3.4 Conservation Measures

[***Note to Reviewers**: The text of this section of Chapter 3, including the conservation measures described, is subject to change and revision as the BDCP planning process progresses. This section, however, has been drafted and formatted to appear as it may in a draft HCP/NCCP. Although this section includes declarative statements (e.g., the Implementing Entity will…), it is nonetheless a "working draft" that will undergo further modification based on input from the BDCP Steering Committee, State and federal agencies, and the public.*]

This section presents the BDCP conservation measures that will be implemented by the BDCP Implementing Entity to avoid, minimize, and compensate for impacts on covered species associated with implementation of the covered activities and conservation measures; improve the ecological function of natural communities, and provide for the conservation of covered species. Conservation measures are those actions that collectively are expected to achieve the BDCP biological goals and objectives.[1] As described in Sections 3.2.2 through 3.2.5, conservation measures address conveyance and water operations, improvements in physical habitats that support covered species, and reductions in the effect of other stressors on covered species. Water operations conservation measures are presented in Section 3.4.1, physical habitat conservation measures are presented in Section 3.4.2, other stressors conservation measures are presented in Section 3.4.3, and avoidance and minimization measures for covered wildlife and plant species are presented in Section 3.4.4.

A summary list of BDCP conservation measures and the biological objectives they serve is provided in Table 3.3. The following information is provided with each conservation measure, as appropriate, in sections 3.4.1-3.4.3.

Letter/Number Code, Title, and Conservation Measure Description. This section provides the unique letter/number code for the measure for use in tracking BDCP implementation, a brief title for the measure, and a specific description of the conservation measure with specified metrics and targets as appropriate.

Defined Adaptive Range. The defined adaptive range applies only to water operations conservation measures and establishes quantified operating range limits within which parameters may be implemented to more effectively advance BDCP biological goals and objectives.

Problem Statement. This section describes the ecological problems that are intended to be addressed by the conservation measures.

Hypotheses. This section describes the hypotheses that justify the approach reflected in the conservation measure. Uncertainties and risks that could be associated with DRERIP-evaluated conservation measures are described in Appendix X, *DRERIP Evaluations*.

[1] Throughout Section 3.4 the terms "goal" and "target" are used to identify the values of metrics presented in the conservation measures. The completed plan will need to identify values of specific metrics that will be part of the terms and conditions of the permits. Some of the goals and targets presented in this section may evolve into permit terms.

DRAFT

Table 3.3. Summary Table of Conservation Measures and their Relationship to Biological Objectives

Conservation Measure	*Biological Objectives Addressed*
Water Operations Conservation Measures *(described in Section 3.4.1)*	
WOCMN12: Operate South Delta diversions to maintain sufficient Old and Middle River Flows during the near-term implementation period for environmental benefits.	ECSY1.1, ECSY1.2, ECSY1.3, ECSY1.4, ECSY1.5, ECSY2.1, ECSY5.1, DESM1.1, LOSM1.1, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, SASP1.1, SASP1.3, Goal WHST3, Goal RILA1, Goal PALA1
WOCMN5: Operate the Delta Cross Channel Gates during the near-term for environmental benefits.	ECSY1.1, ECSY1.3, ECSY1.5, ECSY5.1, DESM1.1, LOSM1.1, CHIN1.1, Goal CHIN4, STEE1.1, Goal STEE4, SASP1.1
WOCMN6: Maintain sufficient Rio Vista flows for environmental benefits during the near-term implementation period.	ECSY1.1, ECSY1.2, ECSY1.3, ECSY1.4, ECSY1.5, ECSY5.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.1, Goal CHIN4, STEE1.1, Goal RILA1, Goal PALA1
WOCMN8: Install and operate gates at Old River and Connection Slough ("Two Gates") to reduce the transport of covered species into the interior Delta and improve water quality in the south and central Delta.	ECSY1.1, ECSY1.3, DESM1.1, LOSM1.1, CHIN1.1, STEE1.1, SASP1.1
WOCMN9: Maintain sufficient Delta outflows during the near-term implementation period for environmental benefits.	ECSY1.1, ECSY1.2, ECSY1.3, ECSY1.4, ECSY1.5, ECSY5.1, DESM1.1, LOSM1.1, SASP1.1, SASP1.3, Goal RILA1, Goal PALA1
WOCMN14: Maintain agricultural, municipal, and industrial water quality requirements during the near-term implementation period.	ECSY1.3, SASP1.2
WOCMN11: Operate the Montezuma Slough Salinity Control Gate during the near-term implementation period for environmental benefits.	ECSY1.1, ECSY1.3, ECSY1.4, ECSY1.5, ECSY5.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN2.1, CHIN2.2, STEE2.1, STEE2.2, SASP1.2, Goal GRST1, Goal GRST2, Goal WHST1, Goal WHST2
WOCML1: Construct a new water diversion facility in the north Delta with multiple intakes and fish screens and an isolated conveyance facility and preferentially operate the facility while maintaining sufficient bypass flows for covered fish species.	ECSY1.1, ECSY1.2, ECSY1.3, ECSY1.4, ECSY 1.5, ECSY2.1, ECSY5.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.2, CHIN1.3, CHIN3.1, STEE1.2, STEE2.2, SASP1.1, Goal WHST3, Goal RILA1, Goal PALA1
WOCML12: Operate South Delta diversions to maintain sufficient Old and Middle River Flows during the long-term implementation period for environmental benefits.	ECSY1.1, ECSY1.2, ECSY1.3, ECSY1.4, ECSY1.5, ECSY2.1, ECSY5.1, DESM1.1, LOSM1.1, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, SASP1.1, SASP1.3, Goal WHST3, Goal RILA1, Goal PALA1
WOCML2: Modify the Fremont Weir and Yolo Bypass and operate the Fremont Weir to provide for a higher frequency and duration of inundation of the Yolo Bypass	ECSY1.2, ECSY1.4, ECSY1.5, ECSY2.1, ECSY5.1, NACO1.1, DESM1.1, DESM1.2, CHIN1.1, CHIN2.1, CHIN3.1, Goal CHIN4, STEE1.1, STEE2.1, Goal STEE4, SASP 1.1, SASP1.2, SASP1.4, Goal GRST1, Goal WHST1, Goal RILA1, Goal PALA1
WOCML5: Operate the Delta Cross Channel gates during the long-term for environmental benefits.	ECSY1.1, ECSY1.3, ECSY1.5, ECSY5.1, DESM1.1, LOSM1.1, CHIN1.1, Goal CHIN4, STEE1.1, Goal STEE4, SASP1.1
WOCML6: Maintain sufficient Rio Vista flows for environmental benefits during the long-term implementation period.	ECSY1.1, ECSY1.2, ECSY1.3, ECSY1.4, ECSY1.5, ECSY5.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.1, Goal CHIN4, STEE1.1, Goal RILA1, Goal PALA1
WOCML9: Maintain sufficient Delta outflows during the long-term implementation period for environmental benefits.	ECSY1.1, ECSY1.2, ECSY1.3, ECSY1.4, ECSY1.5, ECSY5.1, DESM1.1, LOSM1.1, SASP1.1, SASP1.3, Goal RILA1, Goal PALA1
WOCML#: Operate the Dual Conveyance Facilities to Maintain Delta Water Quality and Protect Covered Fish Species.	ECSY1.3, ECSY1.4, ECSY1.5, ECSY3.1, NACO1.1, GECF1.1
WOCML14: Maintain in-Delta agricultural, municipal, and industrial water quality requirements during the long-term implementation period.	ECSY 1.3, SASP1.2

DRAFT

Table 3.3. Summary Table of Conservation Measures and their Relationship to Biological Objectives

Conservation Measure	*Biological Objectives Addressed*
Water Operations Conservation Measures *(described in Section 3.4.1) (continued)*	
WOCML11: Operate the Montezuma Slough Salinity Control Gate during the long-term implementation period for environmental benefits.	ECSY1.1, ECSY1.3, ECSY1.4, ECSY1.5, ECSY5.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN2.1, CHIN2.2, STEE2.1, STEE2.2, SASP1.2, Goal GRST1, Goal GRST2, Goal WHST1, Goal WHST2
Habitat Restoration Conservation Measures *(described in Section 3.4.2)*	
HRCM 16. Restore 65,000 acres of freshwater and brackish tidal marsh within Restoration Opportunity Areas.	ECSY2.1, ECSY5.1, NACO1.2, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN2.1, CHIN2.2, CHIN3.1, STEE2.1, STEE2.2, STEE3.1, SASP1.2, SASP1.3, Goal GRST2, Goal WHST2
HRCM4: Restore at least 5,000 acres freshwater tidal marsh within the Cache Slough Complex ROA.	ECSY2.1, ECSY5.1, NACO1.2, DESM1.1, DESM1.2, LOSM1.2, CHIN2.1, CHIN3.1, STEE2.1, STEE3.1, SASP1.2, Goal GRST2, Goal WHST2
HRCM5: Restore at least 1,500 acres of freshwater tidal marsh within the Cosumnes/Mokelumne ROA.	ECSY2.1, ECSY5.1, NACO1.2, DESM1.2, LOSM1.2, CHIN2.2, CHIN3.1, STEE2.2, STEE3.1, SASP1.2, Goal WHST2
HRCM6: Restore at least 2,100 acres of tidal marsh within the West Delta ROA.	ECSY2.1, ECSY5.1, NACO1.2, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN2.1, CHIN2.2, CHIN3.1, STEE2.1, STEE2.2, STEE3.1, SASP1.2, SASP1.3, Goal GRST2, Goal WHST2
HRCM7: Restore at least 5,000 acres of tidal marsh within the South Delta ROA.	ECSY2.1, ECSY5.1, NACO1.2, DESM1.2, LOSM1.2, CHIN2.2, CHIN3.1, STEE2.2, STEE3.1, SASP1.2, Goal WHST2
HRCM8: Restore at least 1,400 acres tidal marsh within the East Delta ROA.	ECSY2.1, ECSY5.1, NACO1.2, DESM1.2, LOSM1.2, CHIN2.2, CHIN3.1, STEE2.2, STEE3.1, SASP1.2, Goal WHST2
HRCM9: Restore at least 7,000 acres of brackish tidal marsh within the Suisun Marsh Restoration Opportunity Area.	ECSY2.1, ECSY5.1, NACO1.2, DESM1.2, LOSM1.2, CHIN2.1, CHIN2.2, CHIN3.1, STEE2.1, STEE2.2, STEE3.1, SASP1.2, SASP1.3, Goal GRST2, Goal WHST2
HRCM##. Enhance channel margin habitats along at least 20 linear miles of Delta channel banks.	ECSY2.1, ECSY3.1, ECSY5.1, NACO1.3, DESM1.2, LOSM1.2, CHIN1.1, CHIN2.1, CHIN2.2, CHIN3.1, STEE1.1, STEE1.2, STEE2.1, STEE2.2, STEE3.1, SASP1.1, SASP1.2
HRCM15: Enhance channel margin habitats along non-Project levees in the Delta to improve habitat conditions for covered fish species.	ECSY2.1, ECSY3.1, ECSY5.1, NACO1.3, DESM1.2, LOSM1.2, CHIN1.1, CHIN2.1, CHIN2.2, CHIN3.1, STEE1.1, STEE1.2, STEE2.1, STEE2.2, STEE3.1, SASP1.1, SASP1.2
HRCM12: Enhance channel margin habitats along Steamboat and Sutter Sloughs to improve habitat conditions for covered fish species.	ECSY2.1, ECSY3.1, ECSY5.1, NACO1.3, DESM1.2, LOSM1.2, CHIN1.1, CHIN2.1, CHIN3.1, STEE1.1, STEE2.1, STEE3.1, SASP1.1, SASP1.2
HRCM13: Enhance channel margin habitats along the San Joaquin River between Vernalis and Mossdale to improve habitat conditions for covered fish species.	ECSY2.1, ECSY3.1, ECSY5.1, NACO1.3, DESM1.2, LOSM1.2, CHIN2.2, CHIN3.1, STEE1.2, STEE2.2, STEE3.1, SASP1.1, SASP1.2
HRCM11/HRCM14: Restore at least 5,000 acres of riparian forest and scrub in Restoration Opportunity Areas.	ECSY2.1, ECSY5.1, NACO1.3, DESM1.2, LOSM1.2, CHIN1.1, CHIN1.2, CHIN1.3, CHIN2.1, CHIN2.2, STEE1.1, STEE1.2, STEE2.1, STEE2.2
HRCM1/HRCM2: Restore seasonally inundated floodplain habitat along the San Joaquin River downstream of Vernalis.	ECSY2.1, ECSY5.1, NACO1.1, DESM1.2, LOSM1.2, CHIN2.2, CHIN3.1, STEE2.2, STEE3.1, SASP1.1, SASP1.2
HRCM3: Restore seasonally inundated floodplain habitat along Old and/or Middle Rivers.	ECSY2.1, ECSY5.1, NACO1.1, DESM1.2, LOSM1.2, CHIN2.2, CHIN3.1, STEE2.2, STEE3.1, SASP1.1, SASP1.2
HRCM17: Create and operate a new flood bypass in east of the Sacramento Deep Water Ship Channel to restore seasonally inundated floodplain habitat.	ECSY1.4, ECSY2.1, ECSY5.1, NACO 1.1, DESM1.1, DESM1.2, CHIN1.1, CHIN2.1, CHIN3.1, STEE1.1, STEE2.1, SASP1.1, SASP1.2, SASP1.4

DRAFT

Table 3.3. Summary Table of Conservation Measures and their Relationship to Biological Objectives

Conservation Measure	*Biological Objectives Addressed*
Other Stressors Conservation Measures *(described in Section 3.4.3)*	
OSCM1: Determine whether ammonia and ammonium have adverse direct and/or indirect effects on BDCP covered species and, if adverse effects are found, assist wastewater treatment plants in identifying funding sources to reduce the load of ammonia and ammonium in effluent discharges.	ECSY2.1, ECSY4.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.1, CHIN1.2, CHIN1.3, CHIN2.1, CHIN2.2, STEE1.1, STEE1.2, STEE2.1, STEE2.2, SASP1.1, SASP1.2, Goal RILA1, Goal PALA1
OSCM2: Determine whether endocrine disrupting compounds have adverse direct and/or indirect effects on BDCP covered species and, if adverse effects are found, assist wastewater treatment plants in identifying funding sources to reduce the load of endocrine disrupting compounds in effluent discharges.	ECSY4.1, DESM1.1, LOSM1.1, SASP1.1, SASP1.2, Goal GRST1, Goal WHST1, Goal RILA1, Goal PALA1
OSCM3: Reduce the load of methyl mercury entering Delta waterways.	ECSY4.1, SASP 1.1, Goal RILA1, Goal PALA1
OSCM4: Reduce the load of agricultural pesticides and herbicides entering Delta waterways from in-Delta sources that are believed to be toxic to covered fish species and the food organisms upon which they depend.	ECSY2.1, ECSY4.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.1, CHIN1.2, CHIN1.3, CHIN2.1, CHIN2.2, STEE1.1, STEE1.2, STEE2.1, STEE2.2, SASP1.1, Goal RILA1, Goal PALA1
OSCM5: Reduce the loads of toxic contaminants in stormwater and urban runoff by working with existing efforts in the Delta.	ECSY2.1, ECSY4.1, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.1, CHIN1.2, CHIN1.3, CHIN2.1, CHIN2.2, STEE1.1, STEE1.2, STEE2.1, STEE2.2, SASP 1.1, Goal RILA1, Goal PALA1
OSCM7: Maintain dissolved oxygen levels above levels that impair covered fish species in the Stockton Deep Water Ship Channel during periods when covered fish species are present.	ECSY5.1, CHIN1.2, CHIN1.3, Goal CHIN4, STEE1.2, Goal STEE4
OSCM8: Improve the quality of water discharged from managed seasonal wetlands into Suisun Bay and Delta waterways to prevent dissolved oxygen sags.	ECSY4.1, DESM1.1, LOSM1.1, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, SASP1.1
OSCM10: Reduce the risk for future introductions of non-native aquatic organisms from recreational watercraft.	ECSY3.2, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.1, CHIN1.2, CHIN1.3, CHIN2.1, CHIN2.2, STEE1.1, STEE1.2, STEE2.1, STEE2.2, SASP1.1, Goal RILA1, Goal PALA1
OSCM11: Improve the rapid detection of and rapid response to new non-native species introductions into Delta waterways.	ECSY3.2, DESM1.1, DESM1.2, LOSM1.1, LOSM1.2, CHIN1.1, CHIN1.2, CHIN1.3, CHIN2.1, CHIN2.2, STEE1.1, STEE1.2, STEE2.1, STEE2.2, SASP1.1, Goal RILA1, Goal PALA1
OSCM13: Remove non-native submerged and floating aquatic vegetation from Delta waterways.	ECSY3.1, DESM1.1, LOSM1.1, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, Goal STEE4, SASP1.1, SASP1.2
OSCM14: Increase the harvest of non-native predatory fish to decrease their abundance.	ECSY3.1, GECF1.2, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, SASP1.2
OSCM16: Reduce illegal harvest of Chinook salmon, Central Valley steelhead, green sturgeon, and white sturgeon in the Delta.	GECF1.2, LOSM1.1, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, Goal GRST1, Goal WHST3
OSCM17: Reduce adverse effects of harvest on Sacramento splittail abundance.	GECF1.2, SASP 1.1
OSCM18: Develop and implement hatchery and genetic management plans to minimize the potential for genetic and ecological impacts of hatchery reared salmonids on wild salmonid stocks.	GECF2.1, CHIN3.1, STEE3.1
OSCM19: Reduce losses of wild stocks of Chinook salmon to commercial fishing and recreational fishing through a mark-select fishery.	GECF1.2, GECF2.1, Goal CHIN4
OSCM20: Establish new and expand existing conservation propagation programs for Delta and longfin smelt.	GECF2.2, DESM1.1, LOSM1.1

DRAFT

Table 3.3. Summary Table of Conservation Measures and their Relationship to Biological Objectives

Conservation Measure	*Biological Objectives Addressed*
Other Stressors Conservation Measures *(described in Section 3.4.3) (continued)*	
OSCM21: Screen, remove, relocate, consolidate, modify and/or alter timing of non-project diversions to reduce entrainment of covered fish species in the Delta.	ECSY2.1, GECF1.1, DESM1.1, LOSM1.1, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, SASP1.1, SASP1.2, Goal RILA1, Goal PALA1
OSCM24: Reduce the effects of predators on covered fish species by conducting localized predator control of high predator density locations.	ECSY3.1, DESM1.1, LOSM1.1, CHIN1.1, CHIN1.2, CHIN1.3, STEE1.1, STEE1.2, SASP1.1
OSCM25: Improve the survival of outmigrating juvenile salmonids by using non-physical barriers to re-direct them away from channels in which survival is lower.	GECF1.1

DRAFT

Adaptive Management Considerations. This section describes adaptive management-related elements that are associated with each of the conservation measures.

[***Note to Reviewers:*** *The naming convention for conservation measures (e.g., codes "HRCM1," "HRCM2") is retained here to allow for tracking of conservation measures through various changes, additions, deletions, and reorganizations over the past 1½ years of plan development. This complex approach to naming and numbering conservation measures has served its purpose and will be simplified as conservation measures become more stable in their form going into the administrative draft HCP/NCCP*].

Process of Development

The BDCP conservation measures were developed on the basis of the best available scientific and commercial information, including input of a broad range of technical experts and an extensive body of scientific study and analysis compiled over the past several decades. The conservation measures further reflect the recommendations of independent scientists with extensive knowledge of Delta ecological issues.

The BDCP conservation measures were initially developed by groups of technical experts convened by the Steering Committee. To guide initial development of potential conservation measures, these experts, based on review of the body of relevant scientific information and input from the Fishery Agencies and topical experts, identified important environmental stressors affecting the covered fish species and aquatic ecosystem. The groups then identified the range of potential conservation measures that could reduce or remove the effects of these stressors on the covered fish species. The conservation measure development process was informed through application of several tools and processes described in the following paragraphs. Following development of a range of potential conservation measures, the groups iteratively screened and refined the conservation measures based on evaluations of their likely biological effectiveness and implementability.

[***Note to reviewers:*** *Conservation measures for wildlife and plant species and non-tidal natural communities are under development. This section will be revised in subsequent document versions to describe that process.*]

A large body of information on the Delta ecosystem and approaches to ecosystem and species conservation has been developed over many years that provided a starting point for the development of the BDCP conservation measures. Important sources of scientific information and conservation approach ideas included the CALFED Bay Delta Program, particularly the Science Program and Ecosystem Restoration Program; the Interagency Ecological Program; two reports on the Delta prepared by the California Public Policy Institute; the Delta Vision Program, various plan and technical documents; and the Delta Risk Management Strategy. Building on this knowledge base, the BDCP conservation measures were developed using additional investigations, state-of-the-art physical models, specially developed conceptual models, and expert input from a large number of scientists and resource managers.

On several occasions, the BDCP plan participants convened these scientists to provide guidance and insight on a range of issues important to the development of a comprehensive conservation strategy for the BDCP. The recommendations of these advisors are reflected in many of the conservation measures set out in this section (see *BDCP Independent Science Advisors Report,*

DRAFT

November 16, 2007 [Appendix X]; the *BDCP Independent Science Advisors Report Concerning Non-aquatic Species, November 2008* [Appendix X]; and the *BDCP Independent Science Advisors Report on Adaptive Management, February 2009* [Appendix X]).

At several stages in the development of the conservation measures, the plan participants conducted interim evaluations to assess the potential for measures under consideration to improve ecological conditions within the Delta. Central to this assessment were the conceptual ecological models and detailed evaluation processes that were developed under the CALFED Ecosystem Restoration Program to gauge the likely effect of potential actions on Delta fish and ecosystem processes. This process, known as the Delta Regional Ecosystem Restoration Implementation Plan (DRERIP) Scientific Evaluation Process, was used to evaluate draft BDCP conservation measures in December 2008-March 2009 (see Appendix X, *DRERIP Evaluations of BDCP Draft Conservation Measures Summary Report*). Under the DRERIP process, potential conservation measures were evaluated individually to assess their benefits and drawbacks without factoring in potential synergies with other actions. To account for interrelationships with other potential measures, the plan participants formed the BDCP Synthesis Team to review the results of the DRERIP process and identify instances in which combinations of measures would likely provide benefits greater than the sum of the individual measures. The Synthesis Team assessed potential synergies and conflicts between various measures and suggested modifications to the draft conservation measures to improve the overall effectiveness of measures. Based on input from the DRERIP Evaluation and the Synthesis Team, the conservation measures were revised to improve potential effectiveness.

DRAFT