
<i>BDCP Juvenile Growth Objective:</i>	Increase the growth (average size, relative to current conditions) of juvenile winter-run Chinook salmon as they migrate through the Delta to 85% of the temperature adjusted physiological maximum within 10 years of implementation and maintain that level of the 50 year life of the BDCP ² .
<i>BDCP Juvenile Survival Objective:</i>	Double winter-run Chinook salmon juvenile survival (relative to current survival rates) during freshwater migration within 10 years of implementation and maintain these levels for the 50 year term of the BDCP.
<i>BDCP Adult Migration Objective:</i>	Maintain median passage delays at weirs to less than 1.5 days within 10 years of implementation.

<i>Species:</i>	Spring-run Chinook salmon
<i>BDCP Species Goal:</i>	<ol style="list-style-type: none"> 1. Improved survival of emigrating and immigrating Chinook salmon within the Plan Area. 2. Conserved genetic and life-history diversity of spring-run Chinook salmon.
<i>BDCP Juvenile Growth Objective:</i>	Increase the growth (average size, relative to current conditions) of juvenile spring-run Chinook salmon as they migrate through the Delta to 85% of the temperature adjusted physiological maximum within 10 years of implementation and maintain that level of the 50 year life of the BDCP ³ .
<i>BDCP Juvenile Survival Objective:</i>	Double spring-run Chinook juvenile survival (relative to current survival rates) during freshwater migration within 10 years of implementation.
<i>BDCP Adult Migration Objective:</i>	Maintain median passage delays at weirs to less than 1.5 days within 10 years of implementation.
<i>BDCP Hatchery Practices Objective:</i>	Manage hatchery practices to minimize genetic effects on naturally producing Central Valley Chinook salmon.

² Subject to refinement based on additional data. Current temperature adjusted growth rate values based on lab studies and hatchery fish, which may not be applicable to Delta conditions.

³ Subject to refinement based on additional data. Current temperature adjusted growth rate values based on lab studies and hatchery fish, which may not be applicable to Delta conditions.

<i>Species:</i>	Fall-and Late-Fall-run Chinook salmon
<i>BDCP Species Goals:</i>	<ol style="list-style-type: none"> 1. Improved survival of emigrating and immigrating Chinook salmon within the Plan Area. 2. Conserved genetic and life-history diversity of fall and late fall-run Chinook salmon.
<i>BDCP Juvenile Growth Objective:</i>	Increase the growth (average size, relative to current conditions) of juvenile fall-run Chinook salmon as they migrate through the Delta to 85% of the temperature adjusted physiological maximum within 10 years of implementation and maintain that level of the 50 year life of the BDCP ⁴ .
<i>BDCP Juvenile Survival Objective-:</i>	Double fall-run Chinook salmon juvenile survival (relative to current survival rates) during freshwater migration within 10 years of implementation of CM1.
<i>BDCP Adult Passage Objective:</i>	Maintain median passage delays to less than 1.5 days within 10 years of implementation of CM2 (other CMs will contribute to achieving this objective).
<i>BDCP Hatchery Practices Objective:</i>	Manage hatchery practices to minimize genetic effects on naturally producing Central Valley Chinook salmon within 5 years of plan implementation.

<i>Species:</i>	Central Valley Steelhead
<i>BDCP Species Goals:</i>	<ol style="list-style-type: none"> 1. Improved survival of emigrating and immigrating steelhead within the Plan Area. 2. Conserved genetic and life-history diversity of steelhead.
<i>BDCP Juvenile Survival Objective:</i>	Increase juvenile survival during freshwater migration within 10 years.
<i>BDCP Juvenile Passage Objective:</i>	Reduce numbers of emigrating juveniles passing through the DCC and Georgiana Slough within ten years.
<i>BDCP Hatchery Practices Objective:</i>	Manage Central Valley and Coleman National Fish Hatchery practices to minimize genetic effects on naturally producing Central Valley steelhead.

⁴ Subject to refinement based on additional data. Current temperature adjusted growth rate values based on lab studies and hatchery fish, which may not be applicable to Delta conditions.

<i>Species:</i>	Longfin Smelt
<i>BDCP Species Goal:</i>	Enhanced environmental conditions in the Delta that support increased distribution and abundance of Longfin Smelt in the Study Area.
<i>BDCP Growth Objective:</i>	<p>Increase growth rates in the spring by increasing the density of zooplankton (mysids and amphipods) in Suisun Bay and Marsh, and the Western Delta in low flow years to improve survival of juveniles. The average daily zooplankton production in January-April should increase in quantities and quality such that longfin smelt growth rates become similar to their growth rates in 1970's and 1980's. Increase density of longfin smelt preferred prey by ____ percent</p> <p>ADDITIONAL ANALYSES IS NEEDED TO DEVELOP AN APPROPRIATE PERCENT INCREASE IN GROWTH. AND PREY DENSITY.</p>
<i>BDCP Entrainment Objective:</i>	<p>The ratio of entrainment (as measured by expanded salvage) to abundance (as reflected in FMWT or other suitable index) of reproductive adult and juvenile Longfin Smelts in combined SWP and CVP delta pumping facilities shall not exceed ____.</p> <p>ADDITIONAL ANALYSES IS NEEDED TO DEVELOP AN APPROPRIATE RATIO.</p> <p>The ratio would be based on historical longfin smelt lost to entrainment at the project diversions relative to the FMWT—values estimated for years with historically low entrainment and relatively high fish index or some other indicator.</p>
<i>BDCP Physical Spawning Habitat Objective:</i>	Increase the extent of freshwater spawning habitat for longfin smelt within the Delta upstream of X2 during mid-December to April.”