

CLIFTON COURT FOREBAY PREDATORY FISH RELOCATION STUDY

Biological Assessment

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CHAPTER 1

Introduction

1.1 Introduction and Background

The Clifton Court Forebay (CCF) Predatory Fish Relocation Study (PFRS) and Clifton Court Forebay Predator Reduction Electrofishing Study (PRES) were developed in response to the 2009 National Marine Fisheries Service (NMFS) Biological Opinion (BiOp) and Conference Opinion on the Long-Term Operations of the Central Valley Project (CVP) and State Water Project (SWP). Reasonable and Prudent Alternative Action IV.4.2 of this BiOp directs the California Department of Water Resources (DWR) and U.S. Bureau of Reclamation (Reclamation) to commence studies to develop predator control methods for the CCF.

The PFRS augments efforts of the PRES, an on-going study that commenced in 2016 that involves electroshocking and removing predators from CCF and transporting them to Bethany Reservoir with the goal of decreasing predation of ESA listed fish species in CCF. The PFRS study expands on PRES methods, utilizing a wider array of fish removal methods with the intention of maximizing predator removal.

1.1.1 PRES Study

The 2016 pilot year of the PRES focused on determining sampling methods, refining equipment and personnel needs, and collecting initial predator density information. Over an 11-day sampling period that year, 2,686 predatory fish were removed from CCF, including 594 black bass, 2,059 Striped Bass (*Morone saxatilis*), and 33 catfish. Black bass species consisted of a majority of Largemouth Bass (*Micropterus salmoides*), with some Spotted Bass *Micropterus punctulatus*) and Smallmouth Bass (*Micropterus dolomieu*). Catfish species included Channel Catfish (*Ictalurus punctatus*), White Catfish (*Ameiurus catus*), Black Bullhead (*Ameiurus nebulosus*), and Brown Bullhead (*Ameiurus melas*).

In 2017, the sampling approach focused on spatially determining where most of the predators were located within CCF. Clifton Court Forebay was divided into ten sampling sections, including four quadrants each consisting of open water and the shoreline, the Intake Channel, and the Scour Hole (See Figure 1-1 for Intake Canal and Scour Hole locations). Over a 39-day sampling period in 2017, the PRES removed 6,151 predatory fish from CCF, including 879 black bass, 5,236 Striped Bass, and 36 catfish.

For the 2018 season, the PRES focused on maximizing predatory fish removal by utilizing the spatial density information collected in 2017. Focused areas for fish removal included the Intake channel, the Scour Hole, and the shorelines. In 2018, during a 54-day sampling period, a total of 12,851 predatory fish were removed from CCF. The 12,851 fish consisted of 989 black bass, 11,839 Striped Bass, and 23 catfish.

In all three years of the study, from 2016-2018, no Delta Smelt (*Hypomesus transpacificus*) were caught during PRES (**Table 1-1**).

**TABLE 1-1
SAMPLING EFFORT AND CATCH OF EACH SPECIES DURING THE PRES.**

Year	Days of Effort	Black Bass	Striped Bass	Catfish spp.	Delta Smelt
2016	11	594	2,059	33	0
2017	39	879	5,236	36	0
2018	54	989	11,839	23	0

1.2 Purpose of the Biological Assessment

The purpose of this biological assessment (BA) is to review the Proposed Action in sufficient detail to assess potential effects on Federally listed threatened or endangered species under the jurisdiction of U.S. Fish and Wildlife Service (USFWS). The Proposed Action was not covered in the USFWS BiOp for the Proposed Coordinated Operations of the CVP and SWP (81420-2008-F-1481-5). The BA is prepared in accordance with requirements set forth under Section 7 of the Federal Endangered Species Act (ESA) (16 U.S. Code [USC] 1536[c]). Under provisions of Section 7(a)(2) of the ESA, a Federal agency that permits, licenses, funds, or otherwise authorizes activities must consult with USFWS and NMFS, as appropriate, to ensure that its action will not jeopardize the continued existence of any ESA listed species or result in the destruction or adverse modification of critical habitat.

1.3 Action Area

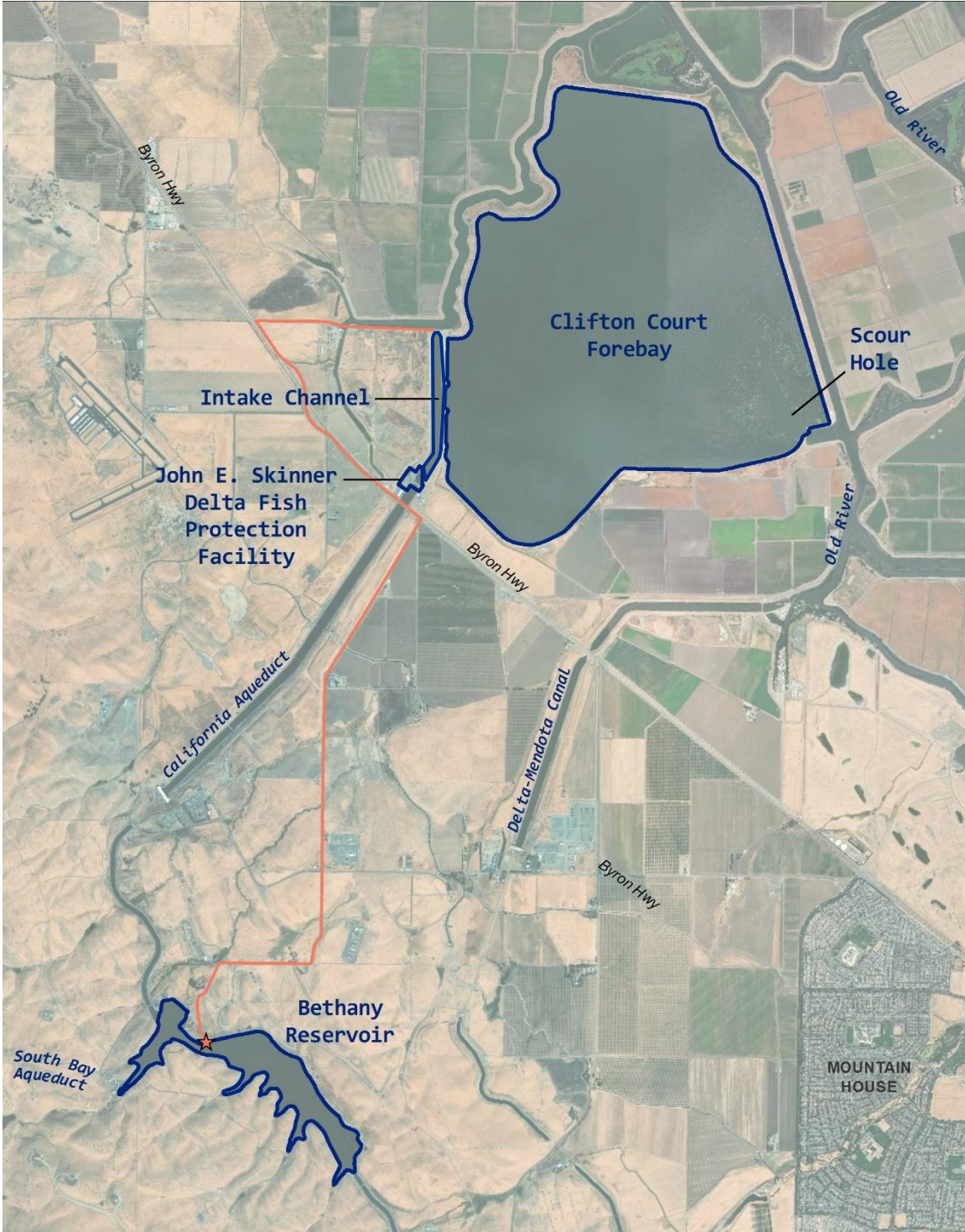
For the purposes of this BA, the Action Area refers to the area where direct and indirect effects would occur. The Action Area for PFRS includes CCF and the John E. Skinner Delta Fish Protection Facility (SDFPF), where predatory fish collection and staging would occur, and the immediate vicinity of the boat launch at Bethany Reservoir, where predatory fish will be relocated (**Figure 1-1**). Clifton Court Forebay is located near the town of Byron in Contra Costa County. DWR operates CCF as a regulating reservoir as part of the SWP. CCF is tidally filled by operating five radial gates that divert water from Old River in the south Delta. Bethany Reservoir, which is part of the SWP, is a small reservoir (6 miles of shoreline) in northeastern Alameda County.

1.4 Species Considered

This BA considers species identified during Agency coordination meetings (described in Chapter 2) to discuss the Proposed Action, but that are not covered by existing permits for the Coordinated Operations of the CVP and SWP, or the Memorandum of Understanding (MOU) between the DWR and CDFW for previous predatory fish relocation projects at CCF. Based on the existing permits and agreements, this BA prepared for USFWS only considers the Federally listed Delta Smelt. Other special-status species that have the potential to occur in the vicinity of the Action Area such as California red-legged frog (*Rana draytonii*) and California tiger salamander (*Ambystoma californiense*) were determined to not be impacted by the Proposed Action due to sampling activities occurring in open water, avoiding potential amphibian habitat occurring in the riparian zone.

The only Federal listed species identified that could occur in the Action Area and be affected by the Proposed Action is Delta Smelt (Federally Threatened, State Endangered). Other non-listed species considered that were identified during the coordination meetings as species that could occur and be affected by the Proposed Action, include double crested cormorants (*Phalacrocorax auritus*) (MBTA), and western pond turtle (*Actinemys marmorata*) (under review for listing under USFWS; CDFW SSC).

Central Valley Spring-run Chinook salmon (*Oncorhynchus tshawytscha*) evolutionarily significant unit (ESU), Sacramento River winter-run Chinook salmon ESU, Southern distinct population segment (DPS) of North American Green Sturgeon (*Acipenser medirostris*), and Central Valley steelhead DPS (*Oncorhynchus mykiss*) are covered under the existing 2009 NMFS BiOp (NMFS 2009). Collection of Delta Smelt, longfin smelt (*Spirinchus thaleichthys*), spring-run Chinook salmon, and winter-run Chinook salmon are also covered by the MOU between the DWR and CDFW for predator reduction, diet analysis, and fish collection methodologies to better assist with the survival of listed species in CCF (April 4, 2016) (CDFW 2016).



SOURCE: USDA, 2016; ESA, 2018

Clifton Court Forebay Predatory Relocation

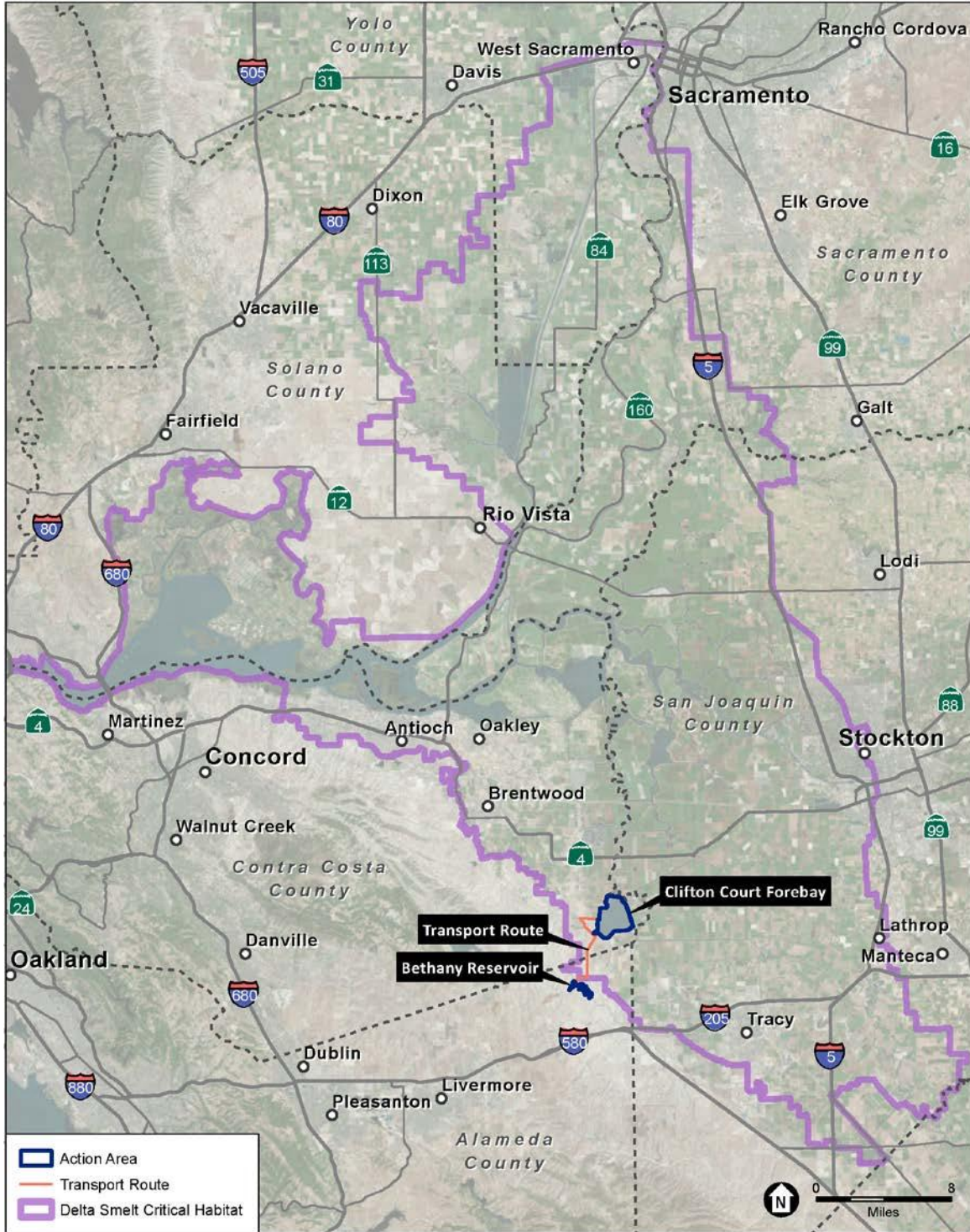
Figure 1-1
Action Area

1.5 Critical Habitat

Critical habitat is defined in Section 3(5)A of the ESA as the specific portions of the geographic area occupied by the species in which physical or biological features essential to the conservation of the species are found and that may require special management considerations or protection. Specific areas outside of the geographic area occupied by the species may also be included in critical habitat designations upon a determination that such areas are essential for the conservation of the species. Critical habitat has been designated for Delta Smelt and includes portions of the Action Area as shown in **Figure 1-2**.

1.6 Organization of the Biological Assessment

Chapter 2 (*Consultation to Date*) provides a description of the correspondence between regulatory agencies and the proponent of the Proposed Action that relate to the Proposed Action's potential effects on the species addressed in this BA. Chapter 3 (*Description of the Proposed Action*) provides a description of the types of activities that may occur within the Action Area. Chapter 3 also includes conservation measures to avoid, minimize, or otherwise reduce effects to Federally and State listed species. Chapter 4 (*Environmental Baseline*) describes the environmental baseline, including natural communities and habitat conditions present in the Action Area. Chapter 5 (*Species Accounts*) provides species accounts for all species addressed in the BA. Chapter 6 (*Effects of the Proposed Action*) describes the direct, indirect, and cumulative effects on species that may result from the proposed action. Chapter 7 (*Conclusions and Determination*) provides the FESA-based conclusion statements for the effects of Proposed Action on the Federally listed special-status species, and Chapter 8 (*References*) lists the references cited in this BA.



SOURCE: Esri, 2015; ESA, 2018

Clifton Court Forebay Predatory Relocation

Figure 1-2
Delta Smelt Critical Habitat

CHAPTER 2

Consultation to Date

Listed below are the correspondence, meetings, and discussions between regulatory agencies, the proponent of the Proposed Action, and consultants that relate to the Proposed Action and its potential effects on the species addressed in this BA. The list is presented in chronological order, with the earliest consultation shown first.

March 9, 2017

Meeting with DWR, USFWS, NMFS, USBR and CDFW to discuss the PFRS and permits needed to conduct the study.

March 29, 2017

Meeting with DWR, USFWS, NMFS, and CDFW to discuss the details of the Request for Proposals and follow up study permit questions.

November 7, 2017

Meeting with DWR, USFWS, NMFS, CDFW, and ICF ESA JV to discuss permitting approach, including process and approach for developing the BA, ITP, and MOU.

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CHAPTER 3

Description of the Proposed Action

3.1 Description of Proposed Action

The Proposed Action includes two years of both the PFRS and PRES. Both studies are two-year studies inside CCF to be implemented by DWR to collect and relocate predatory fish in order to study the effects of the predator removal on survival of the ESA listed fish species. While the PRES study utilizes electrofishing gear alone for removal of predators, the PFRS study will rely on a broad range of removal methods in order to maximize successful removal of predators from CCF (see below for the methods for each study).

The predatory fish targeted for collection from CCF include Striped Bass, Largemouth Bass, Spotted Bass, Channel Catfish, White Catfish, Black Bullhead, and Brown Bullhead. These species (or other predatory species collected but not listed) will be re-located to Bethany Reservoir. The absence of sensitive fish species, close proximity to CCF, and separation from the Delta, make Bethany Reservoir a suitable relocation site. These studies will aid DWR in complying with the 2009 NMFS BiOp which requires DWR to implement reasonable and prudent alternatives to reduce predation of ESA listed fish species within CCF and develop predator control methods.

Diversion of water from Old River results in the entrainment of numerous species of ESA listed fish, including Central Valley Steelhead, winter and spring-run Chinook Salmon, Delta Smelt, Longfin Smelt, and Green Sturgeon. Once fish are entrained, they must travel 2.1 miles across CCF before reaching the SDFPF where they are salvaged and returned back to the Delta. Losses of fish due to predation by predatory fish, termed pre-screen loss, occur as fish move from the radial gates to the SDFPF.

3.2 PRES Methods

3.2.1 Fish Collection Methods

Three electrofishing boats will be fished concurrently to capture target predatory fish species. Each electrofishing boat is specifically designed and outfitted with equipment necessary to temporarily stun fish and hold them in recirculating livewells. The DWR electrofishing boat is a Midwest Lake® boat outfitted with a Midwest Lake Electrofishing Systems® generator powered Infinity Series control box. The two FISHBIO boats are V hull standard Smith-Root electrofishing boats with a GPP 5.0 electrofishing units. The GPP for each FISHBIO boat is energized by a gasoline powered generator securely attached to the floor (5,000 watts). Each boat has adjustable front mounted insulated boat booms with umbrella type anodes with an integrated

cathode array mounted to the front of the hull. The DWR boat has foot control pads that controls the application of power through the front arrays. The FISHBIO boats contains the standard integrated foot switches in the bow deck and operator console.

Each electrofishing boat will be staffed by four crew members: two netters, a data collector, and a boat operator. Netters will use variable length monorail electrofishing nets to capture stunned fish and transfer them to livewells. The data recorder records time, location, and number of fish caught by species in ArcGIS Collector on a tablet connected to a mounted Trimble R1 Global Navigation Satellite System (GNSS) or other receiver. Point files will be collected at each capture location. The boat operator navigates CCF with a digital map that has 10-foot resolution bathymetry as background to safely navigate the shallow water and sandbars that characterize CCF. The map also has sampling area boundaries displayed to navigate sampling effort. Boat operators will use portable VHF radios and cell phones to communicate start times and electrofisher settings.

Electrofisher settings will typically start at 30Hz to 60 Hz, 0-500 volts, at 10% -30% range on the GPP 5.0 (FISHBIO boast) and 30Hz to 60Hz, 50-340 volts, 10% -30% range on the Infinity box (DWR boat). The previous day's settings will be used as a starting point for each day's settings and, if necessary, the settings will be adjusted to obtain to required stunning effect. Power output settings will be recorded for each sampling period and included frequency, percent of range, voltage, and amperage. Settings will be adjusted as needed based on environmental conditions and observed fish response to the electrical field to ensure high capture efficiency while maintaining minimal injury to fish. The amount of time electricity will be applied to the water will be recorded in seconds on the control box and using a separate time-of-use data logger (HOBO UX90, Onset, Bourne, MA) wired to the GPP high voltage indicator light on the FISHBIO boats.

3.2.2 Collection Frequency

Proposed fish collection will take place four days a week between January and June as conditions allow. No collection will occur once temperatures in the CCF exceed ~21°C. This schedule may be altered for safety reasons (weather or boating conditions), staffing, CCF hunting events or environmental conditions (presence of aquatic vegetation), or other unforeseen variables.

3.2.3 Fish Handling and Transport Procedures

Target captures will be transported to a barge after the livewells in the electrofishing boats reached capacity or at the end of the sampling day. The barge will be positioned in close proximity to the electrofishing boats to minimize travel time and maximize time spent electrofishing. The barge will be outfitted with three circular recirculating livewells to hold fish during and after processing. Livewells will filled with water from CCF using submersible pumps and recirculated as needed.

The fish processing boat will be staffed by four crew members: two fish handlers, a data collector, and a boat operator. Handlers will process fish by scanning for tags, weighing, and measuring. Fish will be first scanned for PIT tags with a Biomark® HPR PLUS PIT tag scanner. If a PIT tag is detected, the fish will be further scanned visually for a Floy tag. Fish that contain a

PIT tag and/or Floy tag are from other CCF studies conducted by DWR (see Section 1.3). For each tagged fish, barge crew will record the species, tag number(s), length as fork length (FL) and total length (TL) to nearest millimeter (mm), weight to nearest tenth or hundredth of a pound (lb) using a Salter-Brecknell SA3N ElectroSamson portable hanging scale (55 lb. max), and whether the fish was alive. All tagged fish will then be returned to CCF.

For each untagged fish, the species, FL (mm), and TL (mm), and whether the fish is alive will be recorded. For approximately every tenth fish of each species, weight (lb) will be recorded to the nearest tenth of a lb. Fish that died (“mortalities”) will be placed in secure plastic bags and disposed of at the Fish Science Building (FSB). Water quality data will be recorded at the beginning and end of each sample day with a YSI® Pro2030 meter and included conductivity (microsiemens per centimeter, $\mu\text{S}/\text{cm}$), dissolved oxygen (DO) percent saturation, and water temperature ($^{\circ}\text{C}$). In addition, turbidity (Nephelometric Turbidity Units; NTU) will be measured using a handheld turbidity meter. Water temperature and DO levels will be monitored throughout the day in livewells to ensure acceptable conditions. An oxygen diffuser bar will be used in conjunction with an oxygen tank to increase DO levels in livewells when necessary. After processing, all live target captures will be transported to a land-based transportation truck and livewell.

To transport fish to Bethany Reservoir, a $\frac{3}{4}$ -ton pickup truck will tow a flatbed trailer on which a 1,314 l insulated fish transport livewell with oxygen diffusers and an oxygen tank will be securely fastened. Prior to receiving fish, the livewell will be filled with water from CCF and, if warranted, DO level will be increased to a range of 90 to 120 percent saturation. The transportation truck and livewell will be strategically positioned on the levee of CCF to minimize barge travel time for fish transfers. Two staff members will be assigned to the transport truck. Fish will be transferred from the processing barge to the transportation livewell using short handled monorail nets. Fish will then be transported to Bethany Reservoir, approximately seven miles from CCF, and released at the public boat ramp. DO percent saturation and water temperature in the livewell will be measured using a YSI® Pro2030 multi-meter just before departure from CCF and just prior to releasing fish into Bethany Reservoir. In addition, DO percent saturation and water temperature in Bethany Reservoir, and the number of mortalities by species during transport, will be recorded. Mortalities will be removed prior to releasing fish, placed in secure plastic bags, and disposed of at the FSB.

3.2.3.1 By-catch of Listed Species

During fish collection, listed species including, Delta Smelt, Longfin Smelt, Central Valley spring-run Chinook Salmon ESU, Sacramento River winter-run Chinook Salmon ESU, southern DPS of North American Green Sturgeon, and Central Valley Steelhead DPS could be captured.

If Delta Smelt are captured (alive or dead), they will be sent to either the USFWS Lodi office, or the University of California Davis fish lab for genetic analysis. Standard operating procedures for packaging and sending specimens will be developed by CDFW staff prior to PFRS implementation and PFRS staff will be trained to implement these methods.

Each crew will also identify and enumerate all ESA-listed fish species captured as incidental bycatch, take and archive with DFW tissue samples as appropriate, and release the species per the terms of DWR’s ESA take permits.

3.3 PFRS Methods

3.3.1 Fish Collection Methods

Fish collection methods including both passive and active fishing methods that may be employed as part of the PFRS are described in more detail below and include the following (note: mesh size on all nets/traps will be no less than 2 inches stretched):

1. Beach Seine (active)
2. Purse Seine (active)
3. Fyke Trap (passive)
4. Hoop Trap (passive)
5. Trawl Net with Skids (active)

Each fish collection method is expected to sample different habitats in CCF and target different predatory species (**Table 3-1**). The specific habitats sampled by collection methods include the Scour Hole, deep habitat (> 60 ft. deep) immediately downstream of the Radial Gates (Figure 1-1), the Intake Channel leading to the fish facility (Figure 1-1), shoreline habitat, and shallow mudflat areas (< 6 ft. deep) throughout CCF. Details on each fish collection method are provided below, including gear description, gear specifications, sampling frequency, species targeted, and habitat areas targeted.

**TABLE 3-1
FISH SPECIES AND HABITAT FOCUSES OF EACH GEAR TYPE.**

	Focus	Hoop Traps	Beach Seine	Purse Seine	Trawling	Fyke Traps
Habitat	Intake Channel				X	X
	Scour Hole	X	X	X	X	
	Shoreline		X			X
	Mudflats	X				
Species	Catfish	X	X			
	Striped Bass		X	X	X	X
	Largemouth Bass		X	X	X	X

Beach Seine

Gear Description: Beach seines are fishing nets of various lengths that are typically deployed from the shore and hang vertically in the water with the top edge (headline) buoyed by floats, and the bottom edge (ground line) held down by weights. Generally, two people can deploy a beach seine, with one person holding the trailing edge of the net in place on shore, and another person pulling the leading edge of the net outward into the water body, then parallel to the shore until the entire net is deployed. The net is then retrieved to the shore, and fish are removed.

Gear Specifications: Multiple seines of 1,000 to 2,000 ft. long by 6-8 ft. deep with 2-inch stretch mesh.

Sampling Frequency: 2-3 hauls of a single seine, twice per week.

Species Targeted: Demersal (catfish) and non-demersal (Striped Bass and black bass) species.

Habitat Areas Targeted: Habitat adjacent to the shoreline where high densities of predators were observed historically.

Purse Seine

Gear Description: A purse seine is similar to a beach seine in that the net hangs vertically in the water when deployed and the headline of the net is buoyed by floats, and the ground line held down by weights. The purse seine has a ringed or drawstring type bottom line on the net that is pulled taught prior to retrieval of the net to prevent fish from swimming down to escape the net. Purse seines are often deployed from boats, and are typically used to capture schooling fish like herring or mackerel.

Gear Specifications: 1,000' long by 10-15' deep with 2-inch stretch mesh.

Sampling Frequency: 1-2 hauls of a single purse seine, twice per week.

Species Targeted: non-demersal, open water species (Striped Bass).

Habitat Areas Targeted: Open water habitat where high densities of predators were observed historically.

Fyke Trap

Gear Description: Fyke traps are passive fishing gear that is fixed in place via anchor, ballast, or stakes. The fyke trap consists of cylindrical netting bags mounted on rings or other rigid structures. Fish passively swim into the cones where they are unable to escape.

Gear Specifications: The fyke traps are cylindrical with a diameter of between 3 m (10 ft.) and 2 m (6.6 ft.), and a length of up to 6 m (19.5 ft.), with an opening at the downstream end and two interior funnels that narrow towards the upstream end. The estimated weight of the fyke trap is 300 lbs. The traps will have a removable "t-bar" installed at the smallest opening of the trap for the exclusion of non-fish (pinnipeds, beavers, otters, etc.) species.

Sampling Frequency: 4 fyke nets, 3 net-nights per week.

Species Targeted: Demersal (catfish) and non-demersal (Striped Bass and black bass) species.

Habitat Areas Targeted: In the Intake Channel and along the shoreline, particularly targeting concentrations of striped bass and largemouth bass.

Hoop Traps

Gear Description: Hoop traps are passive fishing gear that is fixed in place via anchor, ballast, or stakes. The fyke trap consists of cylindrical netting bags mounted on rings or other rigid structures.

Gear Specifications: Hoop traps will be 10 ft. long with 2-inch stretch mesh on 3- to 4-foot-diameter hoops.

Sampling Frequency: 4 tandem sets of hoop nets (8 nets total), 3 net-nights per week.

Species Targeted: Demersal-oriented species (catfish).

Habitat Areas Targeted: Adjacent to Scour Hole and shallow mudflats.

Trawl Net with Skids (Otter Trawl)

Gear Description: A trawl net is an active fishing method that involves pulling a sleeve-like net behind a boat. The net has a weighted ground line or a series of ‘ticklers’ or chains that drag along the bottom to stir up fish into the net, a buoyed or beamed headline, and skids or otter-boards that keep the net open while being pulled. Typically, one boat can pull the trawl net, and after a regulated amount of time being pulled the trawl is retrieved and the capture removed from the net.

Gear Specifications: Surface trawl (40 ft. wide, 55 ft. long, and 6-9 ft. deep) for targeting non-demersal species; benthic trawl (25 ft. spread and 35 ft. long) for targeting demersal species.

Sampling Frequency: Two to four 10-minute tows per day, 2 days per week.

Species Targeted: non-demersal (Striped Bass and black bass) and demersal (catfish) species.

Habitat Areas Targeted: Benthic trawls will only be used in deepwater areas within and adjacent to the Scour Hole and in the Intake Channel. Sonar bathymetry data will be used to avoid submerged obstacles. Surface trawls will be used in shallower areas, but with depth sufficient enough for effective fishing (> 6 ft.).

3.3.2 Collection Frequency

Proposed fish collection will take place four days a week (Monday-Thursday) between October and June as conditions allow. No collection will occur once temperatures in the CCF exceed ~21°C. This may follow the same general schedule as PRES, but could be altered for safety reasons (weather or boating conditions), staffing, CCF hunting events or environmental conditions (presence of aquatic vegetation), or other unforeseen variables.

3.3.3 Fish Handling and Transport Procedures

Fish handling will likely follow similar methods to PRES; however, CDFW staff will finalize the specific methods and train PFRS staff on the standard operating procedures for fish handling, husbandry, and relocation procedures for PFRS. The methods described below are based on PRES and may be modified by CDFW staff prior to PFRS implementation.

3.2.3.1 Predator Handling and Relocation

The CDFW crew will identify all predatory fishes, enumerate each species, enumerate the mortality of each species, and measure the size (as fork length) of at least a systematic

subsample of each species and of all post-capture mortalities. Water quality data will be recorded at the beginning and end of each sample day with a YSI® Pro2030 meter and will include conductivity (microsiemens per centimeter, $\mu\text{S}/\text{cm}$), dissolved oxygen (DO) percent saturation, and water temperature ($^{\circ}\text{C}$). In addition, turbidity (Nephelometric Turbidity Units; NTU) will be measured using a handheld turbidity meter. Water temperature and DO levels will be monitored throughout the day in livewells to ensure acceptable conditions. An oxygen diffuser bar will be used in conjunction with an oxygen tank to increase DO levels in livewells when necessary. After processing, all live target captures will be transported to a land-based transportation truck and livewell.

Specific methods for transport to Bethany Reservoir will be determined by the fishing contractor. In previous studies, transport has occurred via a $\frac{3}{4}$ -ton pickup truck towing a flatbed trailer on which a 1,314 liter insulated fish transport livewell with oxygen diffusers and an oxygen tank that was securely fastened. Prior to receiving fish, the livewell will be filled with water from CCF and, if warranted, DO level will be increased to a range of 90 to 120 percent saturation. The transportation truck and livewell will be strategically positioned on the levee of CCF to minimize barge travel time for fish transfers. Two staff members will be assigned to the transport truck. Fish will be transferred from the processing barge to the transportation livewell using short handled monorail nets. Fish will then be transported to Bethany Reservoir, approximately seven miles from CCF, and released at the public boat ramp. DO percent saturation and water temperature in the livewell will be measured using a YSI® Pro2030 multi-meter just before departure from CCF and just prior to releasing fish into Bethany Reservoir. In addition, DO percent saturation and water temperature in Bethany Reservoir, and the number of mortalities by species during transport, will be recorded. Mortalities will be removed prior to releasing fish, placed in secure plastic bags, and disposed of at the Fish Science Building.

3.2.3.2 By-catch of Listed Species

During fish collection, listed species including, Delta Smelt, Longfin Smelt, Central Valley spring-run Chinook Salmon ESU, Sacramento River winter-run Chinook Salmon ESU, southern DPS of North American Green Sturgeon, and Central Valley Steelhead DPS could be captured.

If Delta Smelt are captured (alive or dead), they will be sent to either the USFWS Lodi office, or the University of California Davis fish lab for genetic analysis. Standard operating procedures for packaging and sending specimens will be developed by CDFW staff prior to PFRS implementation and PFRS staff will be trained to implement these methods.

Each crew will also identify and enumerate all ESA-listed fish species captured as incidental bycatch, take and archive with DFW tissue samples as appropriate, and release the species per the terms of DWR's ESA take permits.

3.4 Conservation Measures

3.4.1 General Conservation Measures

- Worker Awareness Training – All staff participating in project activities will participate in worker awareness training. Training will include procedures and training requirements on the types of sensitive resources in the work area, the applicable environmental rules and regulations, and the measures required to avoid and minimize effects on these resources. Also includes training on project protocols, decontamination procedures, fish husbandry, handling, and relocation procedures, and other relevant information for PFRS staff.
- Equipment Maintenance and Decontamination - All equipment shall be maintained to prevent leaking of fluids such as gasoline, oils, or solvents. Any refueling or onsite maintenance will be conducted away from any waterbody to avoid contamination of that waterbody with fuels, solvents, hydraulic fluids, degreasers, or similar fluids or materials. Deployment of sampling equipment, transport by boat, and protective gear will be cleaned between locations from different water bodies. Away from the waterway, the boat's hull, trailer, equipment, bilge, and any other exposed surfaces will be washed with high-pressure, hot water. When possible, hot water will be used at a temperature of 140°F (60°C) at the hull – or about 155° (68°C) at the nozzle. All boats will be inspected for invasive invertebrates and exotic vegetation that could be introduced into new locations. If the vessels remain onsite during the duration of the project, then a single inspection prior to the launch would be adequate. If the vessels are used simultaneously at other waters during the project, then reoccurring inspections prior to each new or re-launch will be required. Clothing and gear should be thoroughly dried, ideally in the sun, for several days before being used in another waterbody. Gear may also be frozen for a minimum of 8 hours for decontamination.

Vessels and other equipment used in the study must adhere to the decontamination protocols set forth by the CDFW. CDFW staff will ensure that proper maintenance and decontamination procedures are being adequately implemented.

- Follow California WaterFix Spill Prevention, Containment, and Countermeasure Plan - Includes measures to prevent and respond to spills of hazardous material that could affect navigable waters, including actions used to prevent spills, as well as specifying actions that will be taken should any spills occur, and emergency notification procedures (see **Appendix A**).
- Staff Approvals - At least 15 days prior to the onset of any PFRS activities in-water, the applicant shall submit to the USFWS and NMFS for approval, the name(s) and credentials of biological surveyers it requests to conduct activities specified for this study. Information included in a request for authorization must include, at a minimum: (1) relevant education; (2) relevant training on species identification, survey techniques, handling individuals of different age classes, and handling of different life stages by a permitted biologist or recognized species expert authorized for such activities by the Service; (3) a summary of field experience conducting requested activities (to include project/research information and actual experience with the species); (4) a summary of biological opinions and/or informal consultations under which they were authorized to work with the listed species and at what level (such as construction monitoring versus handling) This should also include the names and qualifications of persons under which the work was supervised as well as the amount of work experience on the actual project including detail on whether the species was encountered or not; and (5) a list of Federal Recovery Permits [10(a)1(A)] if any, held or

under which individuals are authorized to work with the species (to include permit number, authorized activities, and name of permit holder).

- Incidental wildlife avoidance - During all activities staff will be aware of non-target wildlife that occurs in the Action Area. **If any marine mammal, bird, reptile, or other sensitive species are observed, activities that could harm or harass those species would be stopped until the species has left the area on its own accord. Further consultation with appropriate agencies will occur as needed.**

3.4.2 Fisheries Specific Measures

- Fishing/Handling/Transport Methods - Fish collection, handling, and transport methods are detailed in Chapter 2, Project Description. CDFW will be responsible for developing and implementing Standard Operating Procedures (SOPs) for post capture, handling, sorting and data collection relating to predatory fish. The SOPs will also include parameters/diagnostics for determining (and reporting) injury and/or mortality of all fish species.
- Electrofishing - Settings will be adjusted as needed based on environmental conditions and observed fish response to the electrical field to ensure high capture efficiency while avoiding or minimizing injury and/or mortality to all fish species. Electrofisher settings typically started at 30Hz, 0-500 volts, at 10% range. Power output settings will be recorded for each sampling period and include frequency, percent of range, voltage, and amperage.
- Fish Collection and Transport - Fish collection and transport will not occur when water temperature inside CCF is 21 degrees C or above. DO conditions during transport will be maintained at 65-100% of saturation for given water temperature and hardness conditions.
- CDFW staffing - During all fish handling and transport CDFW monitors will be present on site. Fishing, processing, transport, and release methods could be adapted as appropriate to limit bycatch or injury/mortality.
- Mesh Size - For all net types, including seines, fykes, etc. mesh size shall be no less than 2 inches stretched.
- Trapping:
 - Fyke nets or other fish traps will have built-in exclusion for marine mammals, typically consisting of a metal bar at the net opening to block entry of large animals but allow fish to pass.
 - **Any gear fishing will be attended.**
- In order to be consistent with the Marine Mammal Protection Act (MMPA) and avoid harassment or physical "take" including capture, injury, or death of potentially present marine mammals, **monitors shall be present at any time traps are being soaked.**
- Net Maintenance - For all net types, cleaning and removal of debris will occur prior to and between deployments in order to maintain function and avoid impingement of smaller fish species (e.g. Delta Smelt).

- Listed Species Handling and Recovery - When using gear that captures a mix of species, listed fish species shall be processed first and handled with extreme care by CDFW staff if not being collected and preserved for further analysis. The listed species shall be moved to a separate recovery tank with an aerator where they will be allowed to fully recover before they are released. Adequate circulation and replenishment of water in holding units are required. Fish will be observed visually during recovery to ascertain that the fish has regained equilibrium and can maintain position in a normal attitude (e.g., not lying on its side, or having problems maintaining a resting or swimming position in the water column), that it has a normal rhythmic respiration behavior (e.g., normal opercular movements and mouth movements, no gasping or irregular opercular movements), and that the fish responds to its surrounding environment with appropriate behaviors (e.g., avoids other fish or the net when its approached, etc., no erratic or spastic movements that would indicate injury or other negative condition). If the fish meets these recovery criteria, then it can be released away from deployed nets or out of the path of electrofishing. Every effort shall be made to minimize mortality by using fish-friendly nets that hold water during transfer, avoiding human contact, and avoiding releasing fish in the presence of piscivorous birds or piscivorous fish.

CHAPTER 4

Environmental Baseline

This chapter describes the physical conditions and habitats present within and around the Action Area. The environmental baseline provides the information necessary to determine whether the Proposed Action will negatively affect the existence or persistence of federally listed species. The environmental baseline “includes the past and present impacts of all Federal, State, or private actions and other human activities in the coverage area, the anticipated impacts of all proposed Federal projects in the coverage area that have already undergone formal or early Section 7 consultation, and the impact of State or private actions that are contemporaneous with the consultation in process” (50 Code of Federal Regulations [CFR] section 402.02).

4.1 Clifton Court Forebay

CCF is operated as a regulating reservoir within the tidally influenced region of the Delta to improve operations of the SWP Harvey O. Banks Pumping Plant and water diversions to the California Aqueduct (Figure 1-1). CCF is generally characterized by relatively shallow and uniform aquatic habitat with limited structural diversity. There are a few areas with emergent vegetation, but in general the habitat complexity within CCF is low. There are two notable habitat features within CCF; the intake canal and the scour hole. The intake canal is located along the southwest border of CCF, and is a long, narrow channel connected to the main body of CCF by a narrow entrance. The entrance is bounded by long, narrow spits of land on the north and south. The Skinner Delta Fish Protection Facility is located at the southern end of the intake canal. The scour hole is located in the southeast corner of CCF just to the west of the radial gates. This area is characterized by a deep scour hole created by water rapidly flowing into CCF through the radial gates due to the head differential between the river and CCF. This area provides the deepest water within CCF, and the areas of the highest flows.

4.2 Bethany Reservoir

The reservoir is approximately 7 miles from CCF (~15 minute drive) and is the first reservoir along the California Aqueduct after leaving Harvey O. Banks Pumping Plant. It serves as CCF for the South Bay Pumping Plant. Bethany Reservoir and surrounding area compose the Bethany Reservoir State Recreation Area and is open to the public for boating, fishing, and other forms of recreation.

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CHAPTER 5

Species Accounts

5.1 Delta Smelt

The USFWS listed the Delta Smelt as threatened on March 5, 1993 (58 FR 12854), and designated critical habitat for this species on December 19, 1994 (59 FR 65256). The Delta Smelt was one of eight fish species addressed in the Recovery Plan for the Sacramento–San Joaquin Delta Native Fishes. A 5-year status review of the Delta Smelt was completed on March 31, 2004; that review affirmed the need to retain the Delta Smelt as a threatened species. The Service is currently considering information to determine if the listing status of Delta Smelt should be upgraded from threatened to endangered.

The Delta Smelt is endemic to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) in California, and is restricted to the area from San Pablo Bay upstream through the Delta in Contra Costa, Sacramento, San Joaquin, Solano, and Yolo counties (Moyle 2002). Their range extends from San Pablo Bay upstream to Verona on the Sacramento River and Mossdale on the San Joaquin River. The Delta Smelt is a slender-bodied fish, generally about 60 to 70 millimeters (mm) (2 to 3 inches [in]) long, although they can reach lengths of up to 120 mm (4.7 in) (Moyle 2002).

Delta Smelt are a pelagic species, inhabiting open waters away from the bottom and shore-associated structural features. Delta Smelt are weakly anadromous and undergo a spawning migration from brackish water to freshwater annually (Moyle 2002). In early winter, mature Delta Smelt migrate from brackish, downstream rearing areas in and around Suisun Bay and the confluence of the Sacramento and San Joaquin rivers upstream to freshwater spawning areas in the Delta.

Adults, juveniles, or larvae that are entrained into CCF are not likely to survive. Delta Smelt entrainment into CCF has been modeled in previous studies (USFWS 2009), but the absolute level of entrainment is relatively unknown primarily due to the difficulty of modelling the level of predation that occurs within CCF prior to fish being salvaged at the SDFPF. Adult Delta Smelt are most vulnerable to entrainment during December to March when adults migrate upstream to spawn; free-swimming and pelagic larval and juvenile Delta Smelt are vulnerable during March–June. Very few juvenile Delta Smelt <20mm fork-length (FL), are salvaged at SDFPF; only one during water year (WY) 2015, salvaged in April (IEP 2016). Only 4 adult Delta Smelt were salvaged at SDFPF during WY 2015, all during January. This represented a slight increase from the record low in WY 2011 (0 salvaged), but much less than WY 2014 (62 salvaged) and WY 2013 (1,701 salvaged) (IEP 2016).

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CHAPTER 6

Effects of the Proposed Action

This chapter describes the potential direct, indirect, interrelated, interdependent, and cumulative effects that the Proposed Action may have to those species identified in Chapter 1.

6.1 Direct and Indirect Effects

Direct effects are those effects generated directly from the Proposed Action. Direct effects to listed species include incidental take during the predator removal activities (50 CFR 402.02). Indirect effects are those effects that are caused by the Proposed Action and are later in time. Examples of these types of effects to biological resources include the discharge of effluent or other material that adversely affect water quality at the project site, and an increase in human activity during project operations (50 CFR 402.02). A summary discussion on direct and indirect effects at the Action Area is provided below.

Implementation of the Proposed Action could result in the direct take of Delta Smelt. Predator collection would occur during the most susceptible time of year for both species to be entrained and present within CCF, and while conservation measures will be employed to limit the potential for take of listed species, the Proposed Action includes fishing methods that could result in mortality of Delta Smelt. Delta Smelt are small, and are generally expected to pass through fishing nets with mesh size ≥ 2 inches stretched, however individuals could become impinged on nets and killed, or predated upon in fish traps if they are unable to escape. Delta Smelt may also be injured or killed due to electrofishing. Increased activity in CCF could also result in mortality if fish are struck by boats, or entangled in nets during deployment or retrieval. Indirect effects of the Proposed Action are likely limited; Delta Smelt are not expected to reside for long time periods in CCF due to their migratory life history, and while some fishing methods could have habitat impacts (such as trawling), these impacts are not expected to alter the suitability of the habitat; CCF is generally unsuitable for Delta Smelt due to predation and is a dead-end for migration, unless fish are salvaged. Since there are no sensitive species in Bethany Reservoir, the release of predatory fish in the Reservoir is not expected to directly or indirectly impact Delta Smelt.

Over the long-term, PFRS could benefit Delta Smelt if the removal of predators from CCF is shown to be feasible and have a positive effect on salvage and relocation, through the reduction of pre-screen loss, of these species from CCF. If salvage and relocation benefit from a reduction in predation within CCF, the reservoir could become less of a population sink for Delta Smelt.

6.2 Effects of Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no significant independent utility apart from the action that is under consideration (50 CFR 402.02). Interrelated and interdependent actions are activities that would not occur “but for” the proposed action (50 CFR 402.02).

The Proposed Action is considered to be an action that has independent utility apart from other projects within the south Delta, and as a result, no adverse interdependent or interrelated effects will occur based on the Proposed Action.

6.3 Cumulative Effects

Cumulative effects include those of future State, tribal, local, or private actions that are reasonably certain to occur in the action area under consideration (50 CFR 402.02). The ESA requires USFWS and NMFS to evaluate the cumulative effects of the Proposed Action on listed species and designated critical habitat, and to consider cumulative effects in formulating biological opinions (USFWS and NMFS 1998). The ESA defines cumulative effects as “those effects of future State or private actions, not involving Federal activities, that are reasonably certain to occur within the action area” of the proposed action subject to consultation (USFWS and NMFS 1998). Future Federal actions that are unrelated to the Proposed Action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA. Federal actions, including activities that would require a permit under CWA Section 404, are, therefore, not included.

CHAPTER 7

Conclusions and Determinations

This chapter describes the conclusions and determinations regarding the effects of the Proposed Action to those species identified in Chapter 1.

7.1 Delta Smelt

Direct and indirect effects of implementation of the Proposed Action are associated with the fish collection activities in CCF. Potential effects include direct mortality during collection activities. In order to avoid and minimize effects of the Proposed Action, conservation measures have been proposed and are detailed in Chapter 3.

Given the current status of Delta Smelt and the environmental baseline for the species within CCF, it is concluded that the Proposed Action is likely to adversely affect Delta Smelt.

7.1.1 Critical Habitat

Adverse modification of critical habitat occurs when the functionality of the habitat or of the primary constituent elements is changed to such an extent that the habitat no longer serves the intended conservation role for the species.

CCF does not currently provide the primary constituent elements for Delta Smelt; the Proposed Action would not affect the suitability of critical habitat within CCF.

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CHAPTER 8

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APPENDIX A

California WaterFix Spill Prevention, Containment, and Countermeasure Plan

As required by local, state, or federal regulations, DWR will develop a Spill Prevention, Containment, and Countermeasure Plan (SPCC) plan for each project. Each SPCC plan will comply with the regulatory requirements of the Spill Prevention, Control, and Countermeasure Rule (40 CFR 112) under the Oil Pollution Act of 1990. This rule regulates nontransportation-related onshore and offshore facilities that could reasonably be expected to discharge oil into navigable waters of the United States or adjoining shorelines. The rule requires the preparation and implementation of site specific SPCC plans to prevent and respond to oil discharges that could affect navigable waters. Each SPCC plan will address actions used to prevent spills in addition to specifying actions that will be taken should any spills occur, including emergency notification procedures. The SPCC plans will include the following measures and practices.

- Discharge prevention measures will include procedures for routine handling of products (e.g., loading, unloading, and facility transfers) (40 CFR 112.7(a)(3)(i)).
- Discharge or drainage controls will be implemented such as secondary containment around containers and other structures, equipment, and procedures for the control of a discharge (40 CFR 112.7(a)(3)(ii)).
- Countermeasures will be implemented for discharge discovery, response, and cleanup (both the facility's capability and those that might be required of a contractor) (40 CFR 112.7(a)(3)(iii)).
- Methods of disposal of recovered materials will comply with applicable legal requirements (40 CFR 112.7(a)(3)(iv)).
- Personnel will be trained in emergency response and spill containment techniques, and will also be made aware of the pollution control laws, rules, and regulations applicable to their work.
- Petroleum products will be stored in nonleaking containers at impervious storage sites from which an accidental spill cannot escape.
- Absorbent pads, pillows, socks, booms, and other spill containment materials will be stored and maintained at the hazardous materials storage sites for use in the event of an accidental spill.
- Contaminated absorbent pads, pillows, socks, booms, and other spill containment materials will be placed in nonleaking sealed containers until transported to an appropriate disposal facility.
- When transferring oil or other hazardous materials from trucks to storage containers, absorbent pads, pillows, socks, booms, or other spill containment material will be placed under the transfer area.
- Refueling of construction equipment will occur only in designated areas that will be a minimum 1 of 150 feet from surface waters and other sensitive habitats, such as wetlands.

- Equipment used in direct contact with water will be inspected daily for oil, grease, and other petroleum products. All equipment will be cleaned of external petroleum products prior to beginning work, where contact with water may occur, to prevent the release of such products to surface waters.
- Oil-absorbent booms will be used when equipment is used in or immediately adjacent to waters. All reserve fuel supplies will be stored only within the confines of a designated staging area, to be located a minimum of 150 feet from surface waters and other sensitive habitats, such as wetlands.
- Fuel transfers will take place a minimum of 150 feet from surface waters and other sensitive habitats, such as wetlands, and absorbent pads will be placed under the fuel transfer operation.
- Staging areas will be designed to contain contaminants such as oil, grease, fuel, and other petroleum products so that should an accidental spill occur they do not drain toward receiving waters or storm drain inlets.
- All stationary equipment will be staged in appropriate staging areas and positioned over drip pans.
- In the event of an accidental spill, personnel will identify and secure the source of the discharge and contain the discharge with sorbents, sandbags, or other material from spill kits and will contact appropriate regulatory authorities (e.g., National Response Center will be contacted if the spill threatens navigable waters of the United States or adjoining shorelines, as well as other appropriate response personnel).

Methods of cleanup may include the following.

- Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- Mechanical methods could include the use of vacuum cleaning systems and pumps.
- Chemical methods include the use of appropriate chemical agents such as sorbents, gels, and foams.

Explanation of effectiveness: The implementation of an SPCC will serve to protect aquatic fish and wildlife in the Delta from the accidental discharge of oil into Delta waters. The SPCC will serve to protect primarily fish and aquatic birds from oils and other petroleum products used during construction and operations. The measures and practices listed above help to prevent accidents from happening and establish procedures for responding to oil spills.

In absence of the implementation of AMM5, CMs, mitigation measures, and other AMMs, there would be a greater potential for significant impacts on these species and natural communities due to loss of habitat and loss of species from construction and/or operation of the proposed project. Refer to the impact analyses for each resource for more detail.

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