

Chapter 7 Conclusion

The determination of effects for listed species and their designated critical habitat in this biological assessment considers direct and indirect effects of the proposed action together with the effect of other activities that are interrelated or dependent on the proposed action. This chapter presents a summary of the effects for listed species and their designated critical habitat.

This chapter also includes Reclamation's determinations under the Magnuson–Stevens Fishery Conservation and Management Act for EFH. The effects determination for EFH concludes whether or not adverse effects would occur, and whether or not the effects would be substantial.

7.1 Analytical Approach

Population and critical habitat analyses are included in this BA to assist the fishery agencies in making the determination of whether the proposed action would reasonably be expected “directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.” 50 C.F.R. § 402.02; 16 U.S.C. § 1536(a)(2). Three possible determinations exist regarding a proposed action's effects on listed species:

- No effect - “No effect” is the appropriate conclusion when it is determined that the proposed action will not affect a listed species or designated critical habitat.
- “May affect, but is not likely to adversely affect” is the appropriate conclusion when effects to listed species or critical habitat are expected to be discountable (extremely unlikely to occur), insignificant (never resulting in take), or completely beneficial (positive effects without adverse effects)
- May affect, likely to adversely affect is the appropriate conclusion if any adverse effect may occur to listed species or critical habitat as a direct result of the proposed action, and the effect is not discountable, insignificant, or beneficial. If incidental take is anticipated to occur as a result of the proposed action, an “is likely to adversely affect” determination is made.

7.2 Aquatic Effects Determinations

The ongoing stressors associated with existing dams and other structures are part of the environmental baseline. Reclamation and DWR do not currently have the authority to remove these structures and alter these baseline conditions. The proposed action primarily includes coordinated long-term operation of the CVP and SWP to store, divert and convey water in accordance with existing water contracts and agreements, including water service and repayment contracts, settlement contracts, exchange contracts, and refuge deliveries, consistent with water rights and applicable laws and regulations. The proposed action also includes habitat restoration and other actions to benefit species.

In consideration of the foregoing effects assessments, incidental take could potentially occur as a result of the proposed action. A main objective in this consultation is incidental take coverage for the coordinated long-term operation of the CVP and SWP. Incidental take is take of listed fish or wildlife species that results from, but is not the purpose of, carrying out an otherwise lawful activity conducted by a Federal

agency or applicant. [50 CFR §402.02]. Take is to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect a listed species or attempt to engage in any such conduct. [ESA §3(19)] Harm means an act which actually kills or injures wildlife. Harm is further defined by USFWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by USFWS as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. [50 CFR §17.3]

Although the effects analysis in Chapter 5 describes effects to listed species in a holistic, species-level manner throughout the action area, Reclamation and DWR also considered whether the effects analysis indicated effects to listed species at the individual level to determine whether incidental take coverage for the proposed action is necessary. Reclamation and DWR provide this biological assessment to help the USFWS and NMFS develop their biological opinions. The determination of jeopardy or adverse modification by USFWS and NMFS is based on the effects of the action on the continued existence of the entire population of the listed species or on a listed population, and/or the effect on critical habitat. An action that does not result in jeopardy or adverse modification can nevertheless result in incidental take. Reclamation and DWR have taken a precautionary approach to describing potential incidental take in the discussion that follows.

7.2.1 Sacramento Winter-Run Chinook Salmon ESU

The overall effects of the proposed action on Winter-Run Chinook Salmon in the Sacramento River upstream of the Delta are beneficial, and the proposed action would improve flows and water temperatures for spawning, rearing, and migration of Winter-Run Chinook Salmon compared to without action conditions. The modeling results illustrate that once the effects of the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of the CVP and SWP facilities and other stressors, the operation of the CVP and SWP provides the necessary cold water to ensure adequate pre-spawning, spawning, and incubation conditions for Winter-Run Chinook Salmon. These improvements in water temperature management under the proposed action, including operation of the Shasta TCD, provide for cold water to maintain egg incubation and avoid temperature dependent mortality. The impacts of increased summer and fall flows under the proposed action would be beneficial for egg and alevin survival. Under without action conditions, it is likely Winter-Run Chinook Salmon would not exist in the mainstem upper Sacramento River.

The proposed action provides substantial beneficial conditions, including water temperatures that allow Winter-Run Chinook Salmon to persist despite the existence of dams and other stressors. The benefits of the lower summer and fall water temperatures under the proposed action outweigh potential adverse effects of higher winter water temperatures because the summer and fall temperatures are often near critical temperature thresholds and, therefore, more of a limiting factor. Also, the juveniles are at their youngest and therefore most vulnerable during summer and fall. These results indicate that water temperatures under the proposed action provide benefits to rearing juvenile Winter-Run Chinook Salmon in the upper Sacramento River.

The proposed action would have higher flows during summer, when flow is generally low and potentially limiting Winter-Run Chinook Salmon holding and spawning success. Additionally, the proposed action would allow for higher fall flows, leading to less dewatering, more food, rearing habitat, and cover. Spring pulse flows under the proposed action would trigger outmigrating juveniles and adults migrating upstream in late spring and provide benefits to multiple life stages.

The higher than ideal May water temperatures in the middle Sacramento River under the proposed action would be likely to negatively impact Winter-run Chinook Salmon adults migrating at that time in the middle Sacramento River, even though the proposed action would improve water temperatures over baseline conditions.

Incidental take of individual members of the species associated with the proposed action result from entrainment, impingement, and predation at the Delta pumps and other diversions, and changes in flows that may affect migratory success. Operation of the DCC gates would entrain juvenile Winter-Run Chinook Salmon into the central and south Delta. Analysis shows entrainment loss rates for Winter-Run Chinook Salmon would be low. The measures included in the proposed action provide for Delta operations to minimize salvage and other effects related to exports.

Conservation measures, such as rice decomposition smoothing, spring management of spawning locations, intakes at Wilkins Slough, Shasta Temperature Control Device Improvements, habitat restoration projects, trap and haul, predator hot spot removal, DCC improvements, Tracy and Skinner improvements, and small screen improvements would be beneficial to Winter-Run Chinook Salmon.

Winter-Run Chinook Salmon adults, eggs, and alevins would be temporarily subject to potential adverse effects from proposed spawning and rearing habitat restoration projects in the upper Sacramento River associated with the proposed action. Construction activities could result in mortality of eggs and alevins by crushing if heavy equipment enters the stream channel or otherwise disturbs existing redds during in-water activities. Eggs and alevins could also be negatively impacted by increases in suspended sediment, turbidity, and contaminant exposure risk, leading to indirect impacts on individuals from reductions in habitat quality in the redd or direct impacts from sublethal and lethal exposures to contaminants. Although these potential effects may be unavoidable, exposure to construction effects would be low based on the limited extent of proposed restoration relative to the overall distribution of spawning adults and the implementation of other AMMs. These projects would be implemented for the benefit of salmonids, including Winter-Run Chinook Salmon, and these effects would be temporary and minimized through AMMs.

In summary, there may be incidental take associated with the proposed action through:

- Redd dewatering and temperature dependent mortality based on in-season adjustments to operations.
- Spawning and rearing habitat restoration projects in Shasta and Tehama counties.
- Clifton Court aquatic mechanical weed removal and predator management.
- Capture and harassment of fish at the Tracy Fish Collection Facility and Skinner Fish Protective Facility.
- Juveniles exposed to screened diversions on the Sacramento River to the Delta, which could result in harassment, injury or mortality.
- Cumulative direct and indirect loss associated with export operations including loss in south Delta interior, loss at export facilities, altered hydrodynamics, and operation of the DCC. Loss from entrainment, impingement, and predation at the Delta pumps, could occur and migration success may be affected by changes in flows.
- Diversion of water through the Rock Slough Intake up to the maximum capacity of the intake (350 cfs) for the maximum annual diversion of 195 TAF.
- Monitoring activities supporting the proposed action may result in harassment or mortality.

Therefore, while the proposed action is likely to have overall beneficial effects, it is also likely to adversely affect individual salmon in the Sacramento River Winter-Run Chinook Salmon ESU.

7.2.2 Sacramento Winter-Run Chinook Salmon Critical Habitat

The proposed action would have no adverse water temperature-related effect on access to spawning areas (PBF1) in Winter-Run Chinook Salmon critical habitat. The effect of the proposed action on the availability of clean gravel for spawning substrate (PBF2) is uncertain. Natural pulse flows would be larger and less frequent under the proposed action which could result in less flushing flows. However, if flows are too large they could lead to transport of gravel without recruitment. The effects of the proposed action on PBF3 are uncertain. The proposed action is expected to substantially benefit river flows for successful spawning, incubation, and emergence; however, would reduce downstream transport and environmental cues for emigrating juveniles (PBF3). The proposed action would have benefits related to water temperatures for spawning, incubation, and development (PBF4). Riparian vegetation would establish (PBF6) less during winter under the proposed action. The proposed action would provide less favorable conditions for emigrating juveniles during winter and early spring (PBF7), because proposed action flows would be lower, but would provide more favorable conditions in the summer months because proposed action flows would be higher. The proposed action is not expected to negatively impact downstream access in critical habitat for juvenile Winter-Run Chinook Salmon emigrating down river.

Spawning and rearing habitat restoration projects in the upper Sacramento River may cause temporary localized adverse effects but are expected to result in long-term beneficial effects to critical habitat for Winter-Run Chinook Salmon.

The proposed action would have beneficial or no adverse effect on numerous PBFs Winter-Run Chinook Salmon critical habitat relative to without action conditions. Beneficial effects include flows and water temperatures important for several PBFs. However, effects to some PBFs remain uncertain. The proposed action could reduce riparian vegetation establishment (PBF6) and provides less flows for emigrating juveniles during winter and early spring (PBF7). Overall the proposed action provides benefits to Sacramento River Winter-Run Chinook Salmon critical habitat.

7.2.3 Sacramento Winter-Run Chinook Salmon Incidental Take Considerations

Conservation measures and other beneficial actions provided in this biological assessment for NMFS to consider when developing an Incidental Take Statement include:

- Number of Winter-Run Chinook Salmon redds below the Clear Creek Confluence and proposed action measures to optimize the use of the available cold water pool under the different “Tiers” to protect the majority of redds, target critical life stages, and avoid releases for water temperatures outside of the spawning areas when cold water is limited.
- Operation of fish screens at Red Bluff Pumping Plant and the Rock Slough Diversion.
- Operation of the DCC based on near real-time monitoring of juvenile presence.
- Management of OMR reverse flows based on near real-time monitoring, fish behavioral cues, predictive tools, and salvage.
- Operation of the Tracy and Skinner salvage facilities.
- Increased production in drought years at the Livingston-Stone National Fish Hatchery.

Reclamation anticipates continued collaboration in a science enterprise to implement and evolve the SAIL monitoring program as well as ongoing restoration and recovery actions developed in collaborative forums using Structured Decision Making. Reclamation and DWR-led efforts welcome NMFS participation, and would include progress reports in annual reporting under the ITS.

7.2.4 Chinook Salmon, Central Valley Spring-Run ESU

Overall effects of the proposed action on Central Valley Spring-Run Chinook Salmon upstream of the Delta are beneficial. The proposed action provides substantial beneficial conditions, including water temperatures that allow Spring-run Chinook Salmon to persist despite the existence of dams and other stressors. The proposed action would improve flows and water temperatures for spawning and incubation compared to without action conditions in the upper and middle Sacramento and Feather Rivers along with Clear Creek. The proposed action also provides adequate flows for rearing and migration of juveniles in the middle Sacramento and lower American rivers from the Central Valley out to the ocean. Higher flows in some years under the proposed action benefit adult Spring-Run Chinook Salmon migrating in the middle Sacramento River and holding in the upper river by enhancing water quality and upstream passage, and reducing stranding, straying, poaching, and disease risks. The modeling results illustrate that once the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of the CVP and SWP facilities and other stressors, the CVP and SWP provide necessary cold water and flow to ensure adequate conditions for Spring-Run Chinook Salmon. Under without action conditions, it is likely Spring-Run Chinook Salmon would not exist in the mainstem upper Sacramento River.

The proposed action includes many beneficial aspects that are aimed at improving the status of Spring-Run Chinook Salmon. These conservation measures include habitat restoration projects, predator hot spot removal, DCC improvements, Tracy and Skinner improvements and small screen improvements. Conservation measures may expose individuals to detrimental effects; however, these actions would provide benefits to Chinook salmon and would offset the adverse effects from operations in the Delta.

Spring-Run Chinook Salmon adults, eggs, and alevins would be temporarily subject to potential adverse effects from proposed spawning and rearing habitat restoration projects in the upper Sacramento River associated with the proposed action. Construction activities could result in mortality of eggs and alevins by crushing if heavy equipment enters the stream channel or otherwise disturbs existing redds during in-water activities. Eggs and alevins could also be negatively impacted by increases in suspended sediment, turbidity, and contaminant exposure risk, leading to indirect impacts on individuals from reductions in habitat quality in the redd or direct impacts from sublethal and lethal exposures to contaminants. Although these potential effects may be unavoidable, exposure to construction effects would be low based on the limited extent of proposed restoration relative to the overall distribution of spawning adults and the implementation of other AMMs. These projects would be implemented for the benefit of salmonids, including Spring-Run Chinook Salmon, and potential adverse effects would be temporary and minimized through AMMs.

In summary, there may be incidental take associated with the proposed action through:

- Redd dewatering and temperature dependent mortality based on in-season adjustments to operations.
- Spawning and rearing habitat restoration projects in Shasta and Tehama counties.
- Clifton Court aquatic mechanical weed removal and predator management

- Capture and harassment of fish at the Tracy Fish Collection Facility and Skinner Fish Protective Facility.
- Juveniles exposed to screened diversions on the Sacramento River to the Delta, which could result in harassment, injury or mortality.
- Cumulative direct and indirect loss associated with export operations including loss in south Delta interior, loss at export facilities, altered hydrodynamics, and operation of the DCC. Loss from entrainment, impingement, and predation at the delta pumps, could occur and migration success may be affected by changes in flows.
- Diversion of water through the Rock Slough Intake up to the maximum capacity of the intake (350 cfs) for the maximum annual diversion of 195 TAF.
- Monitoring activities supporting the proposed action may result in harassment or mortality.

Therefore, while the overall effects of the proposed action are beneficial, the proposed action is likely to adversely affect individual salmon in Central Valley Spring-Run Chinook Salmon ESU.

7.2.5 Chinook Salmon, Central Valley Spring-Run ESU Critical Habitat

Critical habitat for Spring-Run Chinook Salmon is defined as specific areas that contain the PBFs and physical habitat elements essential to the conservation of the species. Within the range of the Spring-Run Chinook Salmon ESU, biological features of the designated critical habitat that are considered vital for Spring-Run Chinook Salmon include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, estuarine areas, and nearshore marine areas. Nearshore marine areas are not discussed further since the habitat is not affected by the proposed action. There are likely to be adverse effects to certain PBFs of Spring-Run Chinook Salmon designated critical habitat resulting from the proposed action. However, those effects are uncertain. These include effects to freshwater rearing habitat and estuarine habitat. However, once the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of the CVP and SWP facilities and other stressors, the proposed action is expected to benefit spawning habitat allowing the species to persist to other life stages and habitats. The proposed action also includes additional beneficial actions that would improve habitat conditions, such as geomorphic flows and gravel augmentation. Therefore, Reclamation has determined that the proposed action would have overall long term beneficial effects on the designated critical habitat. Core and programmatic actions, such as habitat restoration and facility construction, may cause temporary localized adverse effects but are expected to result in long-term beneficial effects to PBFs for Central Valley Spring-Run Chinook Salmon critical habitat.

7.2.6 Central Valley Spring-Run Chinook Salmon Incidental Take Considerations

Conservation measures and other beneficial actions provided in this biological assessment for NMFS to consider when developing an Incidental Take Statement for Spring-Run Chinook Salmon include:

- Operation of fish screens at Red Bluff Pumping Plant and the Rock Slough Diversion.
- Management of OMR reverse flows based on near real-time monitoring, fish behavioral cues, predictive tools, and salvage.
- Operation of the Tracy and Skinner salvage facilities.
- Spring Pulse Flows for Spring-Run Chinook Salmon.

Reclamation anticipates continued collaboration in a science enterprise to implement and evolve the SAIL monitoring program as well as ongoing restoration and recovery actions developed in collaborative forums using Structured Decision Making. Watershed specific programs include the Clear Creek Restoration Program and San Joaquin River Restoration Program. Reclamation and DWR-led efforts welcome NMFS participation, and would include progress reports in annual reporting under the ITS.

7.2.7 Steelhead, Central Valley DPS

Overall effects of the proposed action on Central Valley Steelhead are beneficial. The modeling results illustrate that once the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of the CVP and SWP facilities and other stressors, the CVP and SWP provide necessary cold water and flow to ensure adequate conditions for CV Steelhead. The proposed action will improve flows and water temperatures for spawning and incubation in the American River, upper and middle Sacramento and Feather Rivers along with Clear Creek.

The proposed action provides substantial beneficial conditions, including water temperatures that allow CV Steelhead to persist despite the existence of dams and other stressors throughout the year. Operating the temperature control devices on Shasta and Folsom dams would have beneficial effects under the proposed action. With higher reservoir storage and water temperature management actions, suitable water temperatures would be maintained through the primary CV Steelhead spawning and incubation period (January through April). Lower water temperatures under the proposed action would extend the period of suitable incubation temperatures into April. Based on the CV Steelhead spawning WUA curves for the upper Sacramento River, lower winter and spring flows under the proposed action are expected to increase spawning habitat suitability (velocity) relative to without action conditions in the mainstem Sacramento River; however, CV Steelhead do not usually spawn in the mainstem Sacramento River, but rather spawn in its tributaries.

The proposed action would result in reduced spring flows when compared to without action conditions, which are likely to affect rearing and migrating CV Steelhead and their habitat. Effects include a decrease in floodplain and side-channel habitat, reduced foraging conditions, increased competition and predation, higher water temperatures and lower DO, and reduced emigration flows. Under without action conditions, CV Steelhead completing their lifecycle in the American River, upper and middle Sacramento River, Stanislaus and Feather Rivers along with Clear Creek would not likely survive the high summer water temperatures compared to the proposed action. Several conservation measures proposed would reduce impacts of reduced spring flows on CV Steelhead juveniles. These include pulse flows from Shasta and Folsom Reservoirs, spawning and rearing habitat enhancement on the Sacramento, American, and Stanislaus rivers, cold water pool management tools and infrastructure, predator hot spot removal and the small screen program. OMR management establishes generally protective criteria to avoid entrainment.

Potential short-term adverse effects could occur from some of these beneficial conservation measures, which many are programmatic and adaptive. Adverse effects from proposed spawning and rearing habitat restoration projects resulting from construction activities could result in injuring or mortality of during in-water activities, but these effects would be temporary and minimized through AMMs.

In summary, there may be incidental take associated with the proposed action through:

- Redd dewatering and temperature dependent mortality based on in-season adjustments to operations.
- Clifton Court aquatic weed removal and predator management.

- Capture and harassment of fish at the Tracy Fish Collection Facility and Skinner Fish Protective Facility.
- Juveniles exposed to screened CVP diversions, which could result in harassment, injury or mortality.
- Cumulative direct and indirect loss associated with export operations including the operation of the DCC (loss in south Delta interior, loss at export facilities, and altered hydrodynamics). Loss from entrainment, impingement, and predation at the Delta pumps, could occur and migration success may be affected by changes in flows.
- Diversion of water through the Rock Slough Intake up to the maximum capacity of the intake (350 cfs) for the maximum annual diversion of 195 TAF.
- Temporary construction activities associated with habitat restoration and facility improvements.
- Monitoring activities supporting the proposed action may result in harassment or mortality.

The conservation measures included in the proposed action provide additional opportunities for adjustments to Delta operations to minimize salvage and other effects related to exports.

Therefore, while the overall effects of the proposed action are beneficial to the population of Central Valley Steelhead DPS, the proposed action is likely to adversely affect individuals.

7.2.8 Steelhead, Central Valley DPS Critical Habitat

Critical habitat for CV Steelhead is defined as specific areas that contain the PBFs and physical habitat elements essential to the conservation of the species. Within the range of the Central Valley Steelhead DPS, biological features of the designated critical habitat that are considered vital for CV Steelhead include freshwater spawning sites, freshwater rearing sites, freshwater migration corridors, and estuarine areas. There are likely to be adverse impacts to certain PBFs of CV Steelhead designated critical habitat resulting from the proposed action. These include effects to freshwater migration corridors and estuarine areas. The proposed action relative to without action conditions could reduce riparian vegetation establishment and less flows for emigrating juveniles during winter and early spring.

The proposed action would have both positive and negative effects on the PBFs of freshwater migration habitat for adult and juvenile CV Steelhead. Lower flows during the winter and early spring would have negative effects on migratory habitat for juvenile Steelhead relative to without action conditions. However, higher flows and lower water temperatures under the proposed action during the late spring and summer would have beneficial effects on migratory habitat of juveniles and adults, especially in dry and critically dry years.

The proposed action includes spawning, rearing, and tidal and channel margin restoration activities that could affect estuarine and freshwater critical habitat for CV Steelhead. These construction-related effects are temporary and localized in nature, and minimized through proposed implementation of AMMs. Restoration projects under the proposed action are expected to result in long-term beneficial effects to critical habitat for CV Steelhead.

Once the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of the CVP and SWP facilities and other stressors, the proposed action is expected to result in benefits to CV Steelhead critical habitat. Based on relationships between flow and spawning WUA for CV Steelhead in the upper Sacramento River (USFWS 2003), lower flows under the proposed action would substantially increase the number of years in which flows would be within the optimum weighted

usable area range during the primary spawning period (January through March). However, few CV Steelhead are expected to spawn in the mainstem Upper Sacramento River. The proposed action is also expected to increase the availability of freshwater rearing habitat. Benefits of higher flows under the proposed action during the summer compared to without action conditions include increased downstream extent of suitable rearing water temperatures, improved access to riparian and off-channel habitat, reduced crowding and competition, and increased prey. Therefore, Reclamation has determined that the proposed action would have overall long term beneficial effects on CV Steelhead designated critical habitat.

7.2.9 Steelhead, Central Valley DPS, Incidental Take Considerations

Conservation measures and other beneficial actions provided in this biological assessment for NMFS to consider when developing an Incidental Take Statement for Central Valley Steelhead include:

- Implementation of the 2017 Flow Management Standard and “planning minimum” on the American River.
- Operation of fish screens at Red Bluff Pumping Plant and the Rock Slough Diversion.
- Management of OMR reverse flows based on near real-time monitoring, fish behavioral cues, predictive tools, and salvage.
- Operation of the Tracy and Skinner salvage facilities.

Reclamation anticipates continued collaboration in a science enterprise to implement and evolve the SAIL monitoring program as well as ongoing restoration and recovery actions developed in collaborative forums using Structured Decision Making. Reclamation and DWR-led efforts welcome NMFS participation and would include progress reports in annual reporting under the ITS.

7.2.10 Coho Salmon, Southern Oregon/Northern California Coastal ESU

Overall effects of the proposed action on the Southern Oregon/Northern California Coastal ESU are beneficial. The modeling results illustrate that once the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of the CVP and SWP facilities and other stressors, the CVP and SWP operation provide necessary cold water and flow to ensure adequate conditions for Coho Salmon. The proposed action will improve flows and water temperatures for adult migration, holding, and spawning in the Trinity River compared to a scenario without the operation of Trinity Reservoir.

The proposed action provides beneficial conditions, including water temperatures that allow Coho Salmon to persist despite the existence of dams and other stressors. Reclamation would continue to implement the 2000 ROD flows and the Trinity River Restoration Program to reduce the effects of operation of the Trinity River Division of the CVP. The long term plan to protect salmon in the Lower Klamath River ameliorates the chances of fish die off and provides flows for Coho Salmon spawning and rearing on Grass Valley Creek under the proposed action.

Despite the beneficial components of the proposed action, the inter-basin transfer of water to the Sacramento River likely will continue to affect Coho Salmon, primarily the upper and lower Trinity River populations, through changes in habitat that affect their ability to spawn and rear in the mainstem of the Trinity River. There may be incidental take associated with the proposed action through reductions in floodplain and rearing habitat in the spring.

Therefore, while the overall effects of the proposed action are beneficial, the proposed action is likely to adversely affect individual Southern Oregon/Northern California Coastal Coho Salmon ESU.

7.2.11 Coho Salmon, Southern Oregon/Northern California Coastal ESU Critical Habitat

Critical habitat for Coho Salmon is defined as specific areas that contain the PBFs and physical habitat elements essential to the conservation of the species. Within the range of the Southern Oregon/Northern California Coastal Coho Salmon ESU, biological features of the designated critical habitat that are considered vital for Coho Salmon include: substrate, water quality, water quantity, water temperature, water velocity, cover and shelter, food, riparian vegetation, space, and safe passage conditions.

Under the proposed action, the TRRP is expected to continue to result in increases in Coho Salmon populations, through improving fish habitat conditions, such as Coho Salmon critical habitat and associated biological features.

Although there may be adverse effects to the rearing and floodplain habitat PBFs of Coho Salmon designated critical habitat resulting from the proposed action, the ongoing TRRP, lower Klamath augmentation flows, and Grass Valley Creek flows will address these effects. Therefore, Reclamation has determined that considering the continued implementation of ongoing actions, the proposed action would have overall long term beneficial effects on the Coho Salmon designated critical habitat.

7.2.12 North American Green Sturgeon, Southern DPS

Overall, effects of the proposed action on the Southern DPS of Green Sturgeon in the Sacramento River, Bay-Delta, and Feather River are beneficial. The proposed action would also improve flows and water temperatures for spawning, rearing, and migration of Green Sturgeon. The modeling results illustrate that once the effects of the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of CVP and SWP facilities and other stressors, the operation of the CVP and SWP generally provides better cold water and flow conditions to ensure adequate pre-spawning, spawning, and incubation survival conditions for Green Sturgeon.

Improvements in water temperature management under the proposed action, including operation of the Shasta Dam TCD, provide for cold water to maintain egg incubation and reduce temperature dependent mortality compared to without action conditions. The impacts of increased summer and fall flows under the proposed action would be beneficial for egg and larvae survival, although the proposed action reduces temperatures below the optimal growth temperature for Green Sturgeon juveniles in some months.

In the Sacramento River, spawning and rearing Green Sturgeon would benefit from the proposed action flows that are higher than without action conditions during years with dry hydrology during the months of May to October. Improved spawning and egg incubation would occur due to higher flows during June through October. The proposed action flows would increase transport of juvenile Green Sturgeon to favorable habitat, while also increasing larval rearing habitats and an increased dispersion of larvae to rearing habitats. While there are negative effects of lower flows in April during Green Sturgeon spawning and egg incubation, these reductions in flow and increases in temperature are offset by the increased flows and improved temperatures for Green Sturgeon spawning and egg incubation under the proposed action in summer and May in drier years. In addition to benefits for spawning and egg incubation, water temperatures in the summer are generally cooler under the proposed action, benefiting larvae Green Sturgeon.

In the Feather River, higher summer flows under the proposed action minimize the potential exposure to low flows for egg and larvae incubation under conditions that do not include operation of the SWP. The proposed action would also improve temperature objectives at the lower FERC boundary on the Feather River, during the months of April to July, achieving optimal range temperatures for Green Sturgeon egg and larval survival. The proposed action flows would benefit the peak period of abundance for larvae and juvenile Green Sturgeon on the Feather River. Increased flows under the proposed action during July to August are also anticipated to benefit post-spawning Green Sturgeon adults. Lower flows under the proposed action from January to June in the Feather River could negatively impact juvenile Green Sturgeon migration cues and conditions, such as foraging conditions, DO, toxicity, and habitat impacts, but these impacts are anticipated to be minimal since proposed action flows are well in excess of flows believed to be protective of Green Sturgeon juveniles.

Conservation measures, such as habitat restoration projects, predator hot spot removal, and small screen improvements would be beneficial to Green Sturgeon through increased food availability and quality and refuge habitat from predators. Some conservation measures may expose individuals to direct detrimental effects, such as adult fish rescue and juvenile trap and haul; however, these actions could provide benefits to survival and escapement and would potentially offset the adverse effects. Other conservation measures that require construction could lead to negative effects due to temporary loss of habitat leading to predation, degraded water quality, noise-related delay in migration, and direct effects from contact with construction equipment. Although these potential effects may be unavoidable, exposure to construction effects would be low based on the limited extent of proposed restoration relative to the overall distribution of Green Sturgeon adults and juveniles, and the implementation of avoidance and minimization measures.

The proposed action provides substantial beneficial conditions to the species; however, there will be incidental take of individual members of the species resulting from:

- Temperature dependent mortality based on in-season adjustments to operations.
- Entrainment, impingement, and predation at the Delta pumps and other diversions.
- Changes in flows that may affect migratory success in the Feather River.
- Juveniles exposed to CVP screened diversions on the Sacramento River to the Delta, which could result in harassment, injury or mortality.
- Cumulative direct and indirect loss associated with export operations including loss in south Delta interior, loss at export facilities, altered hydrodynamics, and operation of the DCC. Loss from entrainment, impingement, and predation at the delta pumps could occur and migration success may be affected by changes in flows.
- Diversion of water through the Rock Slough Intake up to the maximum capacity of the intake (350 cfs) for the maximum annual diversion of 195 TAF.

Therefore, while the proposed action is likely to have overall beneficial effects, the proposed action is likely to adversely affect individual North American Green Sturgeon southern DPS. The measures included in the proposed action provide additional opportunities for adjustments to Delta operations to minimize salvage and other effects on Green Sturgeon.

7.2.13 North American Green Sturgeon, Southern DPS Critical Habitat

Critical habitat for Green Sturgeon is defined as specific areas that contain the PBFs and physical habitat elements that are essential to the conservation of the species. Within the range of the southern DPS of North American Green Sturgeon, biological features of the designated critical habitat that are considered

vital for Green Sturgeon in estuarine habitat are: food resources, water flow, water quality, migratory corridor, water depth, and sediment quality. These biological features are also considered vital for Green Sturgeon in freshwater habitat, with the addition of substrate type or size.

In Estuarine habitats, increased flow under the proposed action, particularly during July and August of all but the wettest years, may result in greater depths, or greater diversity in habitats, which, in turn, potentially increase productivity and diversity of food resources for Green Sturgeon. Increased flows during the summer and early fall in the Sacramento River, when Green Sturgeon spawn, may adversely impact and deepen scour holes used for spawning, but would also effectively flush out contaminants.

Reduced flows under the proposed action during winter and early spring have the potential to impact immigrating adults, but the flows will be high enough to prevent passage problems in the Sacramento River. In addition, higher proposed flows during late spring, summer, and early fall have the potential to benefit spawning, eggs, and larvae life stages, such as moving larvae and juvenile Green Sturgeon quickly to rearing habitats in the middle Sacramento, although they also may result in water temperatures too cold for effective Green Sturgeon juvenile rearing.

The proposed action has the potential to reduce sediment supply and turbidity due to reduced winter-spring inflow; however, the higher spring, summer, and fall flows under the proposed action would dilute contaminants present in Green Sturgeon critical habitat. The proposed action would adversely impact Green Sturgeon substrate type and size for Green Sturgeon spawning habitat during winter and early spring months in wet years due to high flows scouring gravels suitable for spawning. However, during the late spring and summer months, when Green Sturgeon spawn, flows under the proposed action benefit the suitability of gravel substrates by removing sediments for incubating embryos. The proposed action may reduce fine sediment habitat for Green Sturgeon prey, but may also improve fine sediment conditions in spawning habitat.

Therefore, Reclamation has determined that the proposed action may adversely affect components of Green Sturgeon critical habitat while also resulting in benefits to Green Sturgeon critical habitat.

7.2.14 Delta Smelt

The modeling results illustrate that once the effects of the ongoing operation of the CVP and SWP are isolated from baseline conditions that include construction of the CVP and SWP facilities and other stressors, the operation of the CVP and SWP under the proposed action results in negative effects to Delta Smelt, including adult and larval/early juvenile entrainment at the south Delta and other water diversion facilities; extent of low salinity rearing habitat through less Delta outflow or south Delta export effects in certain year types and seasons; and the diversion of water through the Rock Slough Intake. Positive effects include improved low salinity rearing habitat in drier year types and seasons (e.g. summer) and actions to address the effects of degraded habitat and invasive species on the food web. OMR management would reduce entrainment risk. The extent of the other potential adverse effects are generally uncertain.

Additional adverse effects under the proposed action would occur from proposed construction, maintenance, and monitoring activities. These effects might include potentially scoured and eroded habitat within waterways adjacent to restored areas following levee breaching; disturbance of Delta Smelt within some distance (e.g., ~100 feet, depending on tidal currents) of levee breach locations as a result of sediment plumes, noises, and vibrations; changing hydraulics because of breaching which could lead to exposure to residual (historically used) agricultural pesticides and other contaminants; and direct effects

from excavation (physical injury or death), or indirect effects through disruption of normal behavior resulting in increased predation.

Effects to Delta Smelt could include temporary or permanent loss of habitat; exposure to increased suspended sediment and turbidity leading to changes in habitat quality and foraging ability; potential harm from accidental release of construction-related hazardous materials, chemicals, and waste; and effects from inadvertent spread of invasive or nuisance species. The magnitude of these effects is low. Construction and maintenance effects would be limited through avoidance and minimization measures, with minor effects also expected from monitoring.

The proposed action would also provide beneficial effects to Delta Smelt, primarily through operations of SMSCG for 60 days in June–September of above normal and below normal years, which would increase juvenile and subadult Delta Smelt access to relatively food-rich habitat. Several conservation measures are included to avoid and minimize or compensate for effects of the proposed action, including continuing tidal habitat restoration (8,000 acres) in the Delta; Tracy and Skinner Fish Facility improvements; and construction and operation of a Delta Fish Species Conservation Hatchery. A suite of programmatic actions to improve habitat and facilities are also part of the proposed action. Among the actions potentially benefiting Delta Smelt are reconnection of the Sacramento Deepwater Ship Channel with the Sacramento River, which together with nutrient addition could increase food availability for Delta Smelt in the north Delta; introduction of dredge material to increase turbidity; a Central Valley-wide and Delta small diversion screening program; Skinner and Tracy fish facility improvements; and provision of lower San Joaquin River spawning and rearing habitat and Putah Creek Yolo Bypass realignment restoration, which could export food from floodplains to Delta Smelt habitat.

In summary, there may be incidental take associated with the proposed action through:

- Cumulative direct and indirect loss associated with export operations including loss in south Delta interior, loss at export facilities, altered hydrodynamics, and operation of the DCC. Loss from adult and larval/early juvenile entrainment, impingement, and predation at the Delta pumps and other water diversion facilities.
- Reduction in the extent of low salinity rearing habitat through less Delta outflow or south Delta export effects
- Temporary and permanent loss of habitat
- Exposure to increased suspended sediment and turbidity leading to changes in habitat quality and foraging ability
- Potential harm from accidental release of construction-related hazardous materials, chemicals and waste
- Effects from inadvertent spread of invasive or nuisance species.
- Clifton Court aquatic mechanical weed removal and predator management.
- Diversion of water through the Rock Slough Intake up to the maximum capacity of the intake (350 cfs) for the maximum annual diversion of 195 TAF.
- Monitoring activities supporting the proposed action may result in harassment or mortality.

Therefore, while the proposed action is likely to have some beneficial effects, it is likely to adversely affect Delta Smelt.

7.2.15 Delta Smelt Incidental Take Considerations

Conservation measures and other beneficial actions provided in this biological assessment for USFWS to consider when developing an Incidental Take Statement include:

- Management of OMR reverse flows based on near real-time monitoring, fish behavioral cues, predictive tools, and salvage.
- Management of habitat acreage, creation of low salinity zone habitat in Suisun Marsh, food subsidies, and restoration.
- Operation of the Fish Conservation and Culture Lab to supplement wild populations and support development of a Delta Fish Species Conservation Hatchery.
- Operation of the Tracy and Skinner salvage facilities.

Reclamation anticipates continued collaboration in a science enterprise to implement and evolve the EDSM program as well as ongoing restoration and recovery actions developed in collaborative forums using Structured Decision Making. Reclamation and DWR-led efforts welcome USFWS participation and would include progress reports in annual reporting under the ITS.

7.2.16 Delta Smelt Critical Habitat

Within critical habitat for Delta Smelt, PBFs are considered essential to the conservation of the species. Once the effects of the ongoing operation of the CVP and SWP are isolated from baseline conditions, the proposed action would result in adverse effects to the physical habitat PBF (through reduction of spawning substrate), the water quality PBF (through reductions in food availability and turbidity), the river flow PBF (through entrainment risk), and the salinity PBF (through changes in location and reduction in extent of low salinity zone habitat) in certain years and seasons. The proposed action would result in beneficial effects to the salinity PBF (through changes in location and increase in extent of low salinity zone habitat) in certain years and seasons. Adverse effects to Delta Smelt critical habitat would also occur from construction of conservation measures and maintenance. Construction and maintenance effects would be temporary and limited through avoidance and minimization measures.

Beneficial effects to Delta Smelt critical habitat from the proposed action include reduced salinity in Suisun Marsh through operation of the SMSCG for 60 days in June through September of above normal and below normal years, increasing habitat suitability in a food-rich environment, as well as food subsidies from the Sacramento Deepwater Ship Channel, and Colusa Basin Drain. The water quality and physical habitat PCE would continue to be positively affected by the 8,000 acres of tidal habitat restoration in the Delta associated with the proposed action, which would increase food availability and extent of spawning substrate. The programmatic actions described previously could also contribute beneficial effects to the various PCEs of Delta Smelt critical habitat and reduce the extent of the adverse effects of the proposed action on Delta Smelt critical habitat.

Therefore, the proposed action results in both beneficial and adverse effects to Delta Smelt critical habitat.

7.2.17 Eulachon, Southern DPS

Under the proposed action, Trinity River at Lewiston flows would contribute less to flow entering the lower Klamath River during December–April. The timing coincides with Eulachon spawning in the Klamath River and larvae being transported to the estuary and ocean. The proposed action overall slightly

increases flows from the Trinity River in May, which is the month when the Trinity River provides the largest portion of the Klamath River flows. It is uncertain the extent to which there may be negative effects because of these differences, given the lack of quantitative relationships between biological performance and flow, but mechanisms include food transport and water temperature. Flows under the proposed action would not be appreciably lower in the lower Klamath River. Flow from the Trinity River under the proposed action during December–April generally aligns with the preferred water temperatures for spawning Eulachon. Flows and water temperature differences under the proposed action are insignificant and, therefore, are not likely to adversely affect Eulachon spawning temperatures in the lower Klamath River.

The proposed action may affect, but is not likely to adversely affect Eulachon.

7.2.18 Eulachon, Southern DPS Critical Habitat

Eulachon critical habitat PBFs include water flow, quality, and temperature conditions, and substrate supporting spawning and incubation. Under the proposed action, Trinity River flows would be less during December–April, a time when Trinity River flows form a small percentage of flow entering the lower Klamath. Flows from Trinity River would be similar under the proposed action during May, a time when Trinity River flows form a larger percentage of Klamath River flows. The proposed action does not physically obstruct migration corridors or freshwater spawning and incubation sites in the lower tidal Klamath River but could reduce water flow and quality during the main historical period of spawning migration.

The proposed action may affect, but is not likely to adversely affect Eulachon critical habitat.

7.2.19 Southern Resident Killer Whale

Effects of the proposed action to SRKW are examined within the context of changes in the availability of its preferred prey, Chinook salmon. As stated above in the effects analysis for each Chinook salmon run, the proposed action will have negative impacts to individual Chinook salmon from both the Core Water Operation and construction of conservation measures. Despite these negative effects to Chinook salmon individuals, the proposed action results in an overall beneficial effect to the different Chinook salmon populations in the Central Valley. Beneficial effects include summer/fall water temperatures favorable for rearing of early Chinook salmon life stages; provision of gravel for spawning habitat in the upper Sacramento River; restoration of rearing habitat between Keswick and Red Bluff; trap and haul for salmonid juveniles from the upper Sacramento River to downstream of the Delta in drought years; increased Winter-Run Chinook Salmon hatchery production in drought years; implementation of spawning and rearing habitat projects in the American River; continued maintenance at restoration sites in the American River; drought temperature management in the American River; 8,000 acres of habitat restoration in the Delta and Tracy; and Skinner fish facility improvements, among others. A suite of programmatic actions to improve habitat and facilities are also proposed. Among those potentially benefiting Chinook salmon are a Central Valley-wide small diversion screening program, DCC improvements, Skinner and Tracy fish facility improvements, spawning and rearing habitat restoration, and improvements to the Shasta Dam TCD.

When combined with lack of effects to hatchery production, the proposed action is not likely to reduce prey availability for SRKW. Therefore, the proposed action may affect, but is not likely to adversely affect SRKW.

7.2.20 Southern Resident Killer Whale Critical Habitat

Critical Habitat for SRKW is located outside of the action area. Therefore, the designated critical habitat will not be affected by the proposed action.

7.3 Terrestrial Effects Determinations

The procedure for analyzing effects on terrestrial species is described in Section 13. As there described, various data sources were used to identify potentially affected acreages of suitable habitat for each species; in most cases suitable habitat was identified using either a USFWS species range map or a pre-existing habitat model for the species. Table 5.23-1 identifies which components of the PA have the potential to affect each terrestrial species, in which watersheds those effects may occur, and whether each component was evaluated at the specific or programmatic level; in this context “specific” indicates that this biological assessment is intended to support a request for concurrence or incidental take authorization by USFWS, while “programmatic” indicates that this biological assessment is intended to support a jeopardy or adverse modification determination by USFWS. Table 7.3-1 summarizes the acreage of suitable habitat affected for each species, and whether the affected acreage is linked to specific or programmatic components of the PA. The effects determinations for each federally listed terrestrial species and any designated critical habitat that may be affected by the proposed action are provided below.

Table 7.3-1. Affected Areas and Mitigation

Component	Amount Affected (Acres Unless Otherwise Specified)
American River Watershed, Western Yellow-Billed Cuckoo	40
American River Watershed, Valley Elderberry Longhorn Beetle	40 acres or 36 shrubs
Bay-Delta Region, Salt Marsh Harvest Mouse	1,748
Bay-Delta Region, Valley Elderberry Longhorn Beetle	88 acres or 79 shrubs
Bay-Delta Region, Giant Garter Snake	755
Feather River Watershed, Western Yellow-Billed Cuckoo	89
Feather River Watershed, Valley Elderberry Longhorn Beetle	23 shrubs
San Joaquin River Watershed, Riparian brush rabbit	345 riparian and 470 grassland
San Joaquin River Watershed, Riparian Woodrat	76 plus 200 inundation consistent with AMM-RBR/RWR

Component	Amount Affected (Acres Unless Otherwise Specified)
San Joaquin River Watershed, Least Bell's Vireo	28
San Joaquin River Watershed, Western Yellow-billed Cuckoo	11
San Joaquin River Watershed, Valley Elderberry Longhorn Beetle	278 (250 shrubs)
Stanislaus River Watershed, Least Bell's Vireo	30
Stanislaus River Watershed, Riparian Brush Rabbit	10 riparian
Stanislaus River Watershed, Riparian Brush Woodrat	10
Stanislaus River Watershed, Western Yellow-billed Cuckoo	73
Stanislaus River Watershed, Valley Elderberry Longhorn Beetle	44 shrubs
Upper Sacramento River Watershed, Giant Garter Snake	34 acres aquatic and 266 acres upland
Upper Sacramento River Watershed, Least Bell's Vireo	10
Upper Sacramento River Watershed, Western Yellow-billed Cuckoo	67
Upper Sacramento River Watershed, Valley Elderberry Longhorn Beetle	60 shrubs
Total Across Watersheds	
All Watersheds, Riparian Brush Rabbit	355 riparian and 470 grassland
All Watersheds, Riparian Woodrat	86 plus 200 inundation consistent with AMM-RBR/RWR
All Watersheds, Salt Marsh Harvest Mouse	1,748
All Watersheds, Western Yellow-billed Cuckoo	280
All Watersheds, Least Bell's Vireo	68
All Watersheds, Giant Garter Snake	1,055

Component	Amount Affected (Acres Unless Otherwise Specified)
All Watersheds, Valley Elderberry Longhorn Beetle	492 shrubs
All other terrestrial species	0

7.3.1 Riparian Brush Rabbit

The proposed action may result in loss of up to 90 acres of suitable but unoccupied riparian habitat for the species (permanent and temporary habitat loss are treated together because of the relatively long time required for riparian habitat to recover). The proposed action may also result in permanent loss of up to 25 acres and temporary loss of up to 20 acres of suitable but unoccupied adjacent grasslands. Floodplain restoration along the San Joaquin River may result in periodic flooding of up to 265 acres of suitable but unoccupied riparian and 425 acres of suitable but unoccupied adjacent grasslands for riparian brush rabbit. Reclamation will discuss appropriate mitigation ratios with USFWS. Reclamation will offset effects of periodic flooding by constructing refugia for riparian brush rabbits to use during flood events.

The proposed action may affect, is likely to adversely affect, riparian brush rabbit.

7.3.2 Riparian Woodrat

The proposed action may result in loss of up to 86 acres of suitable but unoccupied riparian habitat for the species (permanent and temporary habitat loss are treated together because of the relatively long time required for riparian habitat to recover). Floodplain restoration may result in periodic flooding of up to 200 acres of suitable but unoccupied riparian habitat for riparian woodrat. Reclamation will discuss appropriate mitigation ratios with USFWS, and will offset effects of periodic flooding by constructing refugia for riparian woodrats to use during flood events.

The proposed action may affect, is likely to adversely affect, riparian woodrat.

7.3.3 Salt Marsh Harvest Mouse

Adverse effects from Tidal Habitat Restoration would involve temporary loss of up to 1,748 acres. Over time, the restored and enhanced area is expected to be suitable for salt marsh harvest mouse and of higher long-term value for the species because it will be less vulnerable to sea level rise. Thus, the proposed action is expected to have a net beneficial effect on the species.

The proposed action may affect, is likely to adversely affect, salt marsh harvest mouse.

7.3.4 California Ridgeway's Rail

The restoration projects are outside the current range of the species. Over time, the restored and enhanced area is expected to be suitable for California Ridgeway's rail and of higher long-term value for the species because it will be less vulnerable to sea level rise by including gradual slopes up from the current tidal region, potentially allowing introduction of the species into the restored areas. Thus, the proposed action is expected to have a wholly beneficial effect on the species.

The proposed action may affect, and is not likely to adversely affect, California Ridgeway's rail.

7.3.5 Least Bell's Vireo

The proposed action may result in loss of up to 216 acres of suitable habitat within the species' range. Reclamation will avoid disturbance of occupied habitat and will avoid injury or mortality of least Bell's vireo. Reclamation will discuss appropriate mitigation ratios with USFWS.

The proposed action may affect, is likely to adversely affect, least Bell's vireo.

7.3.6 Western Yellow-Billed Cuckoo

The proposed action may result in loss of up to 221 acres of suitable habitat within the species' range. Reclamation will avoid disturbance of occupied habitat and will avoid injury or mortality of western yellow-billed cuckoo. Reclamation will discuss appropriate mitigation ratios with USFWS. The proposed action may affect, and is likely to adversely affect, western yellow-billed cuckoo.

7.3.7 Western Yellow-Billed Cuckoo Critical Habitat

Reclamation will avoid modification of habitat for this species within designated critical habitat units by avoiding disturbance of suitable habitat in these areas. The proposed action could provide for some different riparian species that require year-round flows, benefiting Western Yellow-Billed Cuckoo critical habitat.

The proposed action may affect, but is not likely to adversely affect western yellow-billed cuckoo critical habitat.

7.3.8 Giant Garter Snake

The proposed action may result in loss of up to 1,049 acres of giant garter snake aquatic and upland habitat. Reclamation will discuss appropriate mitigation ratios with USFWS.

The proposed action may affect, is likely to adversely affect, giant garter snake.

7.3.9 Valley Elderberry Longhorn Beetle

Adverse effects from the project components may involve removal of up to 440 elderberry shrubs. Reclamation will offset habitat loss through transplanting elderberry shrubs and planting new elderberry and associated plants consistent with USFWS guidelines.

The proposed action may affect, is likely to adversely affect, valley elderberry longhorn beetle.

7.3.10 Soft Bird's-Beak

Tidal habitat restoration will occur in areas where habitat is not currently suitable for soft bird's-beak, and no negative effects would be expected from restoration activities. Over time, the restored and enhanced area is expected to be suitable and of higher long-term value for the species because it will be less vulnerable to sea level rise by including gradual slopes up from the current tidal region, potentially allowing introduction of the species into the restored areas. Thus, the proposed action is expected to have a wholly beneficial effect on the species.

The proposed action may affect, but is not likely to adversely affect, soft bird's-beak.

7.3.11 Suisun Thistle

Tidal habitat restoration will occur in areas where habitat is not currently suitable for Suisun thistle, and no negative effects would be expected from restoration activities. Over time, the restored and enhanced area is expected to be suitable for the species and of higher long-term value for the species because it will be less vulnerable to sea level rise by including gradual slopes up from the current tidal region, potentially allowing introduction of the species into the restored areas. Thus, the proposed action is expected to have a wholly beneficial effect on the species.

The proposed action may affect, but is not likely to adversely affect, Suisun thistle.

7.3.12 Vernal Pool Tadpole Shrimp and Vernal Pool Fairy Shrimp

Although Tidal Habitat Restoration under the proposed action has the potential to occur where these species occur, Reclamation will avoid habitat that is occupied or assumed to be occupied by conducting surveys in potential habitat areas.

The proposed action may affect, but is not likely to adversely affect, vernal pool tadpole shrimp and vernal pool fairy shrimp.

7.3.13 California Tiger Salamander

Although Tidal Habitat Restoration under the proposed action has the potential to occur where this species occurs, Reclamation will avoid habitat that is occupied or assumed to be occupied by conducting surveys in potential habitat areas.

The proposed action may affect, but is not likely to adversely affect, California tiger salamander.

7.3.14 California Tiger Salamander Critical Habitat

Although Tidal Habitat Restoration under the proposed action has the potential to occur within a designated critical habitat unit for this species, Reclamation will avoid effects on any of the primary constituent elements of its habitat by conducting surveys in potential habitat areas.

The proposed action is not likely to adversely affect critical habitat for California tiger salamander.

7.3.15 California Least Tern

Although proposed action components occur where California least terns are potentially present, Reclamation will avoid nesting colony sites through surveys and monitoring. The restoration projects are expected to have a net benefit on the species by increasing food production.

The proposed action may affect, but is not likely to adversely affect California least tern.

7.3.16 California Red-Legged Frog

Although proposed action components occur where California red-legged frogs may have historically been present, the likelihood of occupancy of habitats along the Sacramento River downstream of Shasta

Dam is discountable as they have not been observed along the Sacramento River corridor downstream of Shasta Dam.

The proposed action may affect, but is not likely to adversely affect California red-legged frog.

7.4 Essential Fish Habitat

7.4.1 Pacific Coast Salmon

The proposed action would adversely affect Pacific Coast Salmon EFH, although the adverse effects would not be substantial. Adverse effects primarily would occur as a result of the proposed action reducing flow during winter/spring relative to without action conditions, which could affect EFH for juvenile Chinook Salmon in particular, for example by increasing travel time and predation risk. Other adverse effects could arise from construction and maintenance activities.

A number of factors would contribute to the proposed action not having a substantial effect on Pacific Coast Salmon EFH. Construction and maintenance effects under the proposed action would be limited through avoidance and minimization measure. Exposure would be limited relative to the overall extent of Pacific Coast Salmon EFH. Reservoir storage under the proposed action would allow summer/fall water temperatures to be favorable for rearing of early Chinook Salmon life stages. A number of conservation measures are included to avoid and minimize or compensate for effects of the proposed action, including provision of gravel for spawning habitat in the upper Sacramento River; restoration of rearing habitat between Keswick Dam and Red Bluff; implementation of spawning and rearing habitat projects in the lower American River; continued maintenance at restoration sites in the lower American River; drought temperature management in the lower American River; and continued implementation of 8,000 acres of habitat restoration in the Delta. A suite of programmatic actions to improve habitat are also proposed. Among those potentially benefiting Chinook Salmon are a Central Valley-wide small diversion screening program; Delta Cross Channel improvements; lower San Joaquin River spawning and rearing habitat restoration; and improvements to Shasta TCD.

7.4.2 Coastal Pelagic Species

The proposed action is not likely to adversely affect Coastal Pelagic Species EFH. Limited construction effects could occur for proposed action activities bordering EFH (e.g., Delta habitat restoration). AMMs would minimize effects. Operational effects of the proposed action on the salinity field in the Bay-Delta would be small relative to the salinity tolerance of Northern Anchovy. Overall effects to Coastal Pelagic Species EFH would be small relative to the overall extent of Coastal Pelagic Species EFH.

7.4.3 Pacific Coast Groundfish

The proposed action would adversely affect Pacific Coast Groundfish EFH, although the adverse effects would not be substantial. Limited construction effects could occur for proposed action activities bordering EFH (e.g., Delta restoration). Core Water Operation effects on the salinity field in the Bay-Delta would be small relative to the salinity tolerance of Starry Flounder, although reductions in spring Delta outflow relative to without action conditions could negatively affect abundance of Starry Flounder through effects on rearing habitat. Overall effects to Pacific Coast Groundfish EFH would be small relative to the overall extent of Pacific Coast Groundfish EFH.