

TABLE OF CONTENTS AND EXPANDED EFFECTS ANALYSIS OUTLINE

List of Acronyms

List of Tables and Figures

1 INTRODUCTION

- 1.1 Background
- 1.2 Coordinated Operations Agreement
- 1.3 Key Consultation Considerations
- 1.4 Consultation History
- 1.5 Proposed Federal Action

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

- 2.1 Analytical Approach
- 2.2 Rangewide Status of the Species and Critical Habitat
- 2.3 Action Area
- 2.4 Environmental Baseline
- 2.5 Effects of the Action on the Species
 - 2.5.1 Stressors and Species Response
 - 2.5.1.1 Central Valley Salmonid Recovery Plan
 - 2.5.1.1.1 Passage Impediments/Barriers
 - 2.5.1.1.2 Harvest/Angling Impacts
 - 2.5.1.1.3 Water Temperature
 - 2.5.1.1.4 Water Quality
 - 2.5.1.1.5 Flow Conditions
 - 2.5.1.1.6 Loss of Riparian Habitat and Instream Cover
 - 2.5.1.1.7 Loss of Natural River Morphology and Function
 - 2.5.1.1.8 Loss of Floodplain Habitat
 - 2.5.1.1.9 Loss of Tidal Marsh Habitat
 - 2.5.1.1.10 Spawning Habitat Availability
 - 2.5.1.1.11 Physical Habitat Alternation
 - 2.5.1.1.12 Invasive Species/Food Web Changes
 - 2.5.1.1.13 Entrainment/Impingement
 - 2.5.1.1.14 Predation
 - 2.5.1.1.15 Hatchery Effects
 - 2.5.1.1.16 Research and Monitoring
 - 2.5.1.2 Southern Oregon/Northern California Coast Coho Recovery Plan
 - 2.5.1.2.1 Adverse Hatchery Related Effects
 - 2.5.1.2.2 Impaired Water Quality
 - 2.5.1.2.3 Degraded Riparian Forest
 - 2.5.1.2.4 Increased Disease/Predation/Competition
 - 2.5.1.2.5 Altered Sediment Supply

CVP/SWP Operations Biological Opinion

- 2.5.1.2.6 Lack of Floodplain and Chanel Structure
- 2.5.1.2.7 Altered Hydrologic Function
- 2.5.1.2.8 Barriers
- 2.5.1.2.9 Impaired Estuary/Mainstem Function
- 2.5.1.2.10 Adverse Fishery and Collecting Related Effects
- 2.5.1.3 Green Sturgeon Recovery Plan
 - 2.5.1.3.1 Passage Impediments/Barriers to Migration
 - 2.5.1.3.2 Altered Flow
 - 2.5.1.3.3 Altered Water Temperature
 - 2.5.1.3.4 Altered Sediment
 - 2.5.1.3.5 Altered Turbidity
 - 2.5.1.3.6 Take (Entrainment, Poaching & Bycatch)
 - 2.5.1.3.7 Contaminants
 - 2.5.1.3.8 Altered Prey Base
 - 2.5.1.3.9 Competition for Habitat
 - 2.5.1.3.10 Loss of Wetland Function
 - 2.5.1.3.11 Predation
 - 2.5.1.3.12 Water Depth Modification
 - 2.5.1.3.13 Disease
 - 2.5.1.3.14 Climate Change
 - 2.5.1.3.15 Research and Monitoring
- 2.5.1.4 Eulachon Recovery Plan
 - 2.5.1.4.1 Climate Change Impacts on Ocean Conditions
 - 2.5.1.4.2 Dams/Water Diversions
 - 2.5.1.4.3 Eulachon Bycatch
 - 2.5.1.4.4 Climate Change Impacts on Freshwater Habitat
 - 2.5.1.4.5 Predation
 - 2.5.1.4.6 Water Quality
 - 2.5.1.4.7 Catastrophic Events
 - 2.5.1.4.8 Disease
 - 2.5.1.4.9 Competition
 - 2.5.1.4.10 Shoreline Construction
 - 2.5.1.4.11 Tribal/First Nations Fisheries
 - 2.5.1.4.12 Non-indigenous species
 - 2.5.1.4.13 Recreational Harvest
 - 2.5.1.4.14 Commercial Harvest
 - 2.5.1.4.15 Scientific Monitoring
 - 2.5.1.4.16 Dredging
- 2.5.1.5 Southern Resident Killer Whale Recovery Plan
 - 2.5.1.5.1 Prey availability
 - 2.5.1.5.2 Other stressors
- 2.5.2 Upper Sacramento/Shasta Division
 - 2.5.2.1 Seasonal Operations
 - 2.5.2.1.1 Shasta Winter Ops.
 - 2.5.2.1.1.1 Flood Control Ops.

- 2.5.2.1.1.1.1 Winter-Run Chinook Salmon Exposure, Response, and Risk
 - 2.5.2.1.1.1.1.1 Egg/Alevin
 - 2.5.2.1.1.1.1.2 Juveniles
 - 2.5.2.1.1.1.1.3 Adult
- 2.5.2.1.1.1.2 Spring-Run Chinook Salmon Exposure, Response, and Risk
 - 2.5.2.1.1.1.2.1 Egg/Alevin
 - 2.5.2.1.1.1.2.2 Juveniles
 - 2.5.2.1.1.1.2.3 Adult
- 2.5.2.1.1.1.3 CCV Steelhead Exposure, Response, and Risk
 - 2.5.2.1.1.1.3.1 Egg/Alevin
 - 2.5.2.1.1.1.3.2 Juveniles
 - 2.5.2.1.1.1.3.3 Adult
- 2.5.2.1.1.1.4 Green Sturgeon Exposure, Response, and Risk
 - 2.5.2.1.1.1.4.1 Eggs/Larvae
 - 2.5.2.1.1.1.4.2 Juveniles
 - 2.5.2.1.1.1.4.3 Adult
- 2.5.2.1.1.2 Bend Bridge <100,000 cfs
- 2.5.2.1.1.3 "Winter – Spring Minimum flows (D-1641?)"
- 2.5.2.1.1.4 Fall and Winter Refill and Redd Maintenance
- 2.5.2.1.2 Shasta Spring Ops.
 - 2.5.2.1.2.1 Flood Control Ops.
 - 2.5.2.1.2.2 Balanced Shasta/Folsom (Instream demands & Outflow)
 - 2.5.2.1.2.3 Refill (TCD Ops.)
 - 2.5.2.1.2.4 Spring Pulse Flows
 - 2.5.2.1.2.5 Spring Management of Spawning Locations
 - 2.5.2.1.2.6 Shasta Cold Water Pool Management
- 2.5.2.1.3 Shasta Summer Ops.
 - 2.5.2.1.3.1 Balanced Shasta/Folsom/Trinity (Instream demands, Outflow and Temp.)
 - 2.5.2.1.3.2 Shasta Cold Water Pool Management
 - 2.5.2.1.3.2.1 Tier 1
 - 2.5.2.1.3.2.2 Tier 2
 - 2.5.2.1.3.2.3 Tier 3
 - 2.5.2.1.3.2.4 Tier 4
 - 2.5.2.1.3.2.4.1 Temperature Management
 - 2.5.2.1.3.2.4.2 LSNFH Production (Intervention)
 - 2.5.2.1.3.2.4.3 Adult Rescues (Intervention)
 - 2.5.2.1.3.2.4.4 Juvenile Trap and Haul (Intervention)
- 2.5.2.1.4 Shasta Fall Ops.
 - 2.5.2.1.4.1 Balanced Shasta/Folsom/Trinity (Instream demands, Delta req. and Redd dewatering)

CVP/SWP Operations Biological Opinion

- 2.5.2.1.4.2 Shasta Cold Water Pool Management
- 2.5.2.1.4.3 Fall and Winter Refill and Redd Maintenance
- 2.5.2.1.4.4 Rice Decomposition Smoothing
- 2.5.2.2 Operation of a Shasta Dam Raise
- 2.5.2.3 Conservation Measures
 - 2.5.2.3.1 Cold Water Management Tools
 - 2.5.2.3.1.1 Battle Creek Restoration
 - 2.5.2.3.1.2 Lower Intakes near Wilkins Slough
 - 2.5.2.3.1.3 Shasta Temperature Control Device Improvements
 - 2.5.2.3.2 Spawning and Rearing Habitat Restoration
 - 2.5.2.3.2.1 Spawning Gravel Injection
 - 2.5.2.3.2.2 40 - 60 Acres side channel habitat
 - 2.5.2.3.2.3 Small Screen Program
- 2.5.3 Trinity River Division
 - 2.5.3.1 Seasonal Operations
 - 2.5.3.1.1 Trans-basin diversion
 - 2.5.3.1.1.1 Sacramento temperature objectives.
 - 2.5.3.1.2 Reservoir releases
 - 2.5.3.1.2.1 Trinity River temperature objectives
 - 2.5.3.1.2.2 End-of-year carryover storage (>600 TAF)
 - 2.5.3.2 Trinity River ROD
 - 2.5.3.2.1 Long-Term Plan to Protect Adult Salmon in the Lower Klamath River
 - 2.5.3.2.2 Seasonal Operations
 - 2.5.3.2.2.1 Sacramento Temperature Objectives
 - 2.5.3.2.2.2 Trinity Temperature Objectives
 - 2.5.3.2.2.3 End of year Carryover storage
 - 2.5.3.3 Grass Valley Creek flows from Buckhorn Dam
 - 2.5.3.3.1 Water Rights Permit 18879
 - 2.5.3.3.1.1 Minimum flows
 - 2.5.3.3.1.2 Flushing flows
 - 2.5.3.3.1.3 Spring Pulse Flows
 - 2.5.3.3.1.4 Fall spawning and attraction flows
 - 2.5.3.4 Whiskeytown Reservoir Operations
 - 2.5.3.4.1 Power generation and recreation
 - 2.5.3.4.2 Sacramento Temperature Objectives
 - 2.5.3.4.2.1 Sacramento Temperature Objectives
 - 2.5.3.4.2.2 Sacramento water quality (Spring Creek Debris Dam)
 - 2.5.3.4.3 Temperature management
 - 2.5.3.4.3.1 Summer Temperatures
 - 2.5.3.4.3.2 Fall Temperatures
 - 2.5.3.4.4 Clear Creek Flows
 - 2.5.3.4.4.1 Minimum instream flows
 - 2.5.3.4.4.2 10,000 AF Spring pulse flow
 - 2.5.3.4.4.3 Channel maintenance flows (10,000 AF)

CVP/SWP Operations Biological Opinion

- 2.5.3.4.5 Clear Creek Restoration Program
 - 2.5.3.4.5.1 Balanced Sacramento/Trinity/Clear Creek
- 2.5.4 Feather River Division
 - 2.5.4.1 FERC Project #2100-134
 - 2.5.4.1.1 Instream Flows (D-1641)
 - 2.5.4.1.2 Local deliveries and exports to Banks pumping
- 2.5.5 American River Division
 - 2.5.5.1 Seasonal Operations
 - 2.5.5.1.1 Power Generation
 - 2.5.5.1.1.1 Power Bypass (Drought Declaration)
 - 2.5.5.1.2 Winter Ops.
 - 2.5.5.1.2.1 Flood Control
 - 2.5.5.1.2.2 Limited releases >4,000 cfs
 - 2.5.5.1.2.3 Chinook Redd dewatering (Jan – Feb)
 - 2.5.5.1.3 Spring Ops.
 - 2.5.5.1.3.1 Flood Control
 - 2.5.5.1.3.2 Limited releases >4,000 cfs
 - 2.5.5.1.3.3 Steelhead Redd dewatering (Feb – May)
 - 2.5.5.1.3.4 Spring Pulse Flow (reshaping)
 - 2.5.5.1.4 Summer Ops.
 - 2.5.5.1.4.1 Delta WQ (D-1641)
 - 2.5.5.1.4.2 Temperature Management
 - 2.5.5.1.4.3 Drought Temperature Management
 - 2.5.5.1.5 Fall Ops.
 - 2.5.5.1.5.1 Delta WQ (D-1641)
 - 2.5.5.1.5.2 Temperature Management
 - 2.5.5.1.5.3 Redd Dewatering
 - 2.5.5.2 2017 Flow Management Standard Releases and “Planning Minimum”
 - 2.5.5.2.1 Minimum flow schedule/index
 - 2.5.5.2.2 “Planning Minimum” (TBD 2019?)
 - 2.5.5.2.3 Spring Pulse Flow (Mar – April)
 - 2.5.5.3 Spawning and Rearing Habitat Restoration
- 2.5.6 Bay-Delta Division
 - 2.5.6.1 Delta Cross Channel Operations
 - 2.5.6.1.1 D-1641 WQ Sacramento Flows > 20,000 – 25,000
 - 2.5.6.1.2 Oct. – Nov. 30 (fish presence)
 - 2.5.6.1.3 Dec. – May 20 (closed)
 - 2.5.6.1.4 May 21 – June 15 (14 days closed)
 - 2.5.6.1.5 Dec/Jan (Drought)
 - 2.5.6.1.6 Delta Cross-Channel Gate Improvements
 - 2.5.6.2 Agricultural Barriers
 - 2.5.6.2.1 Old River @ Tracy (April/July – Nov.)
 - 2.5.6.2.2 Middle River (April/July – Nov.)
 - 2.5.6.2.3 Grant Line Canal (April/July – Nov.)

CVP/SWP Operations Biological Opinion

- 2.5.6.3 Contra Costa Water District Rock Slough Operations
 - 2.5.6.3.1 Intake volume (350 cfs, 195 TAF annual)
- 2.5.6.4 North Bay Aqueduct
 - 2.5.6.4.1 Jan 15 – Mar. 31 (Dry and CD years)
- 2.5.6.5 Water Transfers
 - 2.5.6.5.1 July – Nov.
 - 2.5.6.5.2 Effects of developing water supplies
- 2.5.6.6 Suisun Marsh
 - 2.5.6.6.1 Suisun Marsh Preservation Agreement
 - 2.5.6.6.2 Suisun Marsh Salinity Control Gates Operation
 - 2.5.6.6.3 Suisun Marsh Food Subsidies
- 2.5.6.7 Export Operations
 - 2.5.6.7.1 OMR Management
 - 2.5.6.7.1.1 Onset: 14-day avg. >-5,000 cfs
 - 2.5.6.7.1.1.1 “First Flush” (IEWPP) Dec. 1 – Jan. 31
 - 2.5.6.7.1.1.2 Jan 1, 5% rule (WR, SR or St)
 - 2.5.6.7.1.2 End: June 30 Or BOTH:
 - 2.5.6.7.1.2.1 CCR 25*C
 - 2.5.6.7.1.2.2 95% past Chipps OR Mossdale 72*F
 - 2.5.6.7.1.3 Additional RT OMR Restrictions
 - 2.5.6.7.1.3.1 Turbidity Bridge Avoidance
 - 2.5.6.7.1.3.2 Larval and Juvenile Delta Smelt
 - 2.5.6.7.1.3.3 Wild Central Valley Steelhead Protection
 - 2.5.6.7.1.3.4 Salvage or Loss Thresholds
 - 2.5.6.7.1.3.4.1 50%
 - 2.5.6.7.1.3.4.2 75%
 - 2.5.6.7.1.4 Storm-Related OMR Flexibility
 - 2.5.6.7.2 Entrainment and Salvage Actions
 - 2.5.6.7.2.1 Minimum Export Rate (HHS 1,500 cfs)
 - 2.5.6.7.2.2 Tracy Fish Collection Facility
 - 2.5.6.7.2.2.1 Predator Removal (CO2 injection)
 - 2.5.6.7.2.2.2 Tracy Fish Facility Improvements
 - 2.5.6.7.2.3 Skinner Fish Facility
 - 2.5.6.7.2.3.1 Skinner Fish Facility Improvements
 - 2.5.6.7.2.3.1.1 Predator Removal
 - 2.5.6.7.2.3.1.2 Clifton Court Aquatic Weed Removal
 - 2.5.6.7.2.3.1.2.1 Operational minimization procedures
 - 2.5.6.7.2.3.2 Release Sites
- 2.5.6.8 Conservation Measures
 - 2.5.6.8.1 Additional Measures
 - 2.5.6.8.1.1 Operations
 - 2.5.6.8.1.1.1 Fall Delta Smelt Habitat
 - 2.5.6.8.1.1.2 San Joaquin Basin Steelhead Telemetry Study
 - 2.5.6.8.1.1.3 Sacramento Deepwater Ship Channel

CVP/SWP Operations Biological Opinion

- 2.5.6.8.1.1.4 North Delta Food Subsidies / Colusa Basin Drain
- 2.5.6.8.1.2 Habitat Restoration
 - 2.5.6.8.1.2.1 Tidal Habitat Restoration 8,000 acres (2008 BiOp)
 - 2.5.6.8.1.2.2 Yolo Bypass SHR and Fish Passage Project
 - 2.5.6.8.1.2.3 Predator Hot Spot Removal
- 2.5.6.8.1.3 Fish Intervention
 - 2.5.6.8.1.3.1 Reintroduction efforts from Fish Conservation and Culture Lab
 - 2.5.6.8.1.3.2 Delta Fish Species Conservation Hatchery
- 2.5.7 Stanislaus River Division
 - 2.5.7.1 Seasonal Operations
 - 2.5.7.1.1 Flood Control
 - 2.5.7.1.1.1 Tulloch Lake
 - 2.5.7.1.2 Stanislaus Stepped Release Plan
 - 2.5.7.1.2.1 “60-20-20” Classification
 - 2.5.7.1.3 Alteration of Stanislaus DO Requirement
 - 2.5.7.1.4 Stanislaus Watershed Team
 - 2.5.7.2 Conservation Measures
 - 2.5.7.2.1 Spawning and Rearing Habitat Restoration
 - 2.5.7.2.2 Temperature Management Study
- 2.5.8 San Joaquin River
 - 2.5.8.1 San Joaquin River Restoration Program
 - 2.5.8.2 Conservation Measures
 - 2.5.8.2.1 Lower SJR Habitat
- 2.5.9 Effects of the Action on Southern Resident Killer Whales
- 2.5.10 CVP/SWP Wide
 - 2.5.10.1 Divert and store water consistent with obligations under water rights and decisions by the State Water Resources Control Board
 - 2.5.10.2 Shasta Critical Determinations and Allocations to Water Service and Water Repayment Contractors
 - 2.5.10.3 2018 Revised Coordinated Operations Agreement
- 2.6 Effects of the Action on Critical Habitat
 - 2.6.1 General Habitat Impacts
 - 2.6.1.1 Altered Flow
 - 2.6.1.2 Water Temperature
 - 2.6.1.3 Habitat Loss and Degradation
 - 2.6.1.4 Water Quality
 - 2.6.2 Upper Sacramento/Shasta Division
 - 2.6.2.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids
 - 2.6.2.2 Effects to sDPS Green Sturgeon Critical Habitat
 - 2.6.3 Trinity River Division

- 2.6.3.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids
 - 2.6.4 Feather River Division
 - 2.6.4.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids
 - 2.6.4.2 Effects to sDPS Green Sturgeon Critical Habitat
 - 2.6.5 American River Division
 - 2.6.5.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids
 - 2.6.6 Bay-Delta Division
 - 2.6.6.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids
 - 2.6.6.2 Effects to sDPS Green Sturgeon Critical Habitat
 - 2.6.7 Stanislaus River Division
 - 2.6.7.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids
 - 2.6.7.2 Effects to sDPS Green Sturgeon Critical Habitat
 - 2.6.8 San Joaquin River
 - 2.6.8.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids
 - 2.6.8.2 Effects to sDPS Green Sturgeon Critical Habitat
 - 2.7 Cumulative Effects
 - 2.8 Integration and Synthesis
 - 2.9 Conclusion
 - 2.10 Reasonable and Prudent Alternatives [if applicable]
 - 2.11 Incidental Take Statement
 - 2.11.1 Amount or Extent of Take
 - 2.11.2 Effect of the Take
 - 2.11.3 Reasonable and Prudent Measures
 - 2.11.4 Terms and Conditions
 - 2.12 Conservation Recommendations
 - 2.13 Reinitiation of Consultation
 - 2.14 “Not Likely to Adversely Affect” Determinations
- 3 MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT
ESSENTIAL FISH HABITAT RESPONSE**
- 3.1 Essential Fish Habitat Affected by the Project
 - 3.2 Adverse Effects on Essential Fish Habitat
 - 3.3 Essential Fish Habitat Conservation Recommendations
 - 3.4 Statutory Response Requirement
 - 3.5 Supplemental Consultation
- 4 FISH AND WILDLIFE COORDINATION ACT**

5 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

5.1 Utility

5.2 Integrity

5.3 Objectivity

6 REFERENCES

7 APPENDICES

1 INTRODUCTION

1.1 Background

1.2 Coordinated Operations Agreement

1.3 Key Consultation Considerations

1.4 Consultation History

1.5 Proposed Federal Action

2 ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

2.1 Analytical Approach

2.2 Rangewide Status of the Species and Critical Habitat

2.3 Action Area

2.4 Environmental Baseline

2.5 Effects of the Action on the Species

Species Evaluated

[Sample table below indicates which species are evaluated for which division; text will accompany to explain. e.g.,]

Division	Upper Sacramento/Shasta	Trinity	Feather	Etc...
Species				
Winter-run Chinook salmon	Yes	No	No	Yes
Spring-run Chinook salmon	Yes	No	No	Yes
CCV Steelhead	Yes	No	No	Yes
Etc....	No	No	No	No

Action Deconstruction Intro

[Insert/refer here to slide 1 of action deconstruction that shows major project components for each division. Slides for each specific division will be in that division's text.]

2.5.1 Stressors and Species Response

2.5.1.1 Central Valley Salmonid Recovery Plan

- 2.5.1.1.1 Passage Impediments/Barriers**
- 2.5.1.1.2 Harvest/Angling Impacts**
- 2.5.1.1.3 Water Temperature**
- 2.5.1.1.4 Water Quality**
- 2.5.1.1.5 Flow Conditions**
- 2.5.1.1.6 Loss of Riparian Habitat and Instream Cover**
- 2.5.1.1.7 Loss of Natural River Morphology and Function**
- 2.5.1.1.8 Loss of Floodplain Habitat**
- 2.5.1.1.9 Loss of Tidal Marsh Habitat**
- 2.5.1.1.10 Spawning Habitat Availability**
- 2.5.1.1.11 Physical Habitat Alternation**
- 2.5.1.1.12 Invasive Species/Food Web Changes**
- 2.5.1.1.13 Entrainment/Impingement**
- 2.5.1.1.14 Predation**
- 2.5.1.1.15 Hatchery Effects**
- 2.5.1.1.16 Research and Monitoring**

- 2.5.1.2 Southern Oregon/Northern California Coast Coho Recovery Plan**
- 2.5.1.2.1 Adverse Hatchery Related Effects**
- 2.5.1.2.2 Impaired Water Quality**
- 2.5.1.2.3 Degraded Riparian Forest**
- 2.5.1.2.4 Increased Disease/Predation/Competition**
- 2.5.1.2.5 Altered Sediment Supply**
- 2.5.1.2.6 Lack of Floodplain and Chanel Structure**
- 2.5.1.2.7 Altered Hydrologic Function**
- 2.5.1.2.8 Barriers**
- 2.5.1.2.9 Impaired Estuary/Mainstem Function**
- 2.5.1.2.10 Adverse Fishery and Collecting Related Effects**

2.5.1.3 Green Sturgeon Recovery Plan

- 2.5.1.3.1 Passage Impediments/Barriers to Migration**
- 2.5.1.3.2 Altered Flow**
- 2.5.1.3.3 Altered Water Temperature**
- 2.5.1.3.4 Altered Sediment**
- 2.5.1.3.5 Altered Turbidity**
- 2.5.1.3.6 Take (Entrainment, Poaching & Bycatch)**
- 2.5.1.3.7 Contaminants**
- 2.5.1.3.8 Altered Prey Base**
- 2.5.1.3.9 Competition for Habitat**
- 2.5.1.3.10 Loss of Wetland Function**
- 2.5.1.3.11 Predation**
- 2.5.1.3.12 Water Depth Modification**
- 2.5.1.3.13 Disease**
- 2.5.1.3.14 Climate Change**
- 2.5.1.3.15 Research and Monitoring**

2.5.1.4 Eulachon Recovery Plan

- 2.5.1.4.1 Climate Change Impacts on Ocean Conditions**
- 2.5.1.4.2 Dams/Water Diversions**
- 2.5.1.4.3 Eulachon Bycatch**
- 2.5.1.4.4 Climate Change Impacts on Freshwater Habitat**
- 2.5.1.4.5 Predation**
- 2.5.1.4.6 Water Quality**
- 2.5.1.4.7 Catastrophic Events**
- 2.5.1.4.8 Disease**
- 2.5.1.4.9 Competition**
- 2.5.1.4.10 Shoreline Construction**
- 2.5.1.4.11 Tribal/First Nations Fisheries**
- 2.5.1.4.12 Non-indigenous species**
- 2.5.1.4.13 Recreational Harvest**
- 2.5.1.4.14 Commercial Harvest**
- 2.5.1.4.15 Scientific Monitoring**
- 2.5.1.4.16 Dredging**

2.5.1.5 Southern Resident Killer Whale Recovery Plan

- 2.5.1.5.1 Prey availability**
- 2.5.1.5.2 Other stressors**

2.5.2 Upper Sacramento/Shasta Division

[Insert here and at the beginning of each division a table indicating which stressors are evaluated for each project component in the division. Should have Naseem indicate best words to use in this description (e.g., NOT insignificant or discountable, not “N/A”, etc.). Example table below.]

CVP/SWP Operations Biological Opinion

Stressor	Increased upstream water temperature	Increased turbidity	Increased contaminant exposure	Etc.
Project Component				
Component 1	Yes	No	No	Yes
Component 2	Yes	No	No	Yes
Component 3	Yes	No	No	Yes
Etc....	No	No	No	No

2.5.2.1 Seasonal Operations

2.5.2.1.1 Shasta Winter Ops.

2.5.2.1.1.1 Flood Control Ops.

2.5.2.1.1.1.1 Winter-Run Chinook Salmon Exposure, Response, and Risk

2.5.2.1.1.1.1.1 Egg/Alevin

2.5.2.1.1.1.1.2 Juveniles

2.5.2.1.1.1.1.3 Adult

2.5.2.1.1.1.2 Spring-Run Chinook Salmon Exposure, Response, and Risk

2.5.2.1.1.1.2.1 Egg/Alevin

2.5.2.1.1.1.2.2 Juveniles

2.5.2.1.1.1.2.3 Adult

2.5.2.1.1.1.3 CCV Steelhead Exposure, Response, and Risk

2.5.2.1.1.1.3.1 Egg/Alevin

2.5.2.1.1.1.3.2 Juveniles

2.5.2.1.1.1.3.3 Adult

2.5.2.1.1.1.4 Green Sturgeon Exposure, Response, and Risk

2.5.2.1.1.1.4.1 Eggs/Larvae

2.5.2.1.1.1.4.2 Juveniles

2.5.2.1.1.1.4.3 Adult

2.5.2.1.1.2 Bend Bridge <100,000 cfs

2.5.2.1.1.3 "Winter – Spring Minimum flows (D-1641?)"

2.5.2.1.1.4 Fall and Winter Refill and Redd Maintenance

2.5.2.1.2 Shasta Spring Ops.

2.5.2.1.2.1 Flood Control Ops.

2.5.2.1.2.2 Balanced Shasta/Folsom (Instream demands & Outflow)

2.5.2.1.2.3 Refill (TCD Ops.)

2.5.2.1.2.4 Spring Pulse Flows

2.5.2.1.2.5 Spring Management of Spawning Locations

2.5.2.1.2.6 Shasta Cold Water Pool Management

2.5.2.1.3 Shasta Summer Ops.

2.5.2.1.3.1 Balanced Shasta/Folsom/Trinity (Instream demands, Outflow and Temp.)

2.5.2.1.3.2 Shasta Cold Water Pool Management

2.5.2.1.3.2.1 Tier 1

2.5.2.1.3.2.2 Tier 2

2.5.2.1.3.2.3 Tier 3

2.5.2.1.3.2.4 Tier 4

2.5.2.1.3.2.4.1 Temperature Management

2.5.2.1.3.2.4.2 LSNFH Production (Intervention)

2.5.2.1.3.2.4.3 Adult Rescues (Intervention)

2.5.2.1.3.2.4.4 Juvenile Trap and Haul (Intervention)

2.5.2.1.4 Shasta Fall Ops.

2.5.2.1.4.1 Balanced Shasta/Folsom/Trinity (Instream demands, Delta req. and Redd dewatering)

2.5.2.1.4.2 Shasta Cold Water Pool Management

2.5.2.1.4.3 Fall and Winter Refill and Redd Maintenance

2.5.2.1.4.4 Rice Decomposition Smoothing

2.5.2.2 Operation of a Shasta Dam Raise

2.5.2.3 Conservation Measures

2.5.2.3.1 Cold Water Management Tools

2.5.2.3.1.1 Battle Creek Restoration

2.5.2.3.1.2 Lower Intakes near Wilkins Slough

2.5.2.3.1.3 Shasta Temperature Control Device Improvements

2.5.2.3.2 Spawning and Rearing Habitat Restoration

2.5.2.3.2.1 Spawning Gravel Injection

2.5.2.3.2.2 40 - 60 Acres side channel habitat

2.5.2.3.2.3 Small Screen Program

2.5.3 Trinity River Division

2.5.3.1 Seasonal Operations

2.5.3.1.1 Trans-basin diversion

2.5.3.1.1.1 Sacramento temperature objectives.

2.5.3.1.2 Reservoir releases

2.5.3.1.2.1 Trinity River temperature objectives

2.5.3.1.2.2 End-of-year carryover storage (>600 TAF)

2.5.3.2 Trinity River ROD

2.5.3.2.1 Long-Term Plan to Protect Adult Salmon in the Lower Klamath River

2.5.3.2.2 Seasonal Operations

2.5.3.2.2.1 Sacramento Temperature Objectives

2.5.3.2.2.2 Trinity Temperature Objectives

2.5.3.2.2.3 End of year Carryover storage

2.5.3.3 Grass Valley Creek flows from Buckhorn Dam

2.5.3.3.1 Water Rights Permit 18879

2.5.3.3.1.1 Minimum flows

2.5.3.3.1.2 Flushing flows

2.5.3.3.1.3 Spring Pulse Flows

2.5.3.3.1.4 Fall spawning and attraction flows

2.5.3.4 Whiskeytown Reservoir Operations

2.5.3.4.1 Power generation and recreation

2.5.3.4.2 Sacramento Temperature Objectives

2.5.3.4.2.1 Sacramento Temperature Objectives

2.5.3.4.2.2 Sacramento water quality (Spring Creek Debris Dam)

2.5.3.4.3 Temperature management

2.5.3.4.3.1 Summer Temperatures

2.5.3.4.3.2 Fall Temperatures

2.5.3.4.4 Clear Creek Flows

2.5.3.4.4.1 Minimum instream flows

2.5.3.4.4.2 10,000 AF Spring pulse flow

2.5.3.4.4.3 Channel maintenance flows (10,000 AF)

2.5.3.4.5 Clear Creek Restoration Program

2.5.3.4.5.1 Balanced Sacramento/Trinity/Clear Creek

2.5.4 Feather River Division

2.5.4.1 FERC Project #2100-134

2.5.4.1.1 Instream Flows (D-1641)

2.5.4.1.2 Local deliveries and exports to Banks pumping

2.5.5 American River Division

2.5.5.1 Seasonal Operations

2.5.5.1.1 Power Generation

2.5.5.1.1.1 Power Bypass (Drought Declaration)

2.5.5.1.2 Winter Ops.

2.5.5.1.2.1 Flood Control

2.5.5.1.2.2 Limited releases >4,000 cfs

2.5.5.1.2.3 Chinook Redd dewatering (Jan – Feb)

2.5.5.1.3 Spring Ops.

2.5.5.1.3.1 Flood Control

2.5.5.1.3.2 Limited releases >4,000 cfs

2.5.5.1.3.3 Steelhead Redd dewatering (Feb – May)

2.5.5.1.3.4 Spring Pulse Flow (reshaping)

2.5.5.1.4 Summer Ops.

2.5.5.1.4.1 Delta WQ (D-1641)

2.5.5.1.4.2 Temperature Management

2.5.5.1.4.3 Drought Temperature Management

2.5.5.1.5 Fall Ops.

2.5.5.1.5.1 Delta WQ (D-1641)

2.5.5.1.5.2 Temperature Management

2.5.5.1.5.3 Redd Dewatering

2.5.5.2 2017 Flow Management Standard Releases and “Planning Minimum”

2.5.5.2.1 Minimum flow schedule/index

2.5.5.2.2 “Planning Minimum” (TBD 2019?)

2.5.5.2.3 Spring Pulse Flow (Mar – April)

2.5.5.3 Spawning and Rearing Habitat Restoration

2.5.6 Bay-Delta Division

2.5.6.1 Delta Cross Channel Operations

2.5.6.1.1 D-1641 WQ Sacramento Flows > 20,000 – 25,000

2.5.6.1.2 Oct. – Nov. 30 (fish presence)

2.5.6.1.3 Dec. – May 20 (closed)

2.5.6.1.4 May 21 – June 15 (14 days closed)

2.5.6.1.5 Dec/Jan (Drought)

2.5.6.1.6 Delta Cross-Channel Gate Improvements

2.5.6.2 Agricultural Barriers

2.5.6.2.1 Old River @ Tracy (April/July – Nov.)

2.5.6.2.2 Middle River (April/July – Nov.)

2.5.6.2.3 Grant Line Canal (April/July – Nov.)

2.5.6.3 Contra Costa Water District Rock Slough Operations

2.5.6.3.1 Intake volume (350 cfs, 195 TAF annual)

2.5.6.4 North Bay Aqueduct

2.5.6.4.1 Jan 15 – Mar. 31 (Dry and CD years)

2.5.6.5 Water Transfers

2.5.6.5.1 July – Nov.

2.5.6.5.2 Effects of developing water supplies

2.5.6.6 Suisun Marsh

2.5.6.6.1 Suisun Marsh Preservation Agreement

2.5.6.6.2 Suisun Marsh Salinity Control Gates Operation

2.5.6.6.3 Suisun Marsh Food Subsidies

2.5.6.7 Export Operations

2.5.6.7.1 OMR Management

2.5.6.7.1.1 Onset: 14-day avg. >-5,000 cfs

2.5.6.7.1.1.1 “First Flush” (IEWPP) Dec. 1 – Jan. 31

2.5.6.7.1.1.2 Jan 1, 5% rule (WR, SR or St)

2.5.6.7.1.2 End: June 30 Or BOTH:

2.5.6.7.1.2.1 CCR 25°C

2.5.6.7.1.2.2 95% past Chipps OR Mossdale 72°F

2.5.6.7.1.3 Additional RT OMR Restrictions

2.5.6.7.1.3.1 Turbidity Bridge Avoidance

2.5.6.7.1.3.2 Larval and Juvenile Delta Smelt

2.5.6.7.1.3.3 Wild Central Valley Steelhead Protection

2.5.6.7.1.3.4 Salvage or Loss Thresholds

2.5.6.7.1.3.4.1 50%

2.5.6.7.1.3.4.2 75%

2.5.6.7.1.4 Storm-Related OMR Flexibility

2.5.6.7.2 Entrainment and Salvage Actions

2.5.6.7.2.1 Minimum Export Rate (HHS 1,500 cfs)

2.5.6.7.2.2 Tracy Fish Collection Facility

2.5.6.7.2.2.1 Predator Removal (CO2 injection)

2.5.6.7.2.2.2 Tracy Fish Facility Improvements

2.5.6.7.2.3 Skinner Fish Facility

2.5.6.7.2.3.1 Skinner Fish Facility Improvements

2.5.6.7.2.3.1.1 Predator Removal

2.5.6.7.2.3.1.2 Clifton Court Aquatic Weed Removal

2.5.6.7.2.3.1.2.1 Operational minimization procedures

2.5.6.7.2.3.2 Release Sites

2.5.6.8 Conservation Measures

2.5.6.8.1 Additional Measures

2.5.6.8.1.1 Operations

2.5.6.8.1.1.1 Fall Delta Smelt Habitat

2.5.6.8.1.1.2 San Joaquin Basin Steelhead Telemetry Study

2.5.6.8.1.1.3 Sacramento Deepwater Ship Channel

2.5.6.8.1.1.4 North Delta Food Subsidies / Colusa Basin Drain

2.5.6.8.1.2 Habitat Restoration

2.5.6.8.1.2.1 Tidal Habitat Restoration 8,000 acres (2008 BiOp)

2.5.6.8.1.2.2 Yolo Bypass SHR and Fish Passage Project

2.5.6.8.1.2.3 Predator Hot Spot Removal

2.5.6.8.1.3 Fish Intervention

2.5.6.8.1.3.1 Reintroduction efforts from Fish Conservation and Culture Lab

2.5.6.8.1.3.2 Delta Fish Species Conservation Hatchery

2.5.7 Stanislaus River Division

2.5.7.1 Seasonal Operations

2.5.7.1.1 Flood Control

2.5.7.1.1.1 Tulloch Lake

2.5.7.1.2 Stanislaus Stepped Release Plan

2.5.7.1.2.1 “60-20-20” Classification

2.5.7.1.3 Alteration of Stanislaus DO Requirement

2.5.7.1.4 Stanislaus Watershed Team

2.5.7.2 Conservation Measures

2.5.7.2.1 Spawning and Rearing Habitat Restoration

2.5.7.2.2 Temperature Management Study

2.5.8 San Joaquin River

2.5.8.1 San Joaquin River Restoration Program

2.5.8.2 Conservation Measures

2.5.8.2.1 Lower SJR Habitat

2.5.9 Effects of the Action on Southern Resident Killer Whales

2.5.10 CVP/SWP Wide

2.5.10.1 Divert and store water consistent with obligations under water rights and decisions by the State Water Resources Control Board

2.5.10.2 Shasta Critical Determinations and Allocations to Water Service and Water Repayment Contractors

2.5.10.3 2018 Revised Coordinated Operations Agreement

2.6 Effects of the Action on Critical Habitat

This section addresses impacts to designated critical habitat for the following species: Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, California Central Valley steelhead, and Southern DPS of North American green sturgeon. The detailed analysis of stressors to the species is contained in Section 2.5 Effects of the Action on Species and will be referred to throughout this section as those analyses are relevant to the impacts to critical habitat. In many cases, the species effects analysis is relied on as underlying support for the critical habitat analysis.

Critical habitat for both CV spring-run Chinook salmon and CCV steelhead was designated concurrently, and they share the same PBFs. The PBFs for winter-run Chinook salmon are generally related to the same habitat types as the other listed salmonids, but are described with more specificity in the designation. For efficiency, effects to critical habitat for Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, and California Central Valley steelhead are discussed within four generalized habitat categories. Table 2.6-1 lists specific PBFs that correspond to ESA-listed critical habitat for each fish species within the associated habitat category. Discussion of effects to the components of each PBF are delineated by species where necessary. Differences in habitat impacts are generally due to the spatial and temporal distribution of each species within the action area. In some cases, effects to one or more component of a PBF apply in the same way to each species' habitat.

Table 2.6-1: Summary of PBFs for ESA-listed salmonids in the Central Valley

	PBFs for Sacramento River winter-run Chinook salmon	PBFs for Central Valley spring-run Chinook salmon and Central Valley Steelhead
Habitat for Spawning Adults, Incubation of Eggs, and Rearing for Fry	<ul style="list-style-type: none"> • Availability of clean gravel for spawning substrate • Adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles • Water temperatures between 42.5–57.5°F (5.8–14.1°C) for successful spawning, egg incubation, and fry development 	Freshwater Spawning Sites

CVP/SWP Operations Biological Opinion

	<ul style="list-style-type: none"> • Habitat areas and adequate prey that are not contaminated 	
Freshwater Rearing Habitat for Juveniles	<ul style="list-style-type: none"> • Habitat areas and adequate prey that are not contaminated • Riparian habitat that provides for successful juvenile development and survival 	Freshwater Rearing Sites
Freshwater Migratory Corridors for Outmigrating Juveniles and Spawning Adults	<ul style="list-style-type: none"> • Adequate river flows for successful spawning, incubation of eggs, fry development and emergence, and downstream transport of juveniles • Access from the Pacific Ocean to appropriate spawning areas in the upper Sacramento River • Access downstream so that juveniles can migrate from the spawning grounds to San Francisco Bay and the Pacific Ocean 	Freshwater Migration Corridors
Estuarine Habitat for Rearing and Migration	<ul style="list-style-type: none"> • Habitat areas and adequate prey that are not contaminated • Riparian habitat that provides for successful juvenile development and survival • Access from the Pacific Ocean to appropriate spawning areas in the upper Sacramento River • Access downstream so that juveniles can migrate from the spawning grounds to San Francisco Bay and the Pacific Ocean 	Estuarine areas

Impacts to designated critical habitat for the Southern DPS of North American green sturgeon is discussed in terms of the following seven PBFs:

- (1) Food resources
- (2) Substrate type or size
- (3) Water Flow
- (4) Water quality

- (5) Migratory corridor
- (6) Water depth
- (7) Sediment quality

The designation discusses these seven elements (or a subset thereof) as they apply to freshwater riverine systems, estuarine areas, and coastal marine areas.

2.6.1 General Habitat Impacts

2.6.1.1 Altered Flow

2.6.1.2 Water Temperature

2.6.1.3 Habitat Loss and Degradation

2.6.1.4 Water Quality

2.6.2 Upper Sacramento/Shasta Division

2.6.2.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids

2.6.2.1.1 Habitat for Spawning Adults, Incubation of Eggs, and Rearing for Fry

2.6.2.1.2 Freshwater Rearing Habitat for Juveniles

2.6.2.1.3 Freshwater Migratory Corridors for Outmigrating Juveniles and Spawning Adults

2.6.2.1.4 Estuarine Habitat for Rearing and Migration

2.6.2.2 Effects to sDPS Green Sturgeon Critical Habitat

2.6.2.2.1 Food resources

2.6.2.2.2 Substrate type or size

2.6.2.2.3 Water Flow & Water quality

2.6.2.2.4 Migratory corridor

2.6.2.2.5 Water depth & Sediment quality

2.6.3 Trinity River Division

2.6.3.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids

2.6.4 Feather River Division

2.6.4.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids

2.6.4.1.1 Habitat for Spawning Adults, Incubation of Eggs, and Rearing for Fry

2.6.4.1.2 Freshwater Rearing Habitat for Juveniles

2.6.4.1.3 Freshwater Migratory Corridors for Outmigrating Juveniles and Spawning Adults

2.6.4.1.4 Estuarine Habitat for Rearing and Migration

2.6.4.2 Effects to sDPS Green Sturgeon Critical Habitat

2.6.4.2.1 Food resources

2.6.4.2.2 Substrate type or size

2.6.4.2.3 Water Flow & Water quality

2.6.4.2.4 Migratory corridor

2.6.4.2.5 Water depth & Sediment quality

2.6.5 American River Division

2.6.5.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids

2.6.5.1.1 Habitat for Spawning Adults, Incubation of Eggs, and Rearing for Fry

2.6.5.1.2 Freshwater Rearing Habitat for Juveniles

2.6.5.1.3 Freshwater Migratory Corridors for Outmigrating Juveniles and Spawning Adults

2.6.5.1.4 Estuarine Habitat for Rearing and Migration

2.6.6 Bay-Delta Division

2.6.6.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids

2.6.6.1.1 Habitat for Spawning Adults, Incubation of Eggs, and Rearing for Fry

2.6.6.1.2 Freshwater Rearing Habitat for Juveniles

2.6.6.1.3 Freshwater Migratory Corridors for Outmigrating Juveniles and Spawning Adults

2.6.6.1.4 Estuarine Habitat for Rearing and Migration

2.6.6.2 Effects to sDPS Green Sturgeon Critical Habitat

2.6.6.2.1 Food resources

2.6.6.2.2 Substrate type or size

2.6.6.2.3 Water Flow & Water quality

2.6.6.2.4 Migratory corridor

2.6.6.2.5 Water depth & Sediment quality

2.6.7 Stanislaus River Division

2.6.7.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids

2.6.7.1.1 Habitat for Spawning Adults, Incubation of Eggs, and Rearing for Fry

2.6.7.1.2 Freshwater Rearing Habitat for Juveniles

2.6.7.1.3 Freshwater Migratory Corridors for Outmigrating Juveniles and Spawning Adults

2.6.7.1.4 Estuarine Habitat for Rearing and Migration

2.6.7.2 Effects to sDPS Green Sturgeon Critical Habitat

2.6.7.2.1 Food resources

2.6.7.2.2 Substrate type or size

2.6.7.2.3 Water Flow & Water quality

2.6.7.2.4 Migratory corridor

2.6.7.2.5 Water depth & Sediment quality

2.6.8 San Joaquin River

2.6.8.1 Effects to Designated Critical Habitat PBFs for ESA-listed Salmonids

2.6.8.1.1 Habitat for Spawning Adults, Incubation of Eggs, and Rearing for Fry

2.6.8.1.2 Freshwater Rearing Habitat for Juveniles

2.6.8.1.3 Freshwater Migratory Corridors for Outmigrating Juveniles and Spawning Adults

2.6.8.1.4 Estuarine Habitat for Rearing and Migration

2.6.8.2 Effects to sDPS Green Sturgeon Critical Habitat

2.6.8.2.1 Food resources

2.6.8.2.2 Substrate type or size

2.6.8.2.3 Water Flow & Water quality

2.6.8.2.4 Migratory corridor

2.6.8.2.5 Water depth & Sediment quality

2.7 Cumulative Effects

2.8 Integration and Synthesis

2.9 Conclusion

2.10 Reasonable and Prudent Alternatives [if applicable]

2.11 Incidental Take Statement

2.11.1 Amount or Extent of Take

2.11.2 Effect of the Take

2.11.3 Reasonable and Prudent Measures

2.11.4 Terms and Conditions

2.12 Conservation Recommendations

2.13 Reinitiation of Consultation

2.14 “Not Likely to Adversely Affect” Determinations

**3 MAGNUSON-STEVENSON FISHERY CONSERVATION AND MANAGEMENT ACT
ESSENTIAL FISH HABITAT RESPONSE**

3.1 Essential Fish Habitat Affected by the Project

3.2 Adverse Effects on Essential Fish Habitat

3.3 Essential Fish Habitat Conservation Recommendations

3.4 Statutory Response Requirement

3.5 Supplemental Consultation

4 FISH AND WILDLIFE COORDINATION ACT

**5 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION
REVIEW**

5.1 Utility

5.2 Integrity

5.3 Objectivity

6 REFERENCES

7 APPENDICES