BDCP Effects Analysis: SAIC Team Summary of Findings for Covered Fish Species

Steering Committee Meeting

October 21, 2010

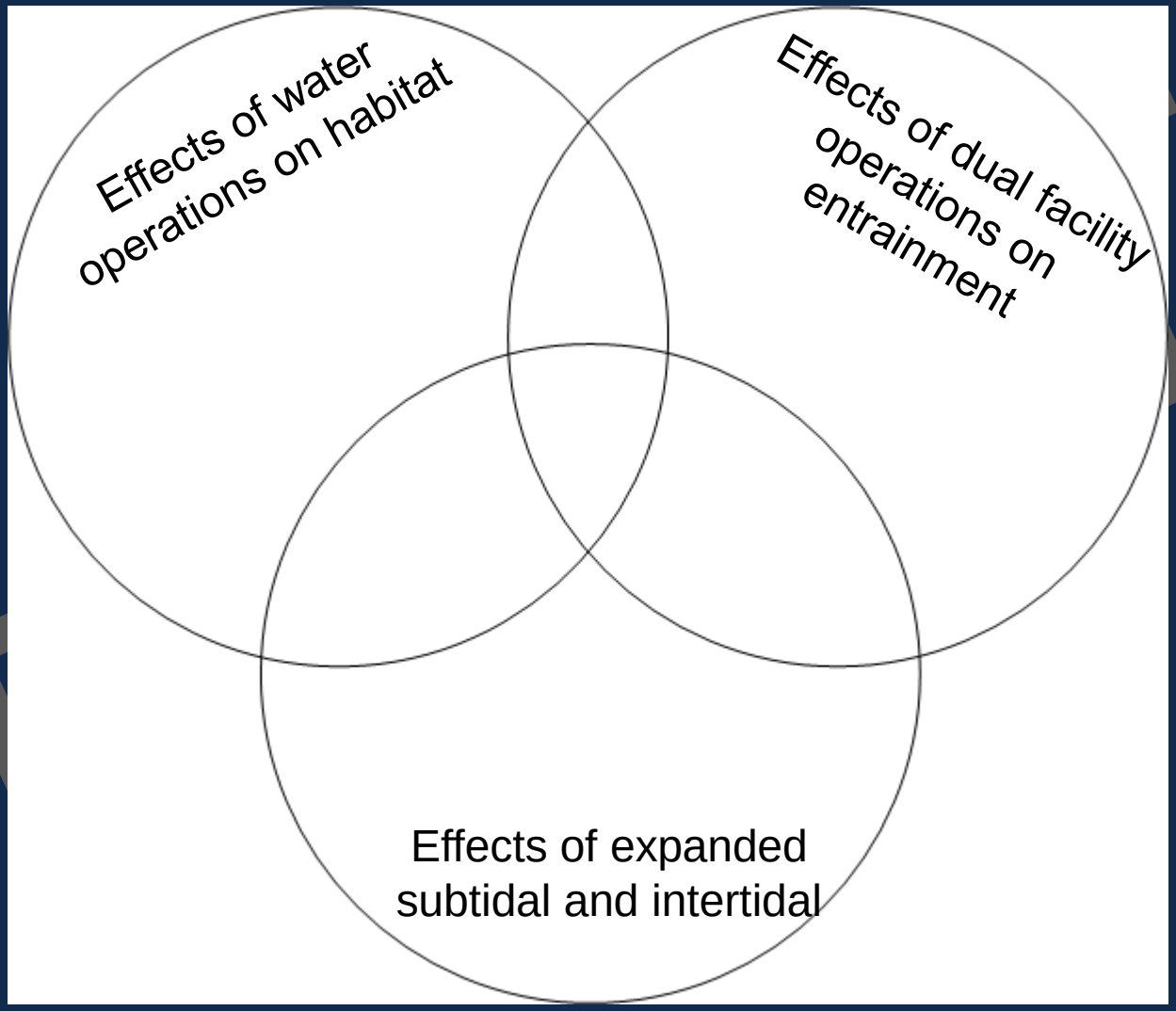
Summary of Findings

- SAIC consultant team work product
- Findings are based on the August 19 BDCP effects analysis and September 9, 2010 expanded habitat analysis
- Findings do not reflect revisions that may take place as a result of comments received and discussions during the Theme Team meetings
- Summary of findings has not been approved or endorsed by
  - State or Federal resource agencies
  - PREs
  - NGOs
- Findings identify areas of the project description that may benefit from further analysis and refinement
- Findings are subject to revision

Process to Date

- Jul 30: Steering Committee presentation of Preliminary Results of Effects Analysis
- Aug 19: Draft Effects Analysis released to Effects Analysis Managers
- Sep 9: Draft Enhanced Habitat Analysis released to Effects Analysis Managers
- Oct 7: Steering Committee presentation of preliminary recommendations for potential refinements

Package of Conservation Actions



Scope of Recommended Areas for Further Consideration

- North Delta intake configuration
- Increased spring-run salmon egg mortality
- Reduced Sacramento River flows downstream of the intakes
- Refinement of April-May south Delta operations
- Winter-spring X2 and outflow effects on longfin smelt
- Summer and fall X2 and delta smelt habitat

Conservation Measure Refinements

- Further analysis and refinement of several conservation measures and operations is underway
- Refinements are expected to reduce and avoid adverse effects on covered fish
- Adaptive range and monitoring will inform refinements and reduce uncertainty
- Summary findings assume that changes in operations and habitat can be accomplished as part of plan formulation that will cumulatively reduce stressors and contribute to increased abundance

Overall Findings

- Implementation of BDCP actions is expected to appropriately minimize and mitigate the effects of covered activities and contribute to species recovery
- Dual facility operations will result in reduced risk of south Delta entrainment: the magnitude of benefit varies among species and lifestages
- The BDCP Conservation Strategy preserves upstream habitat conditions – instream flows and water temperatures, although refinements to water temperature management for spring-run eggs would be beneficial
- The BDCP Conservation Strategy will preserve and restore large-scale geographically distributed seasonal floodplain, intertidal, subtidal, and channel margin habitat, however, the performance of restored habitats has not been tested

Overall Findings

- Increased habitat diversity and complexity offers increased opportunity for diverse life histories based on results from other habitat restoration projects in other estuaries

- Cumulative reduction in many stressors that adversely affect species survival and growth will contribute to improved Delta habitat conditions and species recovery

Contribution to Recovery

- The BDCP conservation measures are expected to result in a contribution to recovery of:
  - Delta and longfin smelt – reduced risk of entrainment losses for juvenile and adult smelt and improved Delta hydrodynamics were observed; the potential adverse effects of changes in late winter X2 on longfin smelt continue to be evaluated
  - Winter-run Chinook salmon - expansion and enhancement of juvenile rearing habitat within the Delta, and improved Delta hydrodynamics were observed

Contribution to Recovery

- Sacramento splittail - expansion and enhancement of suitable floodplain habitat for spawning and rearing, reduced risk of entrainment, and improved Delta hydrodynamics were observed
- Fall-run/late fall-run Chinook salmon - expansion and enhancement of juvenile rearing habitat within the Delta, improved Delta hydrodynamics, and reduced risk of entrainment were observed
- Green and white sturgeon - expansion and enhancement of rearing and foraging habitat and reduced risk of entrainment were observed
- Central Valley steelhead - reduced risk of entrainment for Sacramento and San Joaquin Basin juvenile steelhead and improved Delta hydrodynamics were observed.

Contribution to Recovery

- The conservation measures would provide benefits and would not prohibit recovery for spring-run Chinook salmon (primarily through reduction in Delta stressors) or Pacific and river lamprey (primarily through reduced entrainment)

- The BDCP conservation strategy would contribute to cumulative biological benefits as a result of the reduction in stressors adversely impacting the covered species and their habitat (e.g., reduction in predation and exposure to toxics)

- A key element of the conservation strategy is the expansion of access to seasonally inundated floodplain, intertidal and subtidal aquatic habitat.

Expanded Aquatic Habitat

- Habitat expansion and enhancement would result in:
  - Greater habitat diversity and complexity and substantially expanded physical habitat to support spawning and rearing
  - Alternative migratory pathways
  - Opportunities for covered fish species to express a wider range and diversity of life history characteristics (e.g., extended rearing for salmon fry within the Delta and wider range of ocean entry times)
  - Access to low velocity, shallow water habitat suitable for juvenile rearing)
  - Increased production of nutrients, organic matter, phytoplankton, zooplankton, and macroinvertebrates that serve as food resources for covered fish, both within the habitat as well as over a large area of the Delta

Expanded Aquatic Habitat

- The performance of expanded aquatic habitat in meeting the desired biological goals and objectives is affected by the:
  - Scale of habitat restoration
  - Wide geographic distribution and variety of habitat types
  - Ability to design habitats that have diverse and complex habitat characteristics (range of water depths, seasonal range in salinity gradients, tidal and river flows and flushing, water velocities, habitat complexity and diversity, wind and wave induced turbidity, hydraulic residence time, and other factors)
  - Colonization and use of these expanded habitats by native and non-native species

Expanded Aquatic Habitat

- There are uncertainties in the design and functional performance of large-scale aquatic habitat restoration projects that have not been tested within the Bay-Delta
- Recognizing these uncertainties, BDCP includes development of a measureable set of goals and objectives, performance metrics, monitoring, and adaptive management actions
- The initial restoration actions would be designed in a modular format to allow testing and monitoring representative (e.g., 500 to 1,000 acre) restoration areas
- Monitoring and subsequent refinements to habitat designs will reduce uncertainty and reduce and avoid, to the extent possible, adverse effects of expanded habitat within the Delta (e.g., areas colonized by *Egeria*, *Corbula*, or non-native predators)

Water Diversion Conservation Actions

- Design, operations, and location of north Delta intakes is expected to reduce the risk of entrainment or impingement of all life stages of covered fish at the north Delta intakes to negligible levels
- Removal of non-project diversions as a result of habitat restoration will provide marginal benefit
- Consolidation and screening selected diversions would provide incremental fish benefits
- Transition of Mirant's Contra Costa and Pittsburg Power Plants to closed cycle cooling will reduce and avoid entrainment and impingement of covered fish

Predator Removal

- Localized removal of predators associated with pilings and abandoned boat removal will provide a negligible benefit to covered fish.
- More intensive regional predator removal and removal of predator “hot spots” would provide greater benefits to covered fish

Effects on Salinity (X2) - Fall

- River flows and Delta hydrodynamics influence the location of X2
- The location of X2 is projected to decline (move upstream) during the summer and fall of wet and above normal years
- There is substantial ongoing disagreement about the importance of X2 as an indicator of habitat availability for delta smelt
- Concern that upstream movement of X2 may create salinity conditions that disrupt delta smelt use of Suisun Marsh expanded habitat
- However, during periods when salinity in Suisun Bay is suitable for delta smelt it is expected that delta smelt would directly and indirectly benefit from expanded habitat within Suisun Marsh

Effects on Salinity (X2) - Fall

- During wetter years when fall X2 under BDCP operations would be located further upstream it is expected that pre-spawning adult delta smelt would benefit from expanded habitat located within the Cache Slough complex
- Acreage of X2 area shrinks in wetter years. Total habitat area in dryer years is increased. Overall biological significance is uncertain.

Higher X2 Position From Reduced Delta Outflow – Late Winter/Spring

- The BDCP Conservation Strategy will modify Delta hydrodynamics and move the position of X2 upstream during the late winter and spring
- Controlling for the effects of climate change, the projected declines in longfin smelt abundance due to the proposed project are 2-23%
- The relationship between flow, X2 location, and longfin smelt abundance, and abundance of several other pelagic fish, has degraded in recent years
- Increased habitat and associated increased food supplies may improve conditions for longfin smelt, but these effects are uncertain, particularly at the population level

Removal of Submerged Aquatic Vegetation (SAV)

- SAV has the potential to make habitat unsuitable for covered fish by encroaching on areas used for spawning and rearing, providing habitat for introduced predators, and reducing turbidity both within beds and in nearby areas
- SAV removal is an important secondary action to habitat restoration
- Without SAV removal, some portion of the intertidal and subtidal restored habitat will be colonized by SAV and become unsuitable for covered fish

Increased Predation Resulting From North Delta In-River Intakes

- The use of five in-river intake structures located in the north Delta would create conditions that attract predatory fish such as striped bass, and thus increase the risk of Sacramento River juvenile steelhead, salmon, and splittail to predation losses
- Actions that could reduce the predation risk include reconfiguration of the intakes to an on-bank design that reduces predator habitat

Reduced Reverse Flow Conditions

- BDCP dual facility operations will result in:
  - Substantial improvements in Old and Middle River (OMR) reverse flows within the south and central Delta
  - A net improvement in downstream flows through the Delta, particularly from the San Joaquin, Mokelumne, and Consumes river systems
  - These improvements in Delta hydrodynamics (reduced OMR reverse flows) are expected to result in substantial improvements in habitat conditions for all covered fish

No Adverse Upstream Impacts on Steelhead, Winter-run, Fall-run, and Late Fall-run Salmon

- No indirect adverse effects to upstream habitat were detected for steelhead, winter-run, fall-run, and late fall-run Chinook salmon in the Sacramento, Feather, and American rivers
- Small positive and negative changes were detected in the Sacramento and Feather rivers, such as reduced summer and fall flows in the Sacramento River relative to existing conditions; these changes would not be expected to have a substantial effect on salmonid life history (i.e., migration, spawning, and juvenile rearing)
- No changes in habitat were detected in other rivers including the Trinity, San Joaquin, and Stanislaus or Clear Creek or in non-CVP/SWP rivers including the Mokelumne, Consumes, Tuolumne, and Merced rivers, or Deer, Mill, Butte, Battle, and other tributary creeks

Increased Egg Mortality for Sacramento River Spring-run Salmon

- Egg mortality for spring-run Chinook salmon on the Sacramento River increased approximately 5 percent during ELT and 10 percent during LLT in wet, above normal, and below normal water years relative to existing conditions
- The majority of spring-run Chinook salmon spawn in tributaries: approximately 10% of the spring-run spawn in areas that would be affected by Shasta Reservoir operations
- Refinement in reservoir operations and coldwater pool management may reduce this effect, but potential operational changes have not been evaluated using the hydrologic and water temperature simulation models
- Habitat expansion in tributaries would benefit spring-run Chinook salmon and reduce effects on the Sacramento River

Uncertain Effects Related to Operation of North Delta Intake

- Sacramento River flows downstream of the north Delta intakes will be reduced under BDCP operations relative to existing conditions
- Flows will be reduced less during the winter than during the other seasons
- Flows will be reduced most in the wetter years, but will be increased in drier years
- Concerns have been expressed regarding potential adverse effects of reduced flows on downstream channel margin habitat
- It is uncertain whether the reduction in attraction and olfactory cues for upstream migrating adults salmonids and survival of downstream migrating juvenile salmonids is biologically significant

Habitat Benefits for Eastside Tributary Salmonids

- Intertidal habitat will be expanded in the lower regions of the Mokelumne and Cosumnes rivers in NT
- These expanded intertidal and subtidal habitats will then continue to function during the ELT and LLT to benefit east side steelhead and fall-run Chinook salmon, as well as other aquatic species
- Juvenile salmonids will also benefit from habitat expansion and enhancement in the western Delta and Suisun Marsh

Habitat Benefits for San Joaquin River Salmonids

- Expansion and enhancement of intertidal and subtidal habitat in the south Delta would benefit juvenile splittail, steelhead and Chinook salmon produced in the San Joaquin River basin
- Approximately 12,800 acres of acres aquatic habitat will be restored in the LLT
- Restoration floodplain habitat along the San Joaquin, Old, and Middle rivers will periodically (in years of flood events) provide rearing habitat for San Joaquin River salmonids
- Juvenile salmonids will benefit from habitat expansion and enhancement in the western Delta and Suisun Marsh

Effects of BDCP on Exposure to Toxics Uncertain

- The inundation regime on the Yolo Bypass will be altered, potentially increasing the rate of mercury methylation and uptake by prey organisms: BMPs as part of habitat restoration and management are expected to reduce the risk of adverse effects
- Certain actions set out in the BDCP will likely result in increased exposure of splittail and sturgeon to increased levels of selenium (selenate): the magnitude of the effect is uncertain, particularly at the population level
- Habitat restoration will decrease pyrethroid loading because agricultural land will be taken out of production: the potential benefits to covered fish are uncertain, particularly at the population level

Consistency with Recovery Planning

- The BDCP conservation strategy and actions are consistent with the conservation principles of recovery planning and will address many the stressors as identified in the NMFS and USFWS Recovery Plans Habitat
- BDCP actions are consistent with the long-term recovery goals for the covered species
- The BDCP Conservation Strategy will ensure that the effects of covered activities are appropriately minimized and mitigated
- Reduction in the cumulative stressors on covered fish is expected to contribute to improved survival and species recovery

Restoration of Habitat That Will Increase Abundance

- The BDCP actions are expected to contribute to increased abundance of covered fish through protection and enhancement of suitable upstream salmonid and sturgeon spawning and juvenile rearing habitats, increased floodplain habitat for splittail spawning, increased geographically distributed and complex habitats and food production within the Delta
- Increased access to expanded seasonal floodplain, tidal wetlands, and improved channel margin habitat is expected to contribute to increased juvenile growth and survival based on data collected in Yolo Bypass and restoration projects in other estuaries
- It is expected that these conservation actions will result in improved population growth rates and contribute to species recovery over a wide range of hydrologic and environmental conditions that occur within the Central Valley, however, these effects have not been quantified

Salmonid Independent Populations

- Conservation measures included as part of BDCP would not result in range expansion of salmonid populations into additional upstream habitats or the formation of additional independent salmonid spawning populations
- Habitat conditions and water operations would be complementary to the formation of additional Chinook salmon or steelhead populations within the Central Valley if that should occur in the future

Role of Adaptive Management

- As a comprehensive package of conservation measures, it is expected that certain actions set out in BDCP will contribute to the survival and recovery of Central Valley covered fish populations through cumulative reduction in stressors and improvements in habitat
- The magnitude of the effects of BDCP actions on species recovery has not been quantified
- Areas of uncertainty remain regarding the effectiveness of various individual conservation actions that will be addressed as part of BDCP implementation through monitoring, research, and adaptive management programs

Next Steps

- Review comments on the draft effects analysis provided by State and Federal resource agencies, PREs and NGOs
- Revise effects analyses in response to comments and suggestions
- Refine conservation actions to address, to the extent possible, areas where potentially adverse effects could be minimized or avoided or areas where increased benefits to covered species could be achieved