

CHAPTER I

INTRODUCTION

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The Draft Programmatic Environmental Impact Statement (PEIS) summarizes the evaluation of the direct and indirect impacts of implementing a wide range of actions identified in the Central Valley Project Improvement Act (CVPIA). Details of the information used in the definition of the affected environment and analysis of the environmental consequences are presented in the technical appendices of the Draft PEIS.

This technical appendix presents a summary of conditions that would affect fish in streams that are tributary to the Delta and in the Delta, including background information that was used during the PEIS preparation, and the results of the impact analyses for conditions that occurred throughout the study area, shown in Figure I-1.

The fisheries analysis was primarily based upon changes in stream flows, habitat, and diversions. Changes in stream flows and diversions are as presented in the Surface Water and Facilities Operations technical appendices.

The assumptions and results of the analyses for Alternatives 1, 2, 3, and 4 and Supplemental Analyses 1a, 1b, and 2a are presented in this technical appendix and summarized in the Draft PEIS. The assumptions and results of the analyses for Supplemental Analyses 1c through 1i, 2b through 2d, 3a, and 4a are summarized only in the Draft PEIS. The assumptions related to the fisheries analyses for Alternatives 1, 2, 3, and 4 and for the Supplemental Analyses 1a, 1b, and 2a are presented in Table I-1. The results of the analyses are presented in Table I-2.



**FIGURE I-1
STUDY AREA**

TABLE I-1

SUMMARY OF ASSUMPTIONS FOR FISHERY RESOURCES

Assumptions Common to All Alternatives and Supplemental Analyses	
Continued CVP Operations under CVP-operations criteria and plan, October 1992.	
Regulatory operational criteria provided in D-1422, Bay-Delta Plan Accord, and WR 95-01.	
Winter-Run Biological Opinion as amended in 1995.	
Shasta Temperature Control Device in operation.	
Continued annual installation of a barrier at the head of Old River in late summer and removal in late fall to improve water quality in the Stockton ship channel.	
Changes in reservoir operations, river flows, and diversions based on Surface Water Supplies and Facilities Operations analyses.	
Alternative or Supplemental Analysis	Assumptions Specific to the Alternative or Supplemental Analysis
No-Action Alternative	Common assumptions only.
1	CVP Reoperation and (b)(2) Water Management toward increased implementation of AFRP Actions relating to target flows for CVP-controlled streams (Attachment G, PEIS). Increased Trinity River instream fishery flow. Full implementation of AFRP Actions relating to structures (Attachment F, PEIS). Full implementation of AFRP Actions relating to habitat restoration (Attachment F, PEIS).
1a	Alternative 1 assumptions, plus Implement (b)(2) Water Management Actions in the Delta, in addition to Bay-Delta Plan Accord.
1b	Alternative 1 assumptions, plus Fish barrier at Georgiana Slough that operates in conjunction with Delta Cross Channel facility (Sacramento River). Seasonal operation during April and May of the Old River barrier (San Joaquin River).
1c	Same as Alternative 1 plus Some of the non-delivered CVP water would increase instream flows and Delta outflow.
1d	Same as Alternative 1.
1e	Same as Alternative 1 plus Conveyance of transferred water in a manner to avoid impacts to fisheries.
1f	Same as Supplemental Analyses 1e.

TABLE I-1. CONTINUED

Alternative or Supplemental Analysis	Assumptions Specific to the Alternative or Supplemental Analysis
1h	Same as Alternative 1.
1i	Same as Alternative 1.
2	Alternative 1 assumptions, plus Use acquired water to improve flows in the Stanislaus, Tuolumne, and Merced rivers.
2a	Alternative 2 assumptions plus Fish barrier at Georgiana Slough that operates in conjunction with Delta Cross Channel facility (Sacramento River). Seasonal operation during April and May of the Old River barrier (San Joaquin River).
2b	Same as Alternative 2 plus Conveyance of transferred water in a manner to avoid impacts to fish.
2c	Same as Supplemental Analyses 2b.
2d	Same as Alternative 2 plus Some of the non-delivered CVP water would increase instream flows and Delta outflow.
3	Alternative 1 assumptions, plus Use acquired water to improve flows on the Stanislaus, Tuolumne, Merced, Calaveras, Mokelumne, and Yuba rivers. Acquired water may be exported by Delta pumping facilities.
3a	Same assumptions as Alternative 3 plus Conveyance of transferred water in a manner to avoid impacts to fisheries.
4	Alternative 1 assumptions, plus Implement (b)(2) Water Management actions in the Delta in addition to Bay-Delta Plan Accord. Use acquired water to improve flows on the Stanislaus, Tuolumne, Merced, Calaveras, Mokelumne, and Yuba rivers. Acquired water may not be exported by Delta pumping facilities.
4a	Same as Alternative 4 plus Conveyance of transferred water in a manner to avoid impacts to fisheries.

TABLE I-2

SUMMARY OF IMPACT ASSESSMENT FOR FISHERY RESOURCES

Alternative or Supplemental Analysis	Impact Assessment
No-Action Alternative	Improved downstream temperature conditions in the Sacramento River due to operation of the Shasta Temperature Control Device which provides increased flexibility in the maintenance and use of the cold water pool in Shasta Lake.
Changes Compared to the No-Action Alternative	
1	<p>Stream flow improvements; due to (b)(2) Water Management, combined with structural and other habitat restoration actions in Clear Creek and in the Sacramento, American, and Stanislaus rivers would improve environmental conditions such as river temperature, diversion entrainment, short-term fluctuations in river level, increased flows providing better movement and habitat quality and quantity, and food web support. These environmental conditions would benefit all life stages of representative fish species, including chinook salmon, steelhead trout, sturgeon, American shad, and striped bass.</p> <p>Increases in the Trinity River fishery flow pattern would increase transport and provide improved water temperatures for salmon and steelhead trout.</p> <p>Increases in river flows and structural actions would improve passage and access to previously unavailable or underused stream habitats in Clear Creek, and in the American and Stanislaus rivers for adult, egg, and juvenile life stages of representative species. Conditions related to downstream fish movement would decline in the Sacramento River as a result of decreased flows and lower exports from the Trinity River basin.</p> <p>Structural actions would provide improved passage to previously unavailable or underused stream habitats in the minor tributaries to the Sacramento, Yuba, and San Joaquin rivers and the Delta for adult, egg, and juvenile life stages of representative species.</p> <p>Fish screen construction or improvements on the Sacramento, Feather, Yuba, Bear, American, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, and San Joaquin rivers and the Delta would benefit juvenile and adult life stages of representative species.</p> <p>Reductions in Delta exports in April through September would decrease entrainment mortality losses of juvenile and adult life stages of representative species. Increased Delta exports in October through February could increase entrainment mortality, but improved fish screens would reduce entrainment mortality for screenable life stages of representative species. Juvenile chinook salmon and steelhead that use the Delta for temporary residence and estuarine species residing in the Delta would benefit from a change in entrainment mortality.</p>

TABLE I-2. CONTINUED

Alternative or Supplemental Analysis	Impact Assessment
Changes Compared to the No-Action Alternative	
1	<p>Reductions in the frequency of short-term changes in river surface levels in the Sacramento, Yuba, American, Tuolumne, Merced rivers and the Delta would reduce redd dessication, stranding, and risk of mortality for egg, larval, and juvenile life-stage chinook salmon and steelhead trout.</p> <p>Increased flows and/or restoration of riparian vegetation that increases stream shading would decrease river water temperatures on Clear Creek, minor tributaries to the Sacramento River, Yuba, and Stanislaus rivers. Reduced summer flows on the American River during June through September, would increase water temperatures and adversely affect rearing juvenile steelhead trout.</p> <p>Actions to reduce predation at diversion facilities and limit predator habitat would improve survival of juvenile life stages of representative species in the Sacramento River and its minor tributaries and the Yuba, Mokelumne, Stanislaus, Tuolumne, Merced, and San Joaquin rivers, as well as in the Delta.</p> <p>The combined effects of increased instream flows, lower instream water temperatures, habitat restoration, and structural improvements would collectively improve habitat quality and quantity for representative species in all study area rivers except the Merced River.</p> <p>Restoration of riparian vegetation and instream habitat would increase the input of nutrients and food organisms and provide improved food web support for representative species in all study area rivers.</p>
Changes Compared to Alternative 1	
1a	<p>Further reductions in exports at Delta pumping facilities during April and May would decrease entrainment mortality of representative species. Juvenile chinook salmon and steelhead trout that use the Delta for temporary residence and estuarine species residing in the Delta would benefit from a decrease in entrainment mortality.</p> <p>Increases in Delta outflow in January through June would improve movement from less productive habitat in the central and south Delta towards more productive habitat near Suisun Bay for egg, larval, and juvenile life stages of representative species during temporary residence in the Delta. Increases in Delta outflow would also improved survival conditions for representative species in the Delta.</p> <p>Increased Delta outflow, reduced exports, and extension of X2 (2 ppt isohaline) farther downstream during April and May would increase Delta habitat quality and quantity for representative species during temporary residence in the Delta.</p>

TABLE I-2. CONTINUED

Alternative or Supplemental Analysis	Impact Assessment
Changes Compared to Alternative 1	
1b	<p>A decrease in flow into the central Delta from the Sacramento River would reduce juvenile life stage diversion-related losses and improve downstream movement of fish in the Sacramento River. Representative species would be transported towards more productive habitat near Suisun Bay, rather than entering the central Delta.</p> <p>The Old River barrier facility would reduce exposure to SWP and CVP pumping facilities and assist the successful outmigration of juvenile salmon from the San Joaquin River.</p> <p>Closure of the DCC barrier would increase the losses of striped bass and delta smelt rearing in the north and central Delta.</p>
1c	<p>Use of non-delivered CVP water is not determined at this time.</p> <p>Potential changes in surface water operations and the effect on fisheries resources will require further site-specific analyses.</p>
1d	<p>Conditions would be similar to Alternative 1.</p>
1e	<p>Conditions would be similar to Alternative 1, except in dry years when site-specific transfer operations could affect reservoir operations, river flows, and Delta exports.</p>
1f	<p>Conditions would be similar to Supplemental Analysis 1e.</p>
1g	<p>Conditions would be similar to Alternative 1.</p>
1h	<p>Conditions would be similar to Alternative 1.</p>
1i	<p>Red Bluff Diversion Dam gates would no longer be closed during the summer, thereby reducing mortality of juvenile chinook salmon and steelhead trout that migrate downstream to rear.</p> <p>Restoration of the river reach affected by Lake Red Bluff would create additional spawning and rearing habitat, and reduce predation losses.</p>

TABLE I-2. CONTINUED

Alternative or Supplemental Analysis	Impact Assessment
Changes Compared to the No-Action Alternative	
2	<p>(b)(2) Water Management, increased Trinity River flows, structural actions, and habitat restoration would provide general benefits to fisheries through improved habitat quality and quantity, passage to underused habitat, improved survival through fish screen improvements, and improved instream and riparian habitat conditions that would improve survival conditions for all life stages of representative species. These flow, structural, and habitat restoration actions would be similar to Alternative 1, plus</p> <p>Improved flows during April through June on the Tuolumne, Merced, and Stanislaus rivers would improve water temperature conditions and provide improved survival conditions for juvenile chinook salmon and steelhead trout and life stages of other species using these streams.</p> <p>Increased river flows in the Stanislaus, Tuolumne, Merced, and lower San Joaquin rivers would improve downstream movement of juvenile life stages of representative species in these rivers.</p> <p>Greater flows from the San Joaquin River towards Suisun Bay would further improve Delta flow conditions, reduce diversion-related losses, and facilitate the movement of organisms into more productive habitat located near Suisun Bay.</p> <p>The combined effects of the flow, structural, and habitat restoration actions in Alternative 2 would further improve habitat quality and quantity in the Bay-Delta and in the Stanislaus, Tuolumne, Merced, and lower San Joaquin rivers.</p> <p>The combined effects would also provide further improvement in food web support in the Bay-Delta and in the Stanislaus, Tuolumne, Merced, and lower San Joaquin rivers.</p>
Changes Compared to Alternative 2	
2a	<p>The decrease in flow into the central Delta from the Sacramento River would reduce juvenile life stage diversion-related losses and improve downstream movement of egg, larval, and juvenile life stages of representative species. Representative species would be transported towards more productive habitat near Suisun Bay, rather than less productive habitat in the central Delta.</p> <p>The Old River barrier facility would assist the outmigration of juvenile chinook salmon and steelhead trout from the San Joaquin River. Old River barrier would also reduce exposure of representative species to SWP and CVP pumping facilities.</p> <p>Closure of the DCC barrier would increase losses of striped bass and delta smelt rearing in the north and central Delta.</p>
2b	<p>Conditions are similar to Alternative 2, except in dry years when site-specific transfer operations may affect reservoir operations, river flows, and Delta exports.</p>
2c	<p>Conditions are similar to Supplemental Analysis 2b.</p>

TABLE I-2. CONTINUED

Alternative or Supplemental Analysis	Impact Assessment
Changes Compared to Alternative 2	
2d	<p>Use of non-delivered CVP water is not determined at this time.</p> <p>Potential changes in surface water operations and the effect on fisheries resources will require further site-specific analyses.</p>
Changes Compared to the No-Action Alternative	
3	<p>(b)(2) Water Management, increased Trinity River flows, structural actions, and habitat restoration would provide general benefits to fisheries through improved habitat quality and quantity, passage to underused habitat, improved survival through fish screen improvements, and improved instream and riparian habitat conditions that would improve survival conditions for all life stages of representative species. These flow, structural, and habitat restoration actions would be similar to Alternative 1, plus</p> <p>Increased spring stream flows, in combination with habitat restoration actions, would further improve temperature conditions on the Yuba, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced rivers and benefit rearing fry and juvenile chinook salmon and steelhead trout.</p> <p>Reduced diversions on the Yuba, Mokelumne, Calaveras, Stanislaus, Tuolumne, and Merced rivers would benefit migrating juvenile chinook salmon and steelhead trout.</p> <p>Increased Delta outflow would further improve overall conditions affecting diversion-related losses of representative species in the Delta, even though there would be increased Delta exports of acquired water in August through May.</p> <p>Reduced flow fluctuations on the Yuba and Mokelumne rivers would reduce stranding and benefit egg, fry, and juvenile life stages of chinook salmon and steelhead trout.</p> <p>Pulse flows on the Yuba, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, and San Joaquin rivers would primarily benefit outmigration of fall-run juvenile chinook salmon.</p>
Change Compared to Alternative 3	
3a	<p>Conditions would be similar to Alternative 3, except in dry years when site-specific transfer operations may affect reservoir operations, river flows, and Delta exports.</p>

TABLE I-2. CONTINUED

Alternative or Supplemental Analysis	Impact Assessment
Changes Compared to the No-Action Alternative	
4	<p>(b)(2) Water Management, increased Trinity River flows, structural actions, and habitat restoration would provide general benefits to fisheries through improved habitat quality and quantity, passage to underused habitat, improved survival through fish screen improvements, and improved instream and riparian habitat conditions that would improve survival conditions for all life stages of representative species. These flow, structural, and habitat restoration actions would be similar to Alternative 3, plus</p> <p>The combination of actions would reduced Delta exports and increase Delta outflow, which would shift the distribution of Delta species downstream into more productive habitat and away from the influence of Delta diversions.</p> <p>The DCC would be closed during November through January of wetter years to facilitate the outmigration of juvenile chinook salmon and steelhead trout down the Sacramento River. This structural action would improve survival and reduce the movement of these species into less productive habitat located in the central Delta, and expose these species to increased diversions and predation.</p> <p>Increased Delta outflow in all months would shift estuarine salinity downstream and increase habitat quality and quantity for Sacramento splittail, delta smelt, longfin smelt, and striped bass.</p> <p>Decreased diversions in the Delta would reduce the entrainment of food web organisms and nutrients, thereby increasing food web support in the Delta. Also, the downstream shift in estuarine salinity would increase production of prey organisms and benefit rearing life stages of all representative species.</p>
Changes Compared to Alternative 4	
4a	<p>Conditions would be similar to Alternative 4, except in dry years, when site-specific transfer operations may affect reservoir operations, river flows, and Delta exports.</p>