NEPA Effects: The effects of NPB would not be adverse because it is intended to improve migration survival.

CEQA Conclusion: As discussed above, the NPB at the divergence of Georgiana Slough from the Sacramento River has the potential to reduce the proportion of steelhead entering the low-survival interior Delta. The impacts of *Environmental Commitment 16 Nonphysical Fish Barriers* are expected to be less than significant. Consequently, no mitigation would be required.

Sacramento Splittail

Construction and Maintenance of Water Conveyance Facilities

The discussion of potential effects to delta smelt from construction and maintenance of the water conveyance facilities under Alternative 4A is also relevant to Sacramento splittail. As discussed for Alternative 1A, various life stages of Sacramento splittail would have the potential to overlap construction and maintenance to varying degrees (Table 11-8).

Impact AQUA-109: Effects of Construction of Water Conveyance Facilities on Sacramento Splittail

The potential effects of construction of the water conveyance facilities on Sacramento splittail would be the same as described for Alternative 4 (Impact AQUA-109). This section provides additional detail on underwater noise impacts which are also applicable to Impact AQUA-109 in Alternative 4.

Table 11-8 presents the life stages of Sacramento splittail and the months of their potential presence in the north, east, and south Delta during the proposed in-water construction window (June 1–October 31). Under Alternative 4A, underwater noise generated by impact pile driving in or near open waters of the Delta can reach levels associated with potential injury of fish, including Sacramento splittail. The potential exists for relatively large numbers of young-of-the-year to occur in the vicinity of pile driving activities at the north Delta intakes, barge unloading facilities, Clifton Court Forebay, and Head of Old River operable barrier as larvae and juveniles disperse from upstream spawning and early rearing areas (riparian margins and floodplains) to the estuary in April-August. However, because of the relatively small area of open water affected by noise exceeding the injury thresholds (Table 4.3.7-1 under Delta Smelt), the limited duration of pile driving activities (Table 4.3.7-1 under Delta Smelt), and the lack of suitable rearing habitat in the affected areas, adverse effects would be limited to a small proportion of the population. Implementation of Mitigation Measures AQUA-1a and AQUA-1b would further reduce these impacts. No significant population-level effects are expected.

NEPA Effects: As concluded for Alternative 4, Impact AQUA-109, the effect would not be adverse for Sacramento splittail. Implementation of the measures described in Appendix 3B, *Environmental Commitments*, such as *Environmental Training*; *Stormwater Pollution Prevention Plan*; *Erosion and Sediment Control Plan*; *Hazardous Materials Management Plan*; *Spill Prevention, Containment, and Countermeasure Plan; Disposal of Spoils, Reusable Tunnel Material, and Dredged Material*; *Fish Rescue and Salvage Plan*; and *Barge Operations Plan* would guide rapid and effective response in the case of inadvertent spills of hazardous materials. Construction would not be expected to increase predation rates relative to baseline conditions. Construction will result in both temporary and permanent alteration of rearing and migratory habitats used by splittail. However, Alternative 4A includes Environmental Commitment 4 to restore tidal habitat and Environmental Commitment 6 to restore channel margin habitat. Underwater noise produced by impact pile driving could result in adverse effects on splittail that occur in areas subject to noise levels exceeding the interim injury threshold for fish smaller than 2 grams (183 dB $SEL_{cumulative}$). Implementation of Mitigation Measures AQUA-1a and AQUA-1b would reduce these potential effects depending on the degree to which they can be implemented (see below).

CEQA Conclusion: As described in Alternative 4, Impact AQUA-109, the impact of the construction of the water conveyance facilities on splittail would not be significant except for construction noise associated with pile driving. Construction of Alternative 4A involves several elements with the potential to affect splittail. However, these turbidity and hazardous material spill effects will be effectively avoided and/or minimized through implementation of environmental commitments (see Impact AQUA-1 and Appendix 3B, *Environmental Commitments*: *Environmental Training*; *Stormwater Pollution Prevention Plan*; *Erosion and Sediment Control Plan*; *Hazardous Materials Management Plan*; *Spill Prevention, Containment, and Countermeasure Plan; Disposal of Spoils, Reusable Tunnel Material, and Dredged Material*; *Fish Rescue and Salvage Plan*; and *Barge Operations Plan*).

Implementation of Mitigation Measures AQUA-1a and AQUA-1b would potentially reduce noise impacts to less than significant levels. The extent to which these measures can be implemented is unknown at this time. Significant impacts may be unavoidable if these measures cannot be implemented to a sufficient degree to substantially reduce the amount of impact driving or the noise levels produced by impact driving.

Mitigation Measure AQUA-1a: Minimize the Use of Impact Pile Driving to Address Effects of Pile Driving and Other Construction-Related Underwater Noise

Mitigation Measure AQUA-1b: Monitor Underwater Noise and if Necessary, Use an Attenuation Device to Reduce Effects of Pile Driving and Other Construction-Related Underwater Noise

Impact AQUA-110: Effects of Maintenance of Water Conveyance Facilities on Sacramento Splittail

NEPA Effects: The potential effects of the maintenance of water conveyance facilities under Alternative 4A would be the same as those described for Alternative 4, Impact AQUA-110. Once constructed, Alternative 4A structures and facilities will require ongoing periodic maintenance that includes in-water work activities with the potential to affect splittail. These activities include periodic cleaning and replacement of screens, trash racks, and associated machinery and dredging to maintain intake capacity. These activities will produce disturbance and underwater noise, and may generate turbidity or other water quality effects. In general, the likelihood of adverse effects on splittail from maintenance activities would be avoided and minimized through the same methods and rationale described for Impact AQUA-1. As concluded in Alternative 4, Impact AQUA-110, the impact would not be adverse for Sacramento splittail.

CEQA Conclusion: As described in Alternative 4, Impact AQUA-110, the impact of the maintenance of water conveyance facilities on Sacramento splittail would be less than significant and no mitigation is required. Once constructed, Alternative 4A structures and facilities will require ongoing periodic maintenance that includes in-water work activities with the potential to affect splittail. These activities include periodic cleaning and replacement of screens, trash racks, and associated machinery and dredging to maintain intake capacity. These activities will produce disturbance and underwater noise, and may generate turbidity or other water quality effects. In general, the likelihood of adverse effects on splittail from maintenance activities would be avoided and minimized through the same methods and rationale described for Impact AQUA-1.

Operations of Water Conveyance Facilities

Impact AQUA-111: Effects of Water Operations on Entrainment of Sacramento Splittail

Water Exports from SWP/CVP South Delta Facilities

The salvage of splittail is considered an indicator of reproductive success more than of relative impact (Sommer et al. 1997); in contrast to other EIR/EIS alternatives for which juvenile splittail salvage was predicted using a historical relationship between Yolo Bypass inundation and salvage density at CVP and SWP, the analysis of splittail salvage for Alternative 4A used the per capita method, which evaluates how changes in exports would affect entrainment potential independent of other factors (This method is fully described in *BDCP Effects Analysis, Appendix 5B – Entrainment; Section 5.B.5.4.5 hereby incorporated by reference*). The per capita method was used because Yolo Bypass inundation is not included in the method, thus allowing an appropriate comparison between NAA_ELT (for which Yolo Bypass improvements would occur, but were not modeled) and H3_ELT (for which Yolo Bypass improvements would also occur as part of a program separate from Alternative 4A, and which was included in the modeling). The per capita rate of juvenile splittail entrainment under H3_ELT, which is an index of entrainment risk of an individual splittail and is directly related to the amount of water exported, averaged across all years would be reduced 37% for juveniles (Table 11-4A-91) and 54% for adults (Table 11-4A-92) compared to NAA_ELT. Adult entrainment and juvenile per capita entrainment are anticipated to be reduced in all water year types due to lower south Delta exports. Because Sacramento River and OMR flows are higher under the H4_ELT flow scenario for Alternative 4A compared to NAA_ELT, this scenario is expected to decrease entrainment loss at the south Delta more so than for the H3_ELT scenario.

Table 11-4A-91. Differences Between Model Scenarios in Juvenile Sacramento Splittail Entrainment Index[a] (Per Capita Method) at the SWP and CVP Salvage Facilities for Alternative 4A (Scenario H3_ELT) (See *BDCP Effects Analysis, Appendix 5B – Entrainment, Section 5B.6.1.7.1)*

	Absolute Difference (Percent Difference)	
Water Year Type	EXISTING CONDITIONS vs. H3_ELT	NAA_ELT vs. H3_ELT
Wet	-1,036,669 (-52%)	-928,107 (-49%)
Above Normal	-54,102 (-41%)	-42,647 (-35%)
Below Normal	-1,789 (-18%)	-1,201 (-13%)
Dry	-579 (-29%)	-306 (-18%)
Critical	-611 (-46%)	-456 (-39%)
All Years	-234,987 (-43%)	-180,132 (-37%)

Shading indicates entrainment increased 10% or more.

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

[a] Estimated annual number of fish lost. Average (May–July).

Table 11-4A-92. Differences Between Model Scenarios in Adult Sacramento Splittail Entrainment Index[a] (salvage density method) at the SWP and CVP Salvage Facilities for Alternative 4A (Scenario H3_ELT) (See *BDCP Effects Analysis, Appendix 5B – Entrainment, Section 5B.6.1.7.1)*

	Absolute Difference (Percent Difference)	
Water Year Type	EXISTING CONDITIONS vs. H3_ELT	NAA_ELT vs. H3_ELT
Wet	-2,790 (-70%)	-2,986 (-72%)
Above Normal	-3,294 (-68%)	-3,258 (-68%)
Below Normal	-1,352 (-40%)	-1,344 (-40%)
Dry	-680 (-28%)	-616 (-26%)
Critical	-594 (-18%)	-494 (-15%)
All Years	-1,875 (-54%)	-1,916 (-54%)

Shading indicates entrainment increased 10% or more.

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

[a] Estimated annual number of fish lost. Average (December–March).

Water Exports from SWP/CVP North Delta Intake Facilities

The north Delta intakes would be screened, and all splittail except larvae and juveniles less than 22 mm long would be excluded from entrainment (*BDCP Effects Analysis – Appendix 5B Entrainment, Section 5.B.6.2.4, hereby incorporated by reference*). Potential impacts would be minimized by the adaptive management plan under Alternative 4A, including monitoring of the new screens effectiveness and corrective measures if needed. This monitoring would be focused on listed species such as delta smelt and winter-run and spring-run Chinook salmon, but the temporal overlap of splittail early life stages with these species occurrence as larvae or juveniles near the north Delta intakes would result in de facto management for splittail. Although entrainment of smaller life stages at the north Delta intakes is likely to occur during lower flow years when floodplain inundation is less, the bulk of reproduction occurs when floodplains are inundated, which would occur more often under NAA_ELT and Alternative 4A because of Yolo Bypass improvements; splittail emerging from the Yolo Bypass at its downstream terminus in the Cache Slough subregion would not be susceptible to north Delta intake entrainment. In addition, the north Delta intakes would divert considerably less water in drier years, so that the risk of entrainment by the north Delta intakes would be less at times when there would be more juvenile splittail likely to be susceptible to entrainment, having not been spawned in the Yolo Bypass or other floodplains.

Predation Associated with Entrainment

Per-capita entrainment-related predation loss of splittail at the south Delta facilities is not expected to be greater under Alternative 4A than NAA_ELT because predicted per capita entrainment is lower due to lower south Delta exports. The predation loss would be lower under Scenario H4_ELT than under Scenario H3_ELT. However, because predation of entrained splittail is not currently considered to be an important driver of splittail population dynamics, this variation in the predicted impact in both Alternative 4A subscenarios is not considered to be adverse to splittail in either of these operational scenarios.

Predation at the north Delta would be increased due to the installation of the proposed water export facilities on the Sacramento River, with three intakes for Alternative 4A. These losses would be offset by the reduction in entrainment and predation loss at the SWP/CVP south Delta intakes, habitat restoration under Environmental Commitment 6, and reduction in potential predation under Environmental Commitment 15. Further, as described for Alternative 1A and as noted for Alternative 4, the fishery agencies concluded that the predation was not a factor currently limiting splittail abundance. In addition, as described above for entrainment at the north Delta intakes, the importance of floodplain inundation (particularly the Yolo Bypass) and the resulting emigration of juvenile splittail to the Delta downstream of the intakes, plus the relatively low diversions from the north Delta intakes in drier years when floodplains would be less available, suggests a limited effect of predation.

NEPA Effects: In conclusion, the effect from entrainment and predation loss under Alternative 4A would not be adverse, because while predation loss of splittail would be potentially increased at the north Delta facilities, it would be offset by substantial reductions in per capita entrainment and associated predation at the south Delta facilities compared to the NAA_ELT actions, as well as other conservation measures (Environmental Commitment 6, Environmental Commitment 15, and potentially Environmental Commitment 16).

CEQA Conclusion: Operational activities associated with reduced south Delta water exports would result in an overall decrease in the proportion of splittail population entrained for all water year types. As discussed above, although entrainment of smaller life stages at the north Delta intakes is likely to occur during lower flow years when floodplain inundation is less, the bulk of reproduction occurs when floodplains are inundated, which would occur more often under NAA_ELT and Alternative 4A because of Yolo Bypass improvements; splittail emerging from the Yolo Bypass at its downstream terminus in the Cache Slough subregion would not be susceptible to north Delta intake entrainment. Also, as discussed above, there would be less water diverted from the north Delta intakes in drier years in which splittail reproduction was more focused in non-floodplain areas, which would limit the potential for entrainment by the north Delta intakes. Under Scenario H3_ELT, estimated juvenile entrainment (Per Capita method) and hence pre-screen predation losses would be 43% lower and adult entrainment and pre-screen predation losses would be 54% lower than Existing Conditions. Per capita entrainment and related predation loss at the south Delta would be further reduced under Scenario H4_ELT compared to Existing Conditions. The impact and conclusion for predation associated with entrainment would be the same as described above.

In conclusion, the impact of Alternative 4A from entrainment and predation loss would be less than significant because of improvements in overall proportional entrainment, and no mitigation is required.

Impact AQUA-112: Effects of Water Operations on Spawning and Egg Incubation Habitat for Sacramento Splittail

Sacramento splittail spawn in floodplains and channel margins and in side-channel habitat upstream of the Delta, primarily in the Sacramento River and Feather River. Floodplain spawning overwhelmingly dominates production in wet years. During low-flow years when floodplains are not inundated, spawning in side channels and channel margins would be much more critical.

In general, Alternative 4A would have little to no effect on splittail spawning habitat relative to the NAA_ELT because improvements to the Yolo Bypass would occur under the NAA_ELT and therefore would not differentiate Alternative 4A from NAA_ELT. There would be negligible effects on channel margin and side-channel habitats in the Sacramento River at Wilkins Slough and the Feather River, with beneficial effects from moderate to substantial increases in mean monthly flow for some months and water year types for each location. There would be negligible negative effects on water temperatures in the Feather River and a beneficial effect from a decrease in exposure to critical high water temperatures.

H3_ELT/ESO_ELT

Floodplain Habitat

Effects of H3_ELT on floodplain spawning habitat were evaluated for Yolo Bypass. Note that, in contrast to other Alternatives, Alternative 4A does not include improvements to Yolo Bypass such as modification of the Fremont Weir; these improvements are assumed to occur as part of NAA_ELT (and therefore also are included in Alternative 4A, but are not as a result of the alternative). As described for Alternative 4, effects in Yolo Bypass were evaluated using a habitat suitability approach based on water depth (2 m threshold) and inundation duration (minimum of 30 days). Effects of flow velocity were ignored because flow velocity was generally very low throughout the modeled area for most conditions, with generally 80 to 90% of the total available area having flow velocities of 0.5 foot per second or less (a reasonable critical velocity for early life stages of splittail; Young and Cech 1996), and because habitat heterogeneity in the flooded Yolo Bypass is high (Sommer et al. 2005).

There would be little to no difference in floodplain habitat availability or acreage between NAA_ELT and Alternative 4A because Yolo Bypass improvements would be present in both (Table 11-4A-93; Table 11-4A-94).

Table 11-4A-93. Differences in Frequencies of Inundation Events (for 82-Year Simulations) of Different Durations on the Yolo Bypass under Different Scenarios and Water Year Types, February through June, from 15 2-D and Daily CALSIM II Modeling Runs

Number of Days of Continuous Inundation	Change in Number of Inundation Events for Each Scenario	
	EXISTING CONDITIONS vs. H3_ELT	NAA_ELT vs. H3_ELT
30–49 Days		
Wet	-4	Little to no difference[a]
Above Normal	0	Little to no difference[a]
Below Normal	4	Little to no difference[a]
Dry	1	Little to no difference[a]
Critical	1	Little to no difference[a]
50–69 Days		
Wet	-5	Little to no difference[a]
Above Normal	0	Little to no difference[a]
Below Normal	1	Little to no difference[a]
Dry	0	Little to no difference[a]
Critical	0	Little to no difference[a]
≥70 Days		
Wet	8	Little to no difference[a]
Above Normal	2	Little to no difference[a]
Below Normal	1	Little to no difference[a]
Dry	0	Little to no difference[a]
Critical	0	Little to no difference[a]

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

[a] The inclusion of Yolo Bypass improvements was not modeled for NAA_ELT, but would be expected to result in minimal differences in the number of inundation events between NAA_ELT and H3_ELT.

Table 11-4A-94. Change in Splittail Weighted Habitat Area (HUs[c] and percent) in Yolo Bypass from Existing Biological Conditions to Alternative 4A by Water Year Type from 15 2-D and Daily CALSIM II Modeling Runs

Water Year Type	EXISTING CONDITIONS vs. H3_ELT	NAA_ELT vs. H3_ELT
Wet	1,123 (73%)	Little to no difference[b]
Above Normal	715 (62%)	Little to no difference[b]
Below Normal	337 (257%)	Little to no difference[b]
Dry	8 (NA[a])	Little to no difference[b]
Critical	5 (NA[a])	Little to no difference[b]

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

[a] NA percent differences could not be computed because no splittail weighted habitat occurred in the bypass for NAA_ELT and Existing Conditions in those years (dividing by 0).

[b] The inclusion of Yolo Bypass improvements was not modeled for NAA_ELT, but would be expected to result in minimal differences in the weighted habitat area between NAA_ELT and H3_ELT.

[c] HUs = Habitat Units. HUs were computed as the product of habitat acreage and a Habitat Suitability Index (based on water depth) that ranges from 0 to 1, where maximum suitability = 1. Therefore, HUs are always less than or equal to habitat acreage.

As noted for Alternative 4, a potential effect of Yolo Bypass improvements is changes in inundation of the Sutter Bypass as a result of increased flow diversion at the modified Fremont Weir. Because modification of the Fremont Weir would occur under Alternative 4A and the NAA_ELT, there would be little to no difference in inundated acreage in the lower Sutter Bypass between H3_ELT and NAA_ELT (Table 11-4A-95). Therefore, H3_ELT would not affect splittail spawning and rearing habitat in the Sutter Bypass relative to NAA_ELT.

Table 11-4A-95. Differences (and Percent Change) in Daily Average (December–June) Lower Sutter Bypass Inundation (acres)

Water Year Type	EXISTING CONDITIONS vs. H3_ELT	NAA_ELT vs. H3_ELT
Wet	-35 (-1.5)	Little to no difference[a]
Above Normal	55 (4.1)	Little to no difference[a]
Below Normal	-26 (-7.8)	Little to no difference[a]
Dry	-4 (-2.8)	Little to no difference[a]
Critical	1 (2.8)	Little to no difference[a]
All	1 (0.1)	Little to no difference[a]

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

[a] The inclusion of Yolo Bypass improvements was not modeled for NAA_ELT, but would be expected to result in minimal differences in the lower Sutter Bypass inundation between NAA_ELT and H3_ELT.

Channel Margin and Side-Channel Habitat

In addition to spawning on floodplains, splittail spawning and larval and juvenile rearing also occur in channel margin and side-channel habitat upstream of the Delta. These habitats are likely to be especially important during dry years, when flows are too low to inundate the floodplains (Sommer et al. 2007). Side-channel habitats are affected by changes in flow because greater flows cause more flooding, thereby increasing availability of such habitat, and because rapid reductions in flow dewater the habitats, potentially stranding splittail eggs and rearing larvae. Effects of the alternative on flows in years with low flows are expected to be most important to the splittail population because in years of high flows, when most production comes from floodplain habitats, the upstream side-channel habitats contribute relatively little production. However, as noted by Sommer (1997), splittail have high fecundity and so can respond rapidly to improvements in environmental conditions (e.g., floodplain inundation), so that very high recruitment occurs in years with floodplain inundation.

Effects on channel margin and side-channel habitat were evaluated by comparing flow conditions for the Sacramento River at Wilkins Slough and the Feather River at the confluence with the Sacramento River for the time-frame February through June. These are the most important months for splittail spawning and larval rearing (Sommer pers. comm.), and juveniles likely emigrate from the side-channel habitats during May and June if conditions become unfavorable.

Differences between model scenarios for monthly average flows during February through June by water-year type were determined for the Sacramento River at Wilkins Slough and for the Feather River at the confluence.

Flows under H3_ELT relative to NAA_ELT in the Sacramento River at Wilkins Slough were compared for the February through June spawning period (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Modeling results indicate that H3_ELT would have primarily negligible effects (<5%) during February through April and May. During June, flows would be up to 16% greater under H3_ELT than under NAA_ELT). Due to the low magnitude and frequency of flow changes during June, this increase is not expected to have a biologically meaningful effect on splittail spawning conditions. Modeling results also show that Sacramento splittail spawning temperature tolerances would not be exceeded in the Sacramento River under Alternative 4A.

Flows in the Feather River at the confluence with the Sacramento River (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*) during February through June under H3_ELT would generally be similar to or greater than flows under NAA_ELT. Flows under H3_ELT during April, May, and June would be up to 77% greater than flows under NAA_ELT, which, due to the high magnitude and frequency of change, would be a beneficial effect to splittail. These flow increases would substantially increase the amount of channel margin and side channel habitat available for splittail spawning during the majority of the spawning period.

Simulated daily and monthly water temperatures in Sacramento River at Hamilton City and Feather River at the confluence with the Sacramento River, respectively, were used to investigate the potential effects of H3_ELT on the suitability of water temperatures for splittail spawning and egg incubation. A range of 45°F to 75°F was selected as the suitable range for splittail spawning and egg incubation.

There would be no biologically meaningful difference (>5% absolute scale) between NAA_ELT and H3_ELT in the frequency of water temperatures in the Sacramento River being within the suitable 45°F to 75°F regardless of water year type (Table 11-4A-96). In the Feather River, there would be differences between NAA_ELT and H3_ELT in temperatures below 45°F. There would be a 6% reduction in the exceedance above the 75°F threshold for above normal water years but due to the low magnitude and frequency of this reduction, it is not expected to have a biologically meaningful effect on splittail.

Table 11-4A-96. Difference (Percent Difference) in Percent of Days or Months[a] during February to June in Which Temperature Would Be below 45°F or above 75°F in the Sacramento River at Hamilton City and Feather River at the Confluence with the Sacramento River[b]

	EXISTING CONDITIONS vs. H3_ELT	NAA_ELT vs. H3_ELT
Sacramento River at Hamilton City		
Temperatures below 45°F		
Wet	-2.8 (-60%)	0 (0%)
Above Normal	-2.8 (-60%)	0 (0%)
Below Normal	-2.7 (-53%)	-0.2 (-8%)
Dry	-1.4 (-47%)	0 (0%)
Critical	-1.1 (-54%)	0 (0%)
All	-2.2 (-55%)	0 (0%)
Temperatures above 75°F		
Wet	0 (NA)	0 (NA)
Above Normal	0 (NA)	0 (NA)
Below Normal	0 (NA)	0 (NA)
Dry	0 (NA)	0 (NA)
Critical	0 (NA)	0 (NA)
All	0 (NA)	0 (NA)
Feather River at Sacramento River Confluence		
Temperatures below 45°F		
Wet	0 (NA)	0 (NA)
Above Normal	0 (NA)	0 (NA)
Below Normal	0 (NA)	0 (NA)
Dry	0 (NA)	0 (NA)
Critical	0 (NA)	0 (NA)
All	0 (NA)	0 (NA)
Temperatures above 75°F		
Wet	2.3 (NA)	0 (0%)
Above Normal	1.8 (NA)	-5.5 (-76%)
Below Normal	1.4 (NA)	-4.3 (-75%)
Dry	3.4 (77%)	-2.2 (-22%)
Critical	6.6 (396%)	0 (0%)
All	3.0 (243%)	-2.0 (-32%)

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

[a] Days were used in the Sacramento River and months were used in the Feather River.

[b] Based on the modeling period of 1922 to 2003.

These results indicate that H3_ELT would cause no negative effects on splittail spawning conditions in channel margin and side-channel habitats resulting from changes in flow and water temperatures. Effects of H3_ELT on mean monthly flow would consist of negligible effects or increases in flow (increases up to 12% in the Sacramento River and to 77% in the Feather River) for some months and water year types in the spawning period that would have beneficial effects on rearing conditions. There would be negligible or beneficial project-related effects on exceedance of critical water temperatures in the Sacramento River, and a beneficial effect from a decrease (up to-6%) in exposure to critical high water temperatures in the Feather River.

Stranding Potential

As indicated above and as described for Alternative 4, rapid reductions in flow can dewater channel margin and side-channel habitats, potentially stranding splittail eggs and rearing larvae. Yolo Bypass improvements would occur under the NAA_ELT and therefore would exist under Alternative 4A, but there would be little to no difference in stranding potential between Alternative 4A and NAA_ELT.

H4_ELT/HOS_ELT

Floodplain Habitat

Floodplain habitat conditions for splittail under H4_ELT would be similar to conditions under H3_ELT, and would not differ from NAA_ELT because Yolo Bypass improvements are assumed to occur independently of Alternative 4A and therefore would be part of Alternative 4A as well as NAA_ELT.

Channel Margin and Side-Channel Habitat

Flows under H4_ELT in the Sacramento River at Wilkins Slough during February through June would be similar to flows under NAA_ELT (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Flows in the Feather River at the Sacramento River confluence under H4_ELT would be up to 119% higher than under NAA_ELT, a benefit to splittail. Flows at these two locations are representative of the reach of these rivers where splittail spawn on wetted channel margin and side channels.

There would be no biologically meaningful difference (<5% difference on an absolute scale) between NAA_ELT and H4_ELT in the frequency of water temperatures in the Sacramento River being within the suitable 45°F to 75°F regardless of water year type (Table 11-4A-97). In the Feather River, there would be differences between NAA_ELT and H4_ELT in temperatures below 45°F. There would be a 6% reduction in the exceedance above the 75°F threshold for above normal water years under H4_ELT relative to NAA_ELT, but no other differences.

Table 11-4A-97. Difference (Percent Difference) in Percent of Days or Months[a] during February to June in Which Temperature Would Be below 45°F or above 75°F in the Sacramento River at Hamilton City and Feather River at the Confluence with the Sacramento River[b]

	EXISTING CONDITIONS vs. H4_ELT	NAA_ELT vs. H4_ELT
Sacramento River at Hamilton City		
Temperatures below 45°F		
Wet	-2.8 (-60%)	0 (0%)
Above Normal	-2.8 (-60%)	0 (0%)
Below Normal	-2.6 (-51%)	-0.1 (-4%)
Dry	-1.4 (-47%)	0 (0%)
Critical	-1.1 (-54%)	0 (0%)
All	-2.2 (-55%)	0 (0%)
Temperatures above 75°F		
Wet	0 (NA)	0 (NA)
Above Normal	0 (NA)	0 (NA)
Below Normal	0 (NA)	0 (NA)
Dry	0 (NA)	0 (NA)
Critical	0 (NA)	0 (NA)
All	0 (NA)	0 (NA)
Feather River at Sacramento River Confluence		
Temperatures below 45°F		
Wet	0 (NA)	0 (NA)
Above Normal	0 (NA)	0 (NA)
Below Normal	0 (NA)	0 (NA)
Dry	0 (NA)	0 (NA)
Critical	0 (NA)	0 (NA)
All	0 (NA)	0 (NA)
Temperatures above 75°F		
Wet	3.8 (NA)	1.5 (702%)
Above Normal	5.5 (NA)	-1.8 (-25%)
Below Normal	1.4 (NA)	-4.3 (-75%)
Dry	5.6 (126%)	0 (0%)
Critical	5 (300%)	-1.6 (-19%)
All	4.2 (340%)	-0.8 (-13%)

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

[a] Days were used in the Sacramento River and months were used in the Feather River.

[b] Based on the modeling period of 1922 to 2003.

Stranding Potential

As noted for H3_ELT, because the improvements to Yolo Bypass such as Fremont Weir modifications would occur under the NAA_ELT and therefore would exist under Alternative 4A, there would be no difference in stranding potential between H4_ELT and NAA_ELT.

NEPA Effects: Collectively, these modeling results indicate that the effect is not adverse because it would not substantially reduce suitable spawning habitat or substantially reduce the number of fish as a result of egg mortality. The effects of H3_ELT on splittail spawning would consist of negligible effects and beneficial effects in some months on channel margin and side-channel habitats in the Sacramento River at Wilkins Slough generally <5% change in flow) and the Feather River (increases in mean monthly flow up to 119%), and negligible or beneficial effects on water temperatures in the Sacramento and Feather Rivers (<5% change).

CEQA Conclusion: In general, Alternative 4A would have no effect on splittail spawning habitat relative to Existing Conditions. There would be negligible flow- and temperature-related effects on channel margin and side-channel habitats in the Sacramento River at Wilkins Slough and the Feather River. Yolo Bypass improvements (e.g., modification of Fremont Weir) would occur irrespective of Alternative 4A, but are not included in Existing Conditions, so there would be generally beneficial effects to splittail coinciding with the implementation of Alternative 4A (but not as a result of Alternative 4A).

H3_ELT/ESO_ELT

Floodplain Habitat

As noted elsewhere in the analysis of Alternative 4A for splittail, increases in floodplain habitat because of Fremont Weir modifications during Yolo Bypass improvements are assumed to occur independently of Alternative 4A and would be part of NAA_ELT as well as Alternative 4A. Comparisons of splittail weighted inundation frequencies for H3_ELT and Existing Conditions show relatively small increases in drier years under H3_ELT. In wet years, there are reductions under H3_ELT in the frequencies of the shorter inundation periods and an increase in the frequency of the longest inundation periods (70 days or more) because a number what would be shorter inundation periods under Existing Conditions merge to produce longer inundation periods under H3_ELT (Table 11-4A-93).The availability of suitable spawning habitat would be greater under H3_ELT than under Existing Conditions (Table 11-4A-94), with increases of between 5 and 979 Habitat Units (HUs; see footnote in Table 11-5A-61) of suitable spawning habitat depending on water year type. Increased HUs for wet, above normal, and below normal water years are predicted to be 73%, 62%, and 257%, respectively for H3_ELT. Comparisons for dry and critical water years indicate project-related increases of 8 and 5 HUs of suitable spawning habitat, respectively, compared to 0 HUs for Existing Conditions. There would generally be no or small differences (8% lower in below normal years) in splittail spawning and rearing habitat in the Sutter Bypass under H3_ELT relative to Existing Conditions (Table 11-4A-95). These results indicate that under H3_ELT the extent of suitable spawning habitats would be up to 257% greater than under Existing Conditions, although the difference would not be as a result of implementation of Alternative 4A, but instead from separate Yolo Bypass improvements that are assumed to take place regardless of Alternative 4A.

Channel Margin and Side-Channel Habitat

Flows were compared between H3_ELT and Existing Conditions for the Sacramento River at Wilkins Slough (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*) during February through June Flows under H3_ELT would generally not differ (<5%) from those under Existing Conditions during February through May although flows during June would be up to 18% higher under H3_ELT. Due to the low magnitude and frequency of flow changes during June, this increase is not expected to have a biologically meaningful effect on splittail spawning conditions.

Results for the Feather River at the confluence with the Sacramento River (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*) show variable effects of H3_ELT depending on month and water year type. Results for all months except April include negligible effects (<5%), small to large increases in mean monthly flow (to 71%), and small to moderate decreases (up to -15%). During April. Flows would be generally similar between H3_ELT and Existing Conditions. Based on a prevalence of negligible (<5%) or beneficial effects on flow (increases to 71%), and isolated decreases that would be of small magnitude, these results indicate that effects of Alternative 4A on flow would not have biologically meaningful negative effects on splittail spawning conditions in channel margin and side-channel habitats in the Feather River.

Simulated daily and monthly water temperatures in Sacramento River at Hamilton City and Feather River at the confluence with the Sacramento River, respectively, were used to investigate the potential effects of H3_ELT on the suitability of water temperatures for splittail spawning and egg incubation. A range of 45°F to 75°F was selected as the suitable range for splittail spawning and egg incubation.

There would be no biologically meaningful difference (>5% absolute scale) between Existing Conditions and H3_ELT in the frequency of water temperatures in the Sacramento River being within the suitable 45°F to 75°F regardless of water year type (Table 11-4A-96). In the Feather River, there would be differences between Existing Conditions and H3_ELT in temperatures below 45°F. There would be a 7% increase in the exceedance above the 75°F threshold under H3_ELT relative to Existing Conditions in critical water years, but no other differences.

Stranding Potential

As noted for other alternatives, and due to a lack of quantitative tools and historical data to evaluate possible stranding effects, the following provides a narrative summary of potential effects in relation to stranding potential. The Yolo Bypass is exceptionally well-drained because of grading for agriculture, which likely helps limit stranding mortality of splittail. Moreover, water stage decreases on the bypass are relatively gradual (Sommer et al. 2001). Stranding of Sacramento splittail in perennial ponds on the Yolo Bypass does not appear to be a problem under Existing Conditions (Feyrer et al. 2004). Yolo Bypass improvements (occurring independently of Alternative 4A) would be designed, in part, to further reduce the risk of stranding by allowing water to inundate certain areas of the bypass to maximize biological benefits, while keeping water away from other areas to reduce stranding in isolated ponds. Actions to increase the frequency of Yolo Bypass inundation that are separate from Alternative 4A but that would coincide with Alternative 4A would increase the frequency of potential stranding events in relation to Existing Conditions. For splittail, an increase in inundation frequency would also increase the production of Sacramento splittail in the bypass. While total stranding losses may be greater under Alternative 4A than under Existing Conditions (although not as a result of Alternative 4A), the total number of splittail would be expected to be greater under Alternative 4A (again, not as a result of Alternative 4A, but coincident with it).

In the Yolo Bypass, Sommer et al. (2005) found these potential losses are offset by the improvement in rearing conditions. Henning et al. (2006) also noted the potential for stranding risk as wetlands desiccate and oxygen concentrations decline, but the seasonal timing of use by juveniles may decrease these risks. Sommer et al. (2005) addressed the question of stranding and concluded the potential improvements in habitat capacity outweighed the potential stranding problems that may exist in some years. Overall, these effects are less than significant.

H4_ELT/HOS_ELT

Floodplain Habitat

Floodplain habitat conditions for splittail under H4_ELT would be similar to conditions under H3_ELT, and would not differ from NAA_ELT because Yolo Bypass improvements are assumed to occur independently of Alternative 4A and therefore would be part of Alternative 4A as well as NAA_ELT.

Channel Margin and Side-Channel Habitat

Flows under H4_ELT in the Sacramento River at Wilkins Slough during February through June would generally be similar to flows under Existing Conditions with some increases (up to 11%) and decreases (up to 12%) depending on month and water year type (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Flows in the Feather River at the Sacramento River confluence under H4_ELT would generally be similar to those under Existing Conditions between February and May and up to 77% higher during June, a benefit to splittail.

There would be no biologically meaningful difference (>5% absolute scale) between Existing Conditions and H4_ELT in the frequency of water temperatures in the Sacramento River being within the suitable 45°F to 75°F regardless of water year type (Table 11-4A-97). In the Feather River, there would be differences between Existing Conditions and H4_ELT in temperatures below 45°F. There would be a 6% increase in the exceedance above the 75°F threshold for above normal water and dry years under H4_ELT relative to Existing Conditions, but no other differences. These increases are not expected to cause a biologically meaningful negative effect to splittail due to their low magnitude and frequency.

Summary of CEQA Conclusion

Collectively, these results indicate that the impact is not significant because it would not substantially reduce suitable spawning habitat or substantially reduce the number of fish as a result of egg mortality. There would be negligible effects of the alternative on flow and water temperatures in channel margin habitats and side channels. Floodplain inundation and stranding potential would be greater than the CEQA baseline, but not as a result of Alternative 4A, and the net result would be expected to be beneficial. No mitigation is necessary.

Impact AQUA-113: Effects of Water Operations on Rearing Habitat for Sacramento Splittail

H3_ELT/ESO_ELT

Because both Alternative 4A and NAA_ELT are assumed to include Yolo Bypass improvements including Fremont Weir modification, there would be little to no difference in the quantity and quality of rearing habitat in the Yolo Bypass. There would be no effect on rearing conditions in channel margin and side-channel habitats due to negligible changes in mean monthly flow and water temperatures during most of the rearing period in the Sacramento River and the Feather River.

Floodplains are important rearing habitats for juvenile splittail during periods of high flows when areas like the Yolo Bypass are inundated. During low flows when floodplains are not inundated, splittail rear in side-channel and channel margin habitat. Therefore, the previous impact discussion applies to rearing as well as spawning habitat for splittail for H3_ELT. The small and infrequent changes to flow under H3_ELT described above would also not substantially affect splittail rearing habitat conditions.

H4_ELT/HOS_ELT

Because flows and water temperatures under H4_ELT would be similar to those under H3_ELT, conclusions for H4_ELT are similar to those under H3_ELT.

NEPA Effects: Based on the analyses above, the effect of Alternative 4 on splittail rearing habitat is not adverse because it would not substantially reduce rearing habitat or substantially reduce the number of fish as a result of mortality.

CEQA Conclusion: In general, there would be no effect of Alternative 4A on splittail rearing habitat relative to Existing Conditions.

H3_ELT/ESO_ELT

As described above, floodplains are important rearing habitats for juvenile splittail during periods of high flows when areas like the Yolo Bypass are inundated. Alternative 4A would not result in changes in floodplain habitat, although there would be a greater extent of floodplain habitat available coincident with implementation of Alternative 4A because of Yolo Bypass improvements (e.g., Fremont Weir modification) that would occur regardless of Alternative 4A but that are not current present under Existing Conditions. During low flows when floodplains are not inundated, splittail rear in side-channel and channel margin habitat. Therefore, the previous impact discussion applies to rearing as well as spawning habitat for splittail for H3_ELT.

H4_ELT/HOS_ELT

Because flows and water temperatures under H4_ELT would be similar to those under H3_ELT, conclusions for H4_ELT are similar to those under H3_ELT.

Summary of CEQA Conclusion

Based on the analyses above, the impact of Alternative 4 on splittail rearing habitat is not significant because it would not substantially reduce rearing habitat or substantially reduce the number of fish as a result of mortality. There would be negligible effects of the alternative on flow and water temperatures in channel margin habitats and side channels. Floodplain inundation and stranding potential would be greater than the CEQA baseline but not as a result of Alternative 4A. No mitigation is necessary.

Impact AQUA-114: Effects of Water Operations on Migration Conditions for Sacramento Splittail

Upstream of the Delta

In general, Alternative 4A would not affect migration conditions for juvenile or adult splittail in the Sacramento River or the Feather River relative to the NAA_ELT based on negligible or beneficial effects on mean monthly flow during the migration period and negligible effects on exposure to critical water temperatures in the Feather River. Adults migrate upstream primarily in December through March and juvenile migrate primarily in April through July (Moyle et al. 2004).

H3_ELT/ESO_ELT

The effects of H3_ELT on splittail migration conditions would be the same as described for channel margin and side-channel habitats in the Sacramento River and Feather River for Impact AQUA-112 above. There would be no effect of H3_ELT on channel margin and side-channel habitat in either location because there would be negligible changes in mean monthly flow and water temperatures compared to NAA_ELT.

H4_ELT/HOS_ELT

The effects of H4_ELT on splittail migration conditions would be the same as described for channel margin and side-channel habitats in the Sacramento River and Feather River for Impact AQUA-112 above. These effects would be similar to those for H3_ELT.

Through-Delta

Alternative 4A would generally improve OMR reverse flows during the period of juvenile splittail migration through the Delta under all flow scenarios. Modeled OMR flows under Alternative 4A would be reduced slightly in May compared to other months under all flow scenarios, but flows would still be less negative than under NAA_ELT. Modeled OMR flows would be increased in June and July under Alternative 4A flow scenarios compared to baseline conditions (NAA_ELT). Based on the modeling, overall OMR flows improve during the splittail migration period. For juvenile splittail migrating down the Sacramento River past the north Delta intakes, migration flows downstream of the north Delta intakes under Alternative 4A generally would be somewhat reduced relative to NAA_ELT, which could reduce splittail survival in the more riverine reaches (as seen for juvenile Chinook salmon; Perry 2010). As noted in the analysis of entrainment potential above, the greatest proportion of juvenile splittail would be expected to be emigrating from the Yolo Bypass in years when it is inundated (a more frequent occurrence under NAA_ELT and Alternative 4A because of Fremont Weir modifications) and therefore these juveniles would enter the Delta in its further downstream, tidal reaches in the Cache Slough subregion, where riverine flow-related migration influences would be very small relative to tidal flow influences.

NEPA Effects: The effect of Alternative 4A is not adverse because it would not substantially reduce or degrade migration habitat or substantially reduce the number of fish as a result of mortality.

CEQA Conclusion: Overall, the effects of water operations on migration conditions for Sacramento splittail are less than significant.

Upstream of the Delta

In general, effects of Alternative 4A would have no effect on splittail migration conditions relative to Existing Conditions due to a lack of effects to flows and water temperatures in the Sacramento River and the Feather River during the splittail migration period.

H3_ELT/ESO_ELT

Effects of H3_ELT on splittail migration conditions are the same as described for channel margin and side-channel habitats in Impact AQUA-112.

H4_ELT/HOS_ELT

The effects of H4_ELT on splittail migration conditions would be the same as described for channel margin and side-channel habitats in the Sacramento River and Feather River for Impact AQUA-112 above. These effects would be similar to those for H3_ELT.

Through-Delta

Average modeled OMR flows would be greater under Scenario H3_ELT than the CEQA baseline during the majority of the juvenile splittail migration through the Delta. OMR flow conditions under Scenario H4 would further improve migration conditions for juvenile splittail. For juvenile splittail migrating down the Sacramento River past the north Delta intakes, migration flows downstream of the north Delta intakes under Alternative 4A generally would be somewhat reduced relative to NAA_ELT, which could reduce splittail survival in the more riverine reaches (as seen for juvenile Chinook salmon; Perry 2010). As noted in the analysis of entrainment potential above, the greatest proportion of juvenile splittail would be expected to be emigrating from the Yolo Bypass in years when it is inundated (a more frequent occurrence under NAA_ELT and Alternative 4A because of Fremont Weir modifications) and therefore these juveniles would enter the Delta in its further downstream, tidal reaches in the Cache Slough subregion, where riverine flow-related migration influences would be very small relative to tidal flow influences. The greater availability of the Yolo Bypass under Alternative 4A compared to Existing Conditions would improve migration conditions for splittail that are able to access the Bypass. Therefore the impact on splittail migration survival is concluded to be less than significant.

Summary of CEQA Conclusion

The impact is less than significant because it would not substantially reduce suitable migration habitat or substantially reduce the number of fish as a result of mortality and no mitigation is necessary. There would be negligible effects of the alternative on flow and water temperatures in channel margin habitats and side channels. Floodplain inundation and stranding potential would be greater than the CEQA baseline but not as a result of Alternative 4A. No mitigation is necessary.

Restoration Measures (Environmental Commitment 4, Environmental Commitment 6, Environmental Commitment 7, and Environmental Commitment 10)

As described for other covered fishes, Alternative 4A includes a greatly reduced extent of restoration measures relative to Alternative 4 and Alternative 1A. The mechanisms of impacts of habitat restoration discussed for winter-run Chinook salmon generally would be similar for splittail, which could overlap restoration measure effects. However, because the extent of restoration is limited to offsetting losses from construction of water facilities under the water conveyance facilities, any such effects would be greatly limited compared to Alternative 1A and 4, for example.

Impact AQUA-115: Effects of Construction of Restoration Measures on Sacramento Splittail

As noted for Alternative 1A's discussion of Impact AQUA-115, in-water and shoreline construction activities (e.g., riprap removal and levee breaching; shoreline excavation and recontouring) could increase turbidity, but splittail are tolerant of such increases. In addition, implementation of the environmental commitments described under Impact AQUA-1 for delta smelt and in Appendix 3B, *Environmental Commitments*, of the Draft EIR/EIS (*Environmental Training; Stormwater Pollution Prevention Plan; Erosion and Sediment Control Plan; Hazardous Materials Management Plan; Spill Prevention, Containment, and Countermeasure Plan; and Disposal of Spoils, Reusable Tunnel Material, and Dredged Material*), would minimize or eliminate any potential negative effects on splittail from construction of the restoration measures.

NEPA Effects: The effects of short-term construction activities would not be adverse to splittail. Implementation of the environmental commitments described in Appendix 3B, *Environmental Commitments*, would minimize or eliminate effects on splittail. The relevant environmental commitments are: *Environmental Training; Stormwater Pollution Prevention Plan; Erosion and Sediment Control Plan; Hazardous Materials Management Plan; Spill Prevention, Containment, and Countermeasure Plan; and Disposal of Spoils, Reusable Tunnel Material, and Dredged Material*. Pertinent details of these plans are provided under Impact AQUA-1.

CEQA Conclusion: As discussed for Alternative 1A, habitat restoration activities could result in short-term effects on splittail but would be localized, sporadic, and of low magnitude; such effects would be avoided by limiting the frequency, duration, and spatial extent of in-water work and with implementation of environmental commitments (see Appendix 3B, *Environmental Commitments*). The potential impact of habitat restoration activities is considered less than significant because it would not substantially reduce splittail habitat, restrict its range, or interfere with its movement. No additional mitigation would be required.

Impact AQUA-116: Effects of Contaminants Associated with Restoration Measures on Sacramento Splittail

As noted in the more detailed analysis of Impact AQUA-116 for Alternative 1A, potential impacts on Sacramento splittail from effects of methylmercury, selenium, copper, ammonia, and pesticides associated with habitat restoration activities would be similar to those discussed in detail for delta smelt (see Impact AQUA-8) except that Sacramento splittail is a benthic forager so the release of sediment borne contaminants may result in greater effects for this species. Alternative 4A would restore 59 acres of tidal wetlands that have the potential to temporarily increase contaminant exposure to fish in the Delta. Additionally, depending on the specific site conditions of the restoration, benthic grazers that bioaccumulate selenium, which splittail feed on, may colonize and increase the potential for splittail exposure to selenium. However, this restoration and its potential contaminant effects would be negligible given the very small area that would be restored.

NEPA Effects: As noted for other species, while Alternative 4A habitat restoration actions may result in a very small increase in production, mobilization, and bioavailability of methylmercury, selenium, copper, and pesticides in the aquatic system, any such releases would be short-term and localized, and would be unlikely to result in measurable increases in the bioaccumulation of these contaminants in splittail. Overall, the effects of contaminants associated with restoration measures would not be adverse for splittail.

CEQA Conclusion: Habitat restoration under Alternative 4A may result in increased production, mobilization, and bioavailability of contaminants in the aquatic system, but these would be short-term and localized, and would be unlikely to result in measurable increases in the bioaccumulation in splittail. For methylmercury, implementation of *Environmental Commitment 12 Methylmercury Management* would help to minimize the increased mobilization of methylmercury in the limited restoration areas. Regarding selenium, the amount of restoration (59) acres would have a negligible effect on the potential for benthic grazers to colonize and bioaccumulate selenium that could be consumed by splittail and substantially affect them. Therefore, the impact of contaminants is considered less than significant because it would not substantially affect splittail either directly or through habitat modifications. Consequently, no mitigation would be required.

Impact AQUA-117: Effects of Restored Habitat Conditions on Sacramento Splittail

Restored habitat under *Environmental Commitment 4 Tidal Natural Communities Restoration* and *Environmental Commitment 6 Channel Margin Enhancement* is intended to offset habitat loss/modification caused by construction and operation of the water facilities proposed under Alternative 4A.

NEPA Effects: The effects of restored habitat conditions on splittail would not be adverse because restoration is intended to provide habitat benefits for splittail.

CEQA Conclusion: As described above, habitat restoration would be undertaken to offset loss/modification of habitat from water facility construction and operation. The effects of restored habitat conditions on splittail would be less than significant. Consequently, no mitigation would be required.

Other Environmental Commitments (Environmental Commitment 12, Environmental Commitment 15, and Environmental Commitment 16)

As noted for other covered species, Alternative 4A includes three other Environmental Commitments, which are reduced in their extent relative to the Conservation Measures included in other Alternatives (e.g., Alternative 1A and Alternative 4). While the extent of these measures is reduced compared to these alternatives, the nature of the mechanisms for splittail remains the same.

Impact AQUA-118: Effects of Methylmercury Management on Sacramento Splittail (Environmental Commitment 12)

The impact discussion for winter-run Chinook salmon (Impact AQUA-46) is also applicable to splittail because they have similar potential to be exposed to methylmercury in the Delta.

NEPA Effects: The effects of methylmercury management on splittail would not be adverse because it is expected to reduce overall methylmercury levels resulting from habitat restoration.

CEQA Conclusion: As noted for winter-run Chinook salmon, effects of *Environmental Commitment 12 Methylmercury Management* within the areas restored under Alternative 4A are expected to reduce overall methylmercury levels resulting from habitat restoration. Because it is designed to improve water quality and habitat conditions, impacts on splittail would be less than significant. Consequently, no mitigation is required.

Impact AQUA-121: Effects of Localized Reduction of Predatory Fish on Sacramento Splittail (Environmental Commitment 15)

NEPA Effects: Potential impacts on Sacramento splittail from predator removal at the north Delta intakes and at the south Delta export facilities is expected to slightly reduce the predation rates on Sacramento splittail. However and as concluded for Alternative 1A (Impact AQUA-121), because the affected proportion of the population would be very small this effect would not be detectable. There would not be an adverse effect on splittail.

CEQA Conclusion: Because the proportion of the population affected by Environmental Commitment 15 would be very small and not measurable, there would be a less than significant impact to splittail. Consequently, no mitigation would be required.

Impact AQUA-122: Effects of Nonphysical Fish Barriers on Sacramento Splittail (Environmental Commitment 16)

As described for Alternative 1A, although the NPB at the divergence of Georgiana Slough from the Sacramento River under Alternative 4A would be constructed and operated to benefit salmonids, Sacramento splittail are likely to also be deterred by the NPB based on their hearing ability and strong swimming ability as young juveniles. This would reduce the risk of predation for juvenile splittail by reducing their entry into the low-survival interior Delta.

NEPA Effects: The NPB also has the potential to attract predatory fish, which often hold around underwater human-made structure. Therefore, there is a slightly increased risk of predation for juvenile Sacramento splittail in the area immediately around the NPB. However, the structure is intended to promote successful survival of salmonids and designs are being tested to minimize any risk of predation associated with the structure. Additionally, the 2011 pilot study of the NPB at Georgiana Slough did not find that predation near the NPB was more frequent than predation farther from the NPB (DWR 2012). As such, the overall effects of NPB would not be adverse.

CEQA Conclusion: As described for Alternative 1A, the first months of the juvenile Sacramento splittail migration to the Delta overlap with the latter portion of the main juvenile salmonid outmigration period during which the NPB would be implemented. Deterrence away from the interior Delta would reduce the risk of predation for juvenile splittail, although the NPB also has the potential to attract predatory fish, which often hold around underwater human-made structures. Therefore, there is a slightly increased risk of predation for juvenile Sacramento splittail in the area immediately around the NPB. However the overall impacts of the NPB are expected to be less than significant on Sacramento splittail because they would reduce entry into the low-survival interior Delta, where entrainment and predation potential increases. Consequently, no mitigation would be required.

Green Sturgeon

Construction and Maintenance of Water Conveyance Facilities

The discussion of potential effects to delta smelt from construction and maintenance of the water conveyance facilities under Alternative 4A is also relevant to green sturgeon. Adult and juvenile