Working Draft
Preliminary Conceptual Conservation Strategy Alternatives
(revised to incorporate new alternatives recommended at the 2/26/07 meeting)

Note to Reviewers: This table provides a list of preliminary conceptual conservation strategy alternatives (CSA's) for the BDCP. Each alternative is based on a different major conservation "theme." While some alternatives may comprise a nearly full conservation strategy, combinations of alternatives are expected to be needed to constitute a complete strategy for the BDCP. Identification of conservation benefits and constraints/issues is preliminary and does not represent a comprehensive assessment. Alternative elements described in the table that would need to be implemented upstream or downstream of the BDCP Planning Area (i.e., the Legal Delta) would only be undertaken in collaboration with willing participants.

Key Elements	Conservation Benefits	Conservation Constraints/Issues
Conservation Strategy Alternative (CSA) 1—Operations Modifications with Existing Conveyance Configuration **Key Assumption: in-Delta levels of entrainment and aquatic habitat conditions are the primary stressors suppressing covered fish species populations.**		
▪ Re-operation of pumps to reduce or avoid impacts on fish during sensitive time period ▪ Re-operation of upstream storage facilities to improve in-stream flows and cold water pool management for benefit of riverine fish and increase Delta in-flow for benefit of estuarine fish ▪ Removal and consolidation of diversions ▪ Increased and improved screening of in-Delta diversions ▪ Opportunistic habitat restoration on channel-side of levees (no island restoration) ▪ Improvements to louver facilities at SWP and CVP pumps ▪ Improvements to fish salvage operations	▪ Reduction of take of key species ▪ Improvement of flow-related habitat conditions both upstream and in the Delta ▪ Improvement to existing estuarine habitat conditions	▪ Limited opportunity for restoration due to limited extent of channels as compared to islands ▪ Limited flexibility for fluctuating delta hydrology (including salinity) due to maintaining existing through-delta conveyance and in-delta pump operation

Key Elements	Conservation Benefits	Conservation Constraints/Issues
CSA 2—In-Delta Habitat Restoration under Existing Operations **Key Assumption: the limited extent and quality of in-Delta floodplain and aquatic habitat are the primary stressors suppressing covered fish species populations.**		
▪ In-Delta Levee setbacks for purpose of floodplain restoration (including riparian, marsh, and open water) ▪ Extensive restoration of existing farmed islands to aquatic, marsh, and/or open water habitat by re-flooding (primarily focused on northern and eastern Delta, to avoid adverse salinity effects on water quality at pumps) ▪ Opportunistic habitat restoration during normal levee maintenance activities	▪ Increase in floodplain habitat in-Delta (i.e., increase habitat for key species)	▪ Limited flexibility for fluctuating hydrology (including salinity) due to maintaining existing operations ▪ Benefits of habitat restoration are constrained for some species by limiting restoration to north and east delta to maintain water quality (freshwater) at pumps ▪ Does not address pumping effects on fish ▪ Possible loss of high value habitat for terrestrial and wetlands species supported by farmland at habitat restoration sites
CSA 3—Opportunistic Exports with In-Delta Habitat Restoration **Key Assumption: in-Delta levels of entrainment; flow-related, floodplain, and aquatic habitat conditions; and existing in-Delta freshwater conditions are the primary stressors suppressing covered fish species populations.**		
▪ Increased pumping capacity to take advantage of high flow episodes, limited or no pumping at other times ▪ Increased conveyance capacity south of Delta ▪ Additional south-of-Delta storage facilities and infrastructure will be necessary to opportunistically store high flows ▪ Re-operate DCC for ecological benefits ▪ Levee setbacks for purpose of floodplain restoration (including riparian, marsh, and open water) ▪ Restoration of existing farmed islands to aquatic, marsh, and/or open water habitat by re-flooding (primarily focused on northern and eastern Delta, to avoid adverse salinity effects on freshwater quality) ▪ Opportunistic habitat restoration during normal levee maintenance activities	▪ Reduced impacts of south Delta pumps (SWP and CVP) on key species, because of reduced entrainment and salvage loss ▪ Maximized benefits to fish of DCC operation ▪ More natural hydrology (including salinity) throughout year ▪ Takes advantage of climate change-related flow changes (i.e., more rain/less snow) ▪ Increased diversion during high flows reduces relative impact on species during regular and low flows ▪ Provides more flexibility to manage river storage for the benefit of fisheries ▪ Increase in floodplain habitat in Delta (i.e., increase habitat for key species)	▪ Ecological (aquatic and terrestrial) impacts due to construction and operation of new south-of-Delta storage facilities ▪ Possible adverse water quality effects in south and central Delta when DCC is closed ▪ Continued entrainment of fish at pumps during high flow periods ▪ Benefits of habitat restoration is constrained for some species by limiting habitat restoration to north and east delta to maintain water quality ▪ Possible loss of high value habitat for terrestrial and wetlands species supported by farmland

Key Elements	Conservation Benefits	Conservation Constraints/Issues
CSA 4—South Delta Aqueduct (SDA) with In-Delta Habitat Restoration **Key Assumption: in-Delta levels of entrainment; flow-related, floodplain, and aquatic habitat conditions; existing in-Delta freshwater conditions; and extent and quality of in-Delta floodplain and aquatic habitat are the primary stressors suppressing covered fish species populations.**		
▪ Peripheral aqueduct ("South Delta Aqueduct") from Sacramento River (near Hood) with discharge into lower San Joaquin River ▪ Interim in-Delta habitat restoration and system operations during SDA construction ▪ Modified operations to more closely mimic natural hydrologic conditions (salinity, flow, temperature) ▪ Levee setbacks for purpose of floodplain restoration (including riparian, marsh, and open water) ▪ Restoration of existing farmed islands to aquatic, marsh, and/or open water habitat by re-flooding (focused Delta-wide where restoration benefits are greatest) ▪ Opportunistic habitat restoration during normal levee maintenance activities ▪ Reconfiguration of Delta for ecosystem benefits and long-term management after construction of SDA ▪ Re-operation of rivers to support Delta inflow	▪ Improved water quality in the lower San Joaquin River ▪ Allows for fluctuating hydrology (including salinity) in northern and western Delta (increased San Joaquin River flows used to maintain freshwater in southern Delta near pumps) ▪ Increase in floodplain habitat in Delta (i.e. increase habitat for key species) ▪ Increased opportunity and flexibility for in-Delta habitat restoration activities and operations for in-flow	▪ Ability to alter Delta island structure for conservation is limited ▪ False attraction for salmonids resulting from Sacramento water flowing out of San Joaquin River ▪ Does not fully address pumping effects (does not isolate CVP and SWP pumps from Delta) ▪ Extent that natural hydrology can be restored is limited (results in separation of Delta into two managed systems) ▪ Entrainment in north Delta at new Sacramento River diversion (near Hood) ▪ Possible loss of high value habitat for terrestrial and wetlands species supported by farmland ▪ Reduced sediment to Delta (possible) ▪ Ecological impacts due to construction and operation of the SDA

Key Elements	Conservation Benefits	Conservation Constraints/Issues
CSA 5—Isolated Facility (IF) with In-Delta Habitat Restoration **Key Assumption: in-Delta levels of entrainment; flow-related, floodplain, and aquatic habitat conditions; existing in-Delta freshwater conditions; and extent and quality of in-Delta floodplain and aquatic habitat are the primary stressors suppressing covered fish species populations.**		
▪ Diversion on Sacramento River at Hood with isolated facility (i.e., "peripheral canal") that isolates Clifton Court Forebay and SWP and CVP pumps ▪ Interim in-Delta habitat restoration and system operations during IF construction ▪ Modified operations to more closely mimic natural hydrologic conditions (salinity, flow, temperature) ▪ Levee setbacks for purpose of floodplain restoration (including riparian, marsh, and open water) ▪ Restoration of existing farmed islands to aquatic, marsh, and/or open water habitat by re-flooding (focused Delta-wide where restoration benefits are greatest) ▪ Opportunistic habitat restoration during normal levee maintenance activities ▪ Reconfiguration of Delta for ecosystem benefits, large-scale habitat restoration, and long-term management after construction of IF ▪ Re-operation of rivers to support Delta inflow	▪ Substantial increase in quality and availability of aquatic, marsh, and riparian habitat when compared to baseline conditions ▪ Increase in organic production in Delta area ▪ Reduced entrainment in south Delta ▪ Restoration of fluctuating hydrology (including salinity) ▪ Increased opportunity and flexibility for in-Delta habitat restoration activities and operations for in-flow ▪ Restoration of east-west flow and more natural Delta ecosystems ▪ Decrease in non-native invasives (possible) ▪ Reduced concentration of covered species at pumps as targets for predation	▪ Entrainment in north Delta at new Sacramento River diversion (near Hood) ▪ Possible loss of high value habitat for terrestrial and wetlands species supported by farmland ▪ Reduced sediment to Delta (possible) ▪ Increase in non-native invasives (possible) ▪ Ecological impacts due to construction and operation of the IF
CSA 6—Suisun Marsh Habitat Restoration in Combination with In-Delta Restoration **Key Assumption: the extent and quality of in-Delta floodplain and aquatic habitat and tidal marsh and aquatic habitat conditions in Suisun Marsh/Bay are the primary stressors suppressing covered fish species populations.**		
▪ Conversion of diked wetlands to tidal wetlands in Suisun Marsh ▪ Removal of salinity control structures in Suisun Marsh ▪ In-Delta habitat restoration similar to CSA 2, but at a reduced extent because of conservation efforts in Suisun Marsh	▪ Expansion of aquatic habitat (floodplain, brackish marsh, and open water) ▪ Expansion of saltmarsh and associated species ▪ Increased habitat diversity within estuarine ecosystem (distributed habitats) ▪ Increased long-term resilience and resistance to stochastic events due to increased habitat diversity and extent ▪ Similar in-Delta benefits as CSA 2, but less magnitude	▪ Loss of waterfowl habitat within Suisun Marsh managed wetlands ▪ Vulnerability of restored habitats to sea level rise ▪ Similar constraints as CSA 2, but less magnitude

Key Elements	Conservation Benefits	Conservation Constraints/Issues
CSA 7—Upstream Habitat Restoration in Combination with In-Delta Restoration **Key Assumption: the extent and quality of in-Delta floodplain and aquatic habitat and fish passage and aquatic habitat conditions in upstream areas are the primary stressors suppressing covered fish species populations.**		
▪ Improving passage and access to upstream habitats ▪ Restoration of spawning habitat (e.g., gravel augmentation) ▪ Expansion of river floodplain habitat including creation and expansion of new floodways ▪ Isolation of captured gravel pits ▪ Installation of screens on river diversions ▪ Removal of bank protection to reestablish floodplain processes ▪ Restoration of riparian habitat including shaded riverine ▪ Modified operations to support in-stream flows and cold water pool management ▪ In-Delta habitat restoration similar to CSA 2, but at a reduced extent because of conservation efforts in upstream areas	▪ Increased spawning and rearing habitat for salmonids and other riverine fishes, including large woody debris for cover ▪ Reduction in fish mortality (due to better screens) ▪ Creates connectivity and greater opportunity for benefits to riparian wildlife species ▪ Improvements in the ecosystem processes beneficially affecting river and Delta habitat (e.g., organic and sediment input) ▪ Similar in-Delta benefits as CSA 2, but less magnitude	▪ Greater emphasis on anadromous vs. estuarine species benefits ▪ Long-term effectiveness relatively more affected by changes in seasonal runoff patterns resulting from climate change ▪ Reduction in upland habitat ▪ Similar constraints as CSA 2, but less magnitude

Key Elements	Conservation Benefits	Conservation Constraints/Issues
CSA 8—Bifurcated SDA with In-Delta Restoration **Key Assumption: in-Delta levels of entrainment; flow-related, floodplain, and aquatic habitat conditions; and existing in-Delta freshwater conditions are the primary stressors suppressing covered fish species populations.**		
▪ Peripheral aqueduct from Sacramento River (near Hood) with a connector to Clifton Court Forebay that isolates the SWP and CVP pumps (smaller discharge than under CSA 5) and a connector that discharges into lower San Joaquin River (smaller discharge than under CSA 4 ▪ Re-operation of rivers to support Delta in-flow ▪ In-Delta interim and long-term operations, habitat restoration, and management similar as described in CSA 4	▪ Improved water quality in the lower San Joaquin River, but not as great as under CSA 4 ▪ Allows for fluctuating hydrology (including salinity) in northern and western Delta (increased San Joaquin River flows used to maintain freshwater in southern Delta near pumps) ▪ Reduced entrainment in south Delta, but not as great as under CSA 5 ▪ Increase in floodplain habitat in Delta (i.e. increase habitat for key species) ▪ Increased opportunity and flexibility for in-Delta habitat restoration activities and operations for in-flow	▪ Ability to alter Delta island structure for conservation is limited ▪ False attraction for salmonids resulting from Sacramento water flowing out of San Joaquin River, but less than under CSA 4 ▪ Does not fully address pumping effects (does not fully isolate CVP and SWP pumps from Delta) ▪ Extent that natural hydrology can be restored is limited (results in separation of Delta into two managed systems), but greater than under CSA 4 ▪ Entrainment in north Delta at new Sacramento River diversion (near Hood) ▪ Possible loss of high value habitat for terrestrial and wetlands species supported by farmland ▪ Reduced sediment to Delta (possible) ▪ Ecological impacts due to construction and operation of the bifurcated SDA (greater than under CSAs 4 and 5)

Key Elements	Conservation Benefits	Conservation Constraints/Issues
CSA 9—Dual Conveyance with In-Delta Restoration **Key Assumption: in-Delta levels of entrainment; flow-related, floodplain, and aquatic habitat conditions; and existing in-Delta freshwater conditions are the primary stressors suppressing covered fish species populations.**		
▪ Improvements/maintenance of through Delta conveyance facilities ▪ Diversion on Sacramento River at Hood with isolated facility (i.e., "peripheral canal") that isolates Clifton Court Forebay and SWP and CVP pumps (of lesser capacity than under CSA 5) ▪ Re-operation of pumps to reduce or avoid impacts on fish during sensitive time period ▪ Modified operations to more closely mimic natural hydrologic conditions (salinity, flow, temperature) ▪ Levee setbacks for purpose of floodplain restoration (including riparian, marsh, and open water) ▪ Restoration of existing farmed islands to aquatic, marsh, and/or open water habitat by re-flooding (focused Delta-wide where restoration benefits are greatest) ▪ Opportunistic habitat restoration during normal levee maintenance activities ▪ Re-operation of rivers to support Delta inflow	▪ Reduced entrainment in south Delta, but not as great as under CSA 5 ▪ Restoration of fluctuating hydrology (including salinity) , but not as great as under CSA 5 ▪ Increased opportunity and flexibility for in-Delta habitat restoration activities and operations for in-flow ▪ Reduced concentration of covered species at pumps as targets for predation (possible) ▪ Increase in floodplain habitat in Delta (i.e. increase habitat for key species) ▪ Increased opportunity and flexibility for in-Delta habitat restoration activities and operations for in-flow	▪ Entrainment in north Delta at new Sacramento River diversion (near Hood) ▪ Possible loss of high value habitat for terrestrial and wetlands species supported by farmland ▪ Ecological impacts due to construction and operation of the IF ▪ Ability to alter Delta island structure for conservation is limited ▪ Does not fully address pumping effects (does not fully isolate CVP and SWP pumps from Delta) ▪ Extent that natural hydrology can be restored is limited