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Department of the Interior

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50 CFR Part 17

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the San Francisco Bay-Delta Population of the Longfin Smelt as Endangered or Threatened; Proposed Rule

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS-R8-ES-2008-0045: 4500030113]

Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the San Francisco Bay-Delta Population of the Longfin Smelt as Endangered or Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of 12-month petition finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to list the San Francisco Bay-Delta distinct population segment (Bay Delta DPS) of longfin smelt as endangered or threatened and to designate critical habitat under the Endangered Species Act of 1973, as amended (Act). After review of the best available scientific and commercial information, we find that listing the longfin smelt rangewide is not warranted at this time, but that listing the Bay-Delta DPS of longfin smelt is warranted. Currently, however, listing the Bay-Delta DPS of longfin smelt is precluded by higher priority actions to amend the Lists of Endangered and Threatened Wildlife and Plants. Upon publication of this 12-month finding, we will add the Bay-Delta DPS of longfin smelt to our candidate species list. We will develop a proposed rule to list the Bay-Delta DPS of longfin smelt as our priorities allow. We will make any determinations on critical habitat during the development of the proposed listing rule. During any interim period, we will address the status of the candidate taxon through our annual Candidate Notice of Review (CNOR).

DATES: The finding announced in this document was made on April 2, 2012.

ADDRESSES: This finding is available on the Internet at http://www.regulations.gov at Docket Number [FWS-R8-ES-2008-0045]. Supporting documentation we used in preparing this finding is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, San Francisco Bay-Delta Fish and Wildlife Office, 650 Capitol Mall, Sacramento, CA 95814. Please submit any new information, materials, comments, or questions concerning this finding to the above street address.

FOR FURTHER INFORMATION CONTACT: Mike Chotkowski, Field Supervisor, San Francisco Bay-Delta Fish and Wildlife Office (see ADDRESSES); by telephone at 916-930-5603; or by facsimile at 916-930-5654 mailto:. If you use a telecommunications device for the deaf (TDD), please call the Federal Information Relay Service (FIRS) at 800-877-8339.

SUPPLEMENTARY INFORMATION:

Background

Section 4(b)(3)(B) of the Endangered Species Act of 1973, as amended (Act) (16 U.S.C. 1531 et seq.), requires that, for any petition to revise the Federal Lists of Endangered and Threatened Wildlife and Plants that contains substantial scientific or commercial information that listing the species may be warranted, we make a finding within 12 months of the date of receipt of the petition. In this finding, we will determine that the petitioned action is: (1) Not warranted, (2) warranted, or (3) warranted, but the immediate proposal of a regulation implementing the petitioned action is precluded by other pending proposals to determine whether species are endangered or threatened, and expeditious progress is being made to add or remove qualified species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Section 4(b)(3)(C) of the Act requires that we treat a petition for which the requested action is found to be warranted but precluded as though resubmitted on the date of such finding, that is, requiring a subsequent finding to be made within 12 months. We must publish these 12-month findings in the Federal Register.

Previous Federal Actions

On November 5, 1992, we received a petition from Mr. Gregory A. Thomas of the Natural Heritage Institute and eight co-petitioners to add the longfin smelt (Spirinchus thaleichthys) to the List of Endangered and Threatened Wildlife and designate critical habitat in the Sacramento and San Joaquin Rivers and estuary. On July 6, 1993, we published a 90-day finding (58 FR 36184) in the Federal Register that the petition contained substantial information indicating the requested action may be warranted, and that we would proceed with a status review of the longfin smelt. On January 6, 1994, we published a notice of a 12-month finding (59 FR 869) on the petition to list the longfin smelt. We determined that the petitioned action was not warranted, based on the lack of population trend data for estuaries in Oregon and Washington, although the southernmost populations were found to be declining. Furthermore, we found the Sacramento-San Joaquin River estuary population of longfin smelt was not a distinct population segment (DPS) because we determined that the population was not biologically significant to the species as a whole, and did not appear to be sufficiently reproductively isolated.

On August 8, 2007, we received a petition from the Bay Institute, the Center for Biological Diversity, and the Natural Resources Defense Council to list the San Francisco Bay-Delta (hereafter referred to as the Bay-Delta) population of the longfin smelt as a DPS and designate critical habitat for the DPS concurrent with the listing. On May 6, 2008, we published a 90-day finding (73 FR 24911) in which we concluded that the petition provided substantial information indicating that listing the Bay-Delta population of the longfin smelt as a DPS may be warranted, and we initiated a status review. On April 9, 2009, we published a notice of a 12-month finding (74 FR 16169) on the August 8, 2007, petition. We determined that the Bay-Delta population of the longfin smelt did not meet the discreteness element of our DPS policy and, therefore, was not a valid DPS. We therefore determined that the Bay-Delta population of the longfin smelt was not a listable entity under the Act.

On November 13, 2009, the Center for Biological Diversity filed a complaint in U.S. District Court for the Northern District of California, challenging the Service on the merits of the 2009 determination. On February 2, 2011, the Service entered into a settlement agreement with the Center for Biological Diversity and agreed to conduct a rangewide status review and prepare a 12-month finding to be published by September 30, 2011. In the event that the Service determined in the course of the status review that the longfin smelt does not warrant listing as endangered or threatened over its entire range, the Service agreed to consider whether any population of longfin smelt qualifies as a DPS. In considering whether any population of longfin smelt qualifies as a DPS, the Service agreed to reconsider whether the Bay-Delta population of the longfin smelt constitutes a DPS. At the request of the Service, Department of Justice requested an extension from the Court to allow for a more comprehensive review of new information pertaining to the longfin smelt and to seek the assistance of two expert panels to assist us with that review. The plaintiffs filed a motion of non-opposition, and on October 3, 2011, the court granted an extension to March

23, 2012 for the publication of a new 12-month finding.

Species Information

Species Description and Taxonomy

Longfin smelt measure 9-11 centimeters (cm) (3.5-4.3 inches (in)) standard length, although third-year females may grow up to 15 cm (5.9 in). The sides and lining of the gut cavity appear translucent silver, the back has an olive to iridescent pinkish hue, and mature males are usually darker in color than females. Longfin smelt can be distinguished from other smelts by their long pectoral fins, weak or absent striations on their opercular (covering the gills) bones, incomplete lateral line, low numbers of scales in the lateral series

(54 to 65), long maxillary bones (in adults, these bones extend past mid-eye, just short of the posterior margin of the eye), and lower jaw extending anterior of the upper jaw (Mcallister 1963, p. 10; Miller and Lea 1972, pp. 158-160; Moyle 2002, pp. 234-236).

The longfin smelt belongs to the true smelt family Osmeridae and is one of three species in the Spirinchus genus; the night smelt (Spirinchus starksi) also occurs in California, and the shishamo (Spirinchus lanceolatus) occurs in northern Japan (McAllister 1963, pp. 10, 15). Because of its distinctive physical characteristics, the Bay-Delta population of longfin smelt was once described as a species separate from more northern populations (Moyle 2002, p. 235). McAllister (1963, p. 12) merged the two species S. thaleichthys and S. dilatus because the difference in morphological characters represented a gradual change along the north-south distribution rather than a discrete set. Stanley et al. (1995, p. 395) found that individuals from the Bay-Delta population and Lake Washington population differed significantly in allele (proteins used as genetic markers) frequencies at several loci (gene locations), although the authors also stated that the overall genetic dissimilarity was within the range of other conspecific fish species. They concluded that longfin smelt from Lake Washington and the Bay-Delta are conspecific (of the same species) despite the large geographic separation.

Delta smelt and longfin smelt hybrids have been observed in the Bay-Delta estuary, although these offspring are not thought to be fertile because delta smelt and longfin smelt are not closely related taxonomically or genetically (California Department of Fish and Game (CDFG) 2001, p. 473).

Biology

Nearly all information available on longfin smelt biology comes from either the Bay-Delta population or the Lake Washington population. Longfin smelt generally spawn in freshwater and then move downstream to brackish water to rear. The life cycle of most longfin smelt generally requires estuarine conditions (CDFG 2009, p. 1).

Bay-Delta Population

Longfin smelt are considered pelagic and anadromous (Moyle 2002, p. 236), although anadromy in longfin smelt is poorly understood, and certain populations are not anadromous and complete their entire life cycle in freshwater lakes and streams (see Lake Washington Population section below). Within the Bay-Delta, the term pelagic refers to organisms that occur in open water away from the bottom of the water column and away from the shore. Juvenile and adult longfin smelt have been found throughout the year in salinities ranging from pure freshwater to pure seawater, although once past the juvenile stage, they are typically collected in waters with salinities ranging from 14 to 28 parts per thousand (ppt) (Baxter 1999, pp. 189-192). Longfin smelt are thought to be restricted by high water temperatures, generally greater than 22 degrees Celsius ([deg]C) (71 degrees Fahrenheit ([deg]F)) (Baxter et. al. 2010, p. 68), and will move down the estuary (seaward) and into deeper water during the summer months, when water temperatures in the Bay-Delta are higher. Within the Bay-Delta, adult longfin smelt occupy water at temperatures from 16 to 20 [deg]C (61 to 68 [deg]F), with spawning occurring in water with temperatures from 5.6 to 14.5 [deg]C (41 to 58 [deg]F) (Wang 1986, pp. 6-9).

Longfin smelt usually live for 2 years, spawn, and then die, although some individuals may spawn as 1- or 3-year-old fish before dying (Moyle 2002, p. 36). In the Bay-Delta, longfin smelt are believed to spawn primarily in freshwater in the lower reaches of the Sacramento River and San Joaquin River. Longfin smelt congregate in deep waters in the vicinity of the low salinity zone (LSZ) near X2 (see definition below) during the spawning period, and it is thought that they make short runs upstream, possibly at night, to spawn from these locations (CDFG 2009, p. 12; Rosenfield 2010, p. 8). The LSZ is the area where salinities range from 0.5 to 6 practical salinity units (psu) within the Bay-Delta (Kimmerer 1998, p. 1). Salinity in psu is determined by electrical conductivity of a solution, whereas salinity in parts per thousand (ppt) is determined as the weight of salts in a solution. For use in this document, the two measurements are essentially equivalent. X2 is defined as the distance in kilometers up the axis of the estuary (to the east) from the Golden Gate Bridge to the location where the daily average near-bottom salinity is 2 psu (Jassby et al. 1995, p. 274; Dege and Brown 2004, p. 51).

Longfin smelt in the Bay-Delta may spawn as early as November and as late as June, although spawning typically occurs from January to April (CDFG 2009, p. 10; Moyle 2002, p. 36). Longfin smelt have been observed in their winter and spring spawning period as far upstream as Isleton in the Sacramento River, Santa Clara shoal in the San Joaquin system, Hog Slough off the South-Fork Mokelumne River, and in Old River south of Indian Slough (CDFG 2009a, p. 7; Radtke 1966, pp. 115-119).

Exact spawning locations in the Delta are unknown and may vary from year to year in location, depending on environmental conditions. However, it seems likely that spawning locations consist of the overlap of appropriate conditions of flow, temperature, and salinity with appropriate substrate (Rosenfield 2010, p. 8). Longfin smelt are known to spawn over sandy substrates in Lake Washington and likely prefer similar substrates for spawning in the Delta (Baxter et. al. 2010, p. 62; Sibley and Brocksmith 1995, pp. 32-74). Baxter found that female longfin smelt produced between 1,900 and 18,000 eggs, with fecundity greater in fish with greater lengths (CDFG 2009, p. 11). At 7 [deg]C (44.6 [deg]F), embryos hatch in 40 days (Dryfoos 1965, p. 42); however, incubation time decreases with increased water temperature. At 8-9.5 [deg]C (46.4-49.1 [deg]F), embryos hatch at 29 days (Sibley and Brocksmith 1995, pp. 32-74).

Larval longfin smelt less than 12 millimeters (mm) (0.5 in) in length are buoyant because they have not yet developed an air bladder; as a result, they occupy the upper one-third of the water column. After hatching, they quickly make their way to the LSZ via river currents (CDFG 2009, p. 8; Baxter 2011a, pers comm.). Longfin smelt develop an air bladder at approximately 12-15 mm (0.5-0.6 in.) in length and are able to migrate vertically in the water column. At this time, they shift habitat and begin living in the bottom two-thirds of the water column (CDFG 2009, p. 8; Baxter 2008, p. 1).

Longfin smelt larvae can tolerate salinities of 2-6 psu within days of hatching, and can tolerate salinities up to 8 psu within weeks of hatching

(Baxter 2011a, pers. comm.). However, very few larvae (individuals less than 20 mm in length) are found in salinities greater than 8 psu, and it takes almost 3 months for longfin smelt to reach juvenile stage. A fraction of juvenile longfin smelt individuals are believed to tolerate full marine salinities (greater than 8 psu) (Baxter 2011a, pers. comm.).

Longfin smelt are dispersed broadly in the Bay-Delta by high flows and currents, which facilitate transport of larvae and juveniles long distances. Longfin smelt larvae are dispersed farther downstream during high freshwater flows (Dege and Brown 2004, p. 59). They spend approximately 21 months of their 24-month life cycle in brackish or marine waters (Baxter 1999, pp. 2-14; Dege and Brown 2004, pp. 58-60).

In the Bay-Delta, most longfin smelt spend their first year in Suisun Bay and Marsh, although surveys conducted by the City of San Francisco collected some first-year longfin in coastal waters (Baxter 2011c, pers. comm.; City of San Francisco 1995, no pagination). The remainder of their life is spent in the San Francisco Bay or the Gulf of Farallones (Moyle 2008, p. 366; City of San Francisco 1995, no pagination). Rosenfield and Baxter (2007, pp. 1587, 1590) inferred based on monthly survey results that the majority of longfin smelt from the Bay-Delta were migrating out of the estuary after the first winter of their life cycle and returning during late fall to winter of their second year. They noted that migration out of the estuary into nearby coastal waters is consistent with captures of longfin smelt in the coastal waters of the Gulf of Farallones. It is possible that some longfin smelt may stay in the ocean and not re-enter freshwater to spawn until the end of their third year of life (Baxter 2011d, pers. comm.). Moyle (2010, p. 8) states that longfin smelt that migrate out of and back into the Bay-Delta estuary may primarily be feeding on the rich planktonic food supply in the Gulf of Farallones. Rosenfield and Baxter (2007, p. 1290) hypothesize that the movement of longfin smelt into the ocean or deeper water habitat in summer months is at least partly a behavioral response to warm water temperatures found during summer and early fall in the shallows of south San Francisco Bay and San Pablo Bay (Rosenfield and Baxter 2007, p. 1590).

In the Bay-Delta, calanoid copepods such as Pseudodiatomus forbesi and Eurytemora sp., as well as the cyclopoid copepod Acanthocyclops vernali (no common names), are the primary prey of longfin smelt during the first few months of their lives (approximately January through May) (Slater 2009b, slide 45). Copepods are a type of zooplankton (organisms drifting in the water column of oceans, seas, and bodies of fresh water). The longfin smelt's diet shifts to include mysids such as opossum shrimp (Neomysis mercedis) and other small crustaceans (Acanthomysis sp.) as soon as they are large enough (20-30 mm (0.78-1.18 in)) to consume these larger prey items, sometime during the summer months of the first year of their lives (CDFG 2009, p. 12). Upstream of San Pablo Bay, mysids and amphipods form 80-95 percent or more of the juvenile longfin smelt diet by weight from July through September (Slater 2009, unpublished data). Longfin smelt occurrence is likely associated with the occurrence of their prey, and both of these invertebrate groups occur near the bottom of the water column during the day under clear water marine conditions.

Lake Washington Population

The Lake Washington population near Seattle, Washington is considered a landlocked population of longfin smelt, as are the populations of longfin smelt in Harrison and Pitt Lakes in British Columbia east of Vancouver (Chigbu and Sibley 1994, p. 1). These populations are not anadromous and complete their entire life cycle in freshwater. Young longfin smelt feed primarily on the copepods Diaptomus, Diaphanosoma, and Epischura, with older fish switching over to mysids (Wydoski and Whitney 2003, p. 105). Chigbu and Sibley (1994, pp. 11-14) found that mysids dominate the diets of longfin smelt in their second year of life (age-1), while amphipods, copepods, and daphnia also contributed substantially to the longfin smelt's diet. A strong spawning run of longfin smelt occurs on even years in Lake Washington, with weak runs on odd years. They spawn at night in the lower reaches of at least five streams that flow into Lake Washington. Water temperatures during spawning were 4.4 [deg]C (40 [deg]F) to 7.2 [deg]C (45 [deg]F) (Wydoski and Whitney 2003, p. 105). Chigbu and Sibley (1994, p. 9) found that female longfin smelt produced between 6,000 and 24,000 eggs, while Wydoski and Whitney (2003, p. 105) found that longfin smelt produced between 1,455 and 1,655 eggs. The reason for the large difference between the observations of these two studies is not known.

Habitat

Longfin smelt have been collected in estuaries from the Bay-Delta (33[deg] N latitude) to Prince William Sound (62[deg] N latitude), a distance of approximately 1,745 nautical miles (Figure 1). Mean annual water temperatures range from 2.4 [deg]C (36.3 [deg]F) in Anchorage to 14.1 [deg]C (57.3 [deg]F) in San Francisco (NOAA 2011a). The different estuary types that the longfin smelt is found in and the range of variability of environments where the species has been observed will be discussed below.

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The origin and geomorphology of West Coast estuaries result from geologic forces driven by plate tectonics and have been modified by glaciations and sea level rise (Emmett et al. 2000, pp. 766-767). Major classifications of estuaries include fjord, drowned-river valley, lagoon, and bar-built. Fjords typically are long, narrow, steep-sided valleys created by glaciation, with moderately high freshwater inflow but little mixing with seawater due to the formation of a sill at the mouth (NOAA 2011b). Fjords generally have one large tributary river and numerous small streams (Emmett et al. 2000, p. 768). Drowned-river valleys, also termed coastal plain estuaries, are found primarily in British Columbia, Washington, and Oregon, and are the dominant type along the west coast, occurring as a result of rising sea levels following the last ice age. Lagoons, primarily found in California, occur where coastal river systems that are closed to the sea by sand spits for much of the year are breached during the winter (Emmett et al. 2000, p. 768). The rarest type of estuary is the bar-built, which is formed by a bar and semi-enclosed body of water (Emmett et al. 2000, p. 768). Estuaries have also been classified by physical or environmental

variables into Northern Riverine, Southern California, Northern Estuarine, Central Marine, Fjord, and Coastal Northwest Groups (Monaco et al. 1992, p. 253). Longfin smelt have been collected from estuaries of all types and classifications.

The Bay-Delta is the largest estuary on the West Coast of the United States (Sommer et al. 2007, p. 271). The modern Bay-Delta bears only a superficial resemblance to the historical Bay-Delta. The Bay-Delta supports an estuary covering approximately 1,235 square kilometers (km\2\) (477 square miles (mi\2\)) (Rosenfield and Baxter 2007, p. 1577), which receives almost half of California's runoff (Lehman 2004, p. 313). The historical island marshes surrounded by low natural levees are now intensively farmed and protected by large, manmade structures (Moyle 2002, p. 32). The watershed, which drains approximately 40 percent of the land area of California, has been heavily altered by dams and diversions, and nonnative species now dominate, both in terms of numbers of species and numbers of individuals (Kimmerer 2004, pp. 7-9). The Bay Institute has estimated that intertidal wetlands in the Delta have been diked and leveed so extensively that approximately 95 percent of the 141,640 hectares (ha) (350,000 acres (ac)) of tidal wetlands that existed in 1850 are gone (The Bay Institute 1998, p. 17).

The physical and biological characteristics of the estuary define longfin smelt habitat. The Bay-Delta is unique in that it contains significant amounts of tidal freshwater (34 km\2\ (13 mi\2\)) and mixing zone (194 km\2\ (75 mi\2\)) habitat (Monaco et al. 1992, pp. 254-255, 258). San Francisco Bay is relatively shallow and consists of a northern bay that receives freshwater inflow from the Sacramento-San Joaquin system and a southern bay that receives little freshwater input (Largier 1996, p. 69). Dominant fish species are highly salt-tolerant and include the commercially important Pacific sardine (Sardinops sagax) and rockfish (Sebastes spp.). Major habitat types include riverine and tidal wetlands, mud flat, and salt marsh, with substantial areas of diked wetland managed for hunting. The sandy substrates that longfin smelt are presumed to use for spawning are abundant in the Delta.

The Russian River collects water from a drainage area of approximately 3,846 km\2\ (1,485 mi\2\), has an average annual discharge of 1.6 million acre-feet, and is approximately 129 km (80 mi) in length (Langridge et al. 2006, p. 4). Little information is available on potential spawning and rearing habitat for longfin smelt, but it is likely to be both small and ephemeral because spawning and rearing habitat is highly dependent upon freshwater inflow, and there may be insufficient freshwater flows for spawning and rearing in some years (Moyle 2010, p. 5). A berm encloses the mouth of the Russian River during certain times of the year, essentially cutting it off from the coastal ocean. This results in a lack of connectivity with the ocean that could be important during dry years. However, in most years the berm is breached by freshwater flows, which allows longfin smelt to enter the Russian River and spawn.

The Eel River drains an area of 3,684 mi\2\ (9,542 km\2\) and is the third largest river in California. Wetlands and tidal areas have been reduced 60 to 90 percent since the 1800s (Cannata and Hassler 1995, p. 1), resulting in changes in tidal influence and a reduction in channel connectivity (Downie 2010, p. 15). The estuary is characterized by a small area where freshwater and saltwater mix (Monaco et al. 1992, p. 258) and thus provides only limited potential longfin rearing habitat.

Humboldt Bay is located only 26 km (16 mi) north of the Eel River and is approximately 260 mi (418 km) north of the Bay-Delta. Humboldt Bay is the second largest coastal estuary in California after the Bay-Delta. However, true estuarine conditions rarely occur in Humboldt Bay because it receives limited freshwater input and experiences little mixing of freshwater and saltwater (Pequegnat and Butler 1982, p. 39).

The Klamath Basin has been extensively modified by levees, dikes, dams, and the draining of natural water bodies since the U.S. Bureau of Reclamation's Klamath Project, designed to improve the region's ability to support agriculture, began in 1905. These changes to the system have altered the biota of the basin (NRC 2008, p. 16). Over the years, loss of thousands of acres of connected wetlands and open water in the Klamath River Basin has greatly reduced habitat value, likely depleting the ability of this area to cycle nutrients and affecting water quality (USFWS 2008, p. 55). The river drains a vast area of 10 million ac (4 million ha). Although a large river, the Klamath River estuary is characterized by small tidal freshwater and mixing zones (Monaco et al. 1992, p. 258) and thus provides limited potential longfin smelt rearing habitat.

Yaquina Bay is located on the mid-coastal region of Oregon, 201 km (125 mi) south of the Columbia River and 348 km (216 mi) north of the California border. Wetlands encompass 548 ha (1,353 ac), including 216 ha (534 ac) of mud flats and 331 ha (819 ac) of tidal marshes (Yaquina Bay Geographic Response Plan 2005, p. 2.1). Forty-eight percent of the estuary is intertidal (Brown et al. 2007, p. 6). The estuary has been modified greatly, being alternately dredged and filled at different locations as a result of development. Dredging, industrial, and residential uses have reduced fish habitat and water quality in the bay. Dredging disturbs sediment, resulting in increased turbidity and reduced sunlight penetration, which can impact native eelgrasses and the benthic species dependent eelgrass beds for breeding, spawning, and shelter (Oberrecht 2011, pp. 1-8).

On the Columbia River, dams, dikes, maintenance dredging, and urbanization have all contributed to habitat loss and alterations that have negatively affected fish and wildlife populations (Lower Columbia River Estuary Partnership 2011, p. 1). It is estimated that as much as 43 percent of estuarine tidal marshes and 77 percent of tidal swamps in the river estuary available for fish species have been lost since 1870 (Columbia River Estuary Study Taskforce 2006, pp. 1-30). Sixty square miles of peripheral tidal habitat have been lost to diking, filling, and conversion to upland habitat for industrial and agricultural use since 1870 (Columbia River Estuary Study Taskforce 2006, p. 1). Prior to construction of dams, estuary islands and much of the floodplain were inundated throughout the year, beginning in December and again in

May or June. Dam operations on the Columbia River's main stem and major tributaries have substantially reduced peak river flows. Dikes and levees have all but eliminated flooding in many low-lying areas. Dredging of shipping channels has caused loss of wetlands and altered shoreline configuration. Dredging has resulted in large sediment reductions upstream, and the dredged sediments have created islands downstream. This has likely reduced spawning habitat and sheltering sites for fish (OWJP 1991, pp. 1-24; Lower Columbia Fish Recovery Board 2004a, pp. 1-192).

Puget Sound is a large saltwater estuary of interconnected flooded glacial valleys located at the northwest corner of the State of Washington. Puget Sound is about 161 km (100 mi) long, covers about 264,179 ha (652,800 ac), and has over 2,092 km (1,300 mi) of shoreline. Fed by streams and rivers from the Olympic and Cascade Mountains, waters flow out to the

Pacific Ocean through the Strait of Juan de Fuca (Lincoln 2000, p. 1). The basin consists of eight major habitat types, the largest of which is kelp and eelgrass, but also includes wetlands, mudflats, and sandflats. Puget Sound consists of five regions, each with its own physical and biological characteristics. Urban and industrial development borders the main basin, which is bounded by Port Townsend on the north and the Narrows (Tacoma) on the south. Approximately 30 percent of freshwater inflow to the main basin is from the Skagit River, which drains an area of approximately 8,011 km\2\ (3,093 mi\2\). Sills at Admiralty Inlet and the Narrows influence circulation. Puget Sound is highly productive. The fish community includes many commercially important species, such as Pacific herring, Pacific salmon, and several species of rockfish (NOAA 2011c, p. 11). There are 10 major dams and thousands of small water diversions in the Puget Sound system (Puget Sound Partnership 2008b, p. 21). Human activities in the region have resulted in the loss of 75 percent of the saltwater marsh habitat and 90 percent of the estuarine and riverine wetlands (Puget Sound Partnership 2008b, p. 21).

The coastline of British Columbia has been shaped by plate tectonics and extensive glaciations. Particularly in summer, prevailing winds drive coastal upwelling, which results in a highly productive food chain. The tidal amplitude is 3-5 meters (m) (9.8-16.4 ft) in most areas, and numerous large and small rivers provide freshwater inflow. Biological communities are diverse and highly variable, including coastal wetlands, kelp beds, and seaweed beds that support a diverse marine fauna (Dale 1997, pp. 13-15). Nearshore areas of British Columbia are characterized by steep to moderately sloping fjords, 20-50 m (65-164 ft) in depth, with salinities ranging from 18 to 28 ppt (AXYS Environmental Consulting 2001, pp. 5, 11, 20). Bar-built estuaries that are semi-enclosed by an ocean-built bar occur on the west coast of Vancouver Island and the Queen Charlotte Islands (Emmett et al. 2000, pp. 769-770). Oxygen depletion is common in fjords (Emmett et al. 2000, p. 776), but because they are anadromous, longfin smelt would presumably be able to avoid those conditions. However, if depletion were to occur during spawning or rearing, recruitment could be affected.

The Fraser River, at approximately 1,375 miles (2,213 km), is the longest river in British Columbia and the tenth longest river in Canada. The Fraser River drains an area of 220,000 km\2\ and flows to the Strait of Georgia at the City of Vancouver before it drains into the Pacific Ocean. Diking and drainage in the lower basin area have reduced the extent of estuarine wetlands that are important to the longfin smelt and other fishes that utilize these areas (Blomquist 2005, p. 8).

Habitat types common in Alaskan estuaries include eel grass beds, understory kelp, sand and gravel beds, and bedrock outcrops (NOAA 2011d). Shallow nearshore areas provide a mosaic of habitat types that support a variety of fishes (NOAA 2005, p. 59). In southwestern Alaska, the related osmerid species capelin (Mallotus villosus) was found to occur in sand-and-gravel habitats, and the surf smelt (Hypomesus pretiosus) was found to occur in bedrock habitats (NOAA 2005, pp. 27, 29). As in British Columbia, if oxygen depletion occurs in fjord habitats during spawning or rearing, longfin smelt recruitment could be affected.

Cook Inlet is a large mainland Alaskan estuary located in the northern Gulf of Alaska. Cook Inlet is approximately 290 km (180 miles) long. The watershed covers about 100,000 km\2\ of southern Alaska (USACE 2011, p. 1).

Distribution

Longfin smelt are widely distributed along 3,541 km (2,200 mi) of Pacific coastline from the Bay-Delta to Cook Inlet, Alaska (Table 1). We found no evidence of range contraction; the current distribution of longfin smelt appears to be similar to its historical distribution.

Table 1--Known Occurrences of Longfin Smelt

State	Location	Reference
California	Monterey Bay	Eschmeyer 1983, p. 82; Wang 1986, pp. 6-10).
	Bay-Delta	Eschmeyer 1983, p. 82; Wang 1986, pp. 6-10.
	Offshore Bay-Delta	City of San Francisco 1993, p. 5-8.
	Russian River Estuary.	Cook 2010, pers. comm.
	Van Duzen River	Moyle 2002, p. 235.
	McNulty Slough of Eel River.	CDFG 2010, unpublished data.
	Offshore Humboldt Bay.	Quirollo 1994, pers. comm.
	Humboldt Bay and tributaries.	CDFG 2010, unpublished data.
	Mad River	Moyle 2002, p. 235.
	Klamath River	Kisanuki et al. 1991, p. 72, CDFG 2009, p. 5.

	Lake Earl	D. McLeod field note 1989 (Cannata and Downie 2009).
Oregon	Coos Bay	Veroujean 1994, p. 1.
	Yaquina Bay	ODFW 2011, pp. 1-3, ANHP 2006, p. 3.
	Tillamook Bay	Ellis 2002, p. 17.
	Columbia River Estuary.	ODFW 2011, pp. 1-3.
Washington	Willapa Bay	WDFW 2011, pp. 1-3.
	Grays Harbor	U.S. Army Corps of Engineers 2000, p. 2.
	Puget Sound Basin	Miller and Borton 1980, p. 17.4.
	Lake Washington	Chigbu and Sibley 1994, p. 1.
British Columbia	Fraser River	Fishbase 2011a, p. 1; Fishbase 2011b, p. 1.
	Pitt Lake	Taylor 2011, pers. comm.
	Harrison Lake	Page and Burr 1991, p. 57.
	Vancouver	Hart 1973, p. 147.
	Prince Rupert	Hart 1973, p. 147.
	Skeena Estuary	Kelson 2011, pers. comm.
Alaska	Dixon Entrance	Alaska Natural Heritage Program 2006, p. 3.
	Sitka National Historical Park.	NPS 2011, p. 1.
	Glacier Bay	Arimitsu 2003, pp. 35, 41.
	Klondike Gold Rush National Historical Park.	NPS 2011, p. 1.

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	Yakutat Bay	Alaska Natural Heritage Program 2006, p. 3.
	Wrangell-St. Elias National Park.	Arimitsu 2003, pp. 35, 41, NPS 2011, p. 1.
	Cook Inlet	NOAA 2010b, p. 4, NOAA 2010a, p. 8.
	Kachemak Bay	Abookire et al. 2000, NPS 2011, p.

		1.
	Hinchinbrook Island.	Alaska Natural Heritage Program 2006, p. 3.
	Lake Clark National Park and Preserve.	NPS 2011, p. 1.
	Prince William Sound	Alaska Natural Heritage Program 2006, p. 3.

California

The southernmost known population of longfin smelt is the Bay-Delta estuary, and longfin smelt occupy different habitats of the estuary at various stages in their life cycle (See Habitat section above). Eschmeyer (1983, p. 82) reported the southern extent of the range as Monterey Bay, and Wang (1986, pp. 6-10) reported that an individual longfin smelt had been captured at Moss Landing in Monterey Bay in 1980. Most sources, however, identify the Bay-Delta as the southern extent of the species' range (Moyle 2002, p. 235).

Small numbers of longfin were collected within the Russian River estuary each year between 1997 and 2000 (SCWA 2001, p. 18). No surveys were conducted in 2001 or 2002 (Cook 2011, pers. comm.). Recent surveys (since 2003) in the Russian River estuary conducted by Sonoma County Water Agency have not collected longfin smelt; however, in 2003, trawling surveys were replaced by beach seining, a type of survey less likely to capture a pelagic fish species such as the longfin smelt. Longfin smelt breeding has not been documented at the Russian River (Baxter 2011b, pers. comm.), and because of its limited size, the Russian River estuary is not believed to be capable of supporting a self-sustaining longfin smelt population (The Bay Institute et al. 2007, p. ii; Moyle 2010, p. 5).

Longfin smelt were observed spawning in the Eel River estuary in 1974 (Puckett 1977, p. 19). Although longfin were observed in the Eel River in 2008 and 2009 (Cannata and Downie 2009), it is unknown whether or not they currently spawn there. Humboldt Bay is located 420 km (260 mi) north of the Bay-Delta. Longfin smelt were collected in Humboldt Bay or its tributaries every year from 2003 to 2009, with the exception of 2004 (CDFG 2010, unpublished data). Longfin smelt also have been observed in coastal waters adjacent to Humboldt Bay (Quirollo 1994, pers. comm.). The Humboldt Bay population is thought to be the nearest known breeding population to the Bay-Delta (Baxter 2011b, pers. comm.). Longfin smelt were collected consistently in the Klamath River estuary between 1979 and 1989 (Kisanuki et al. 1991, p. 72), and one longfin smelt was collected in the Klamath River in 2001 (CDFG 2009, p. 5).

Oregon

In Oregon, there are historical records of longfin smelt in Tillamook Bay, Columbia River, Coos Bay, and Yaquina Bay (ANHP 2006, p. 3). One individual was detected in Tillamook Bay in 2000 (Ellis 2002, p. 17). Williams et al. (2004, p. 30) collected 308 longfin in the Columbia River estuary in 2004. Longfin smelt were reported in the

Columbia River estuary, the coastal waters adjacent to the Columbia River, and in Yaquina Bay in 2009 (Nesbit 2011, pers. comm.). In Coos Bay, longfin smelt were detected in low numbers in the early 1980s. However, longfin smelt do not appear to be common in Coos Bay and were not detected during sampling that occurred in the 1970s and the late 1980s (Veroujean 1994, no pagination).

Washington

In Washington, within the Puget Sound Basin, longfin smelt are known to occur in the Nooksack River, Bellingham Bay, Snohomish River, Duwamish River, Skagit Bay, Strait of San Juan de Fuca, Twin River, and Pysht River (Table 1). Longfin smelt are known to occur in nearby Bellingham Bay (Penttila 2007, p. 4). Longfin smelt were collected in the Snohomish River estuary during extensive beach seine and fyke trapping in 2009 (Rice 2010, pers. comm.). Longfin smelt were captured (reported as non-target) in high-rise otter trawls in the lower Duwamish River (Anchor and King County 2007, p. 11). Longfin smelt are common in the Strait of San Juan de Fuca (Penttila 2007, p. 4). Miller et al. (1980, p. 28) found longfin smelt to be the second most common species in tow-net surveys conducted in the Strait of San Juan de Fuca. Most fish caught in these surveys were young of the year and were found near the Twin and Pysht Rivers, both of which may have suitable spawning grounds (Miller et al. 1980, p. 28). Occurrences of longfin smelt within northern Puget Sound and the Strait of Georgia may reflect the abundance and distribution of the anadromous populations from the Fraser River in British Columbia (Washington Department of Fish and Wildlife 2011, pp. 1-3). Currently, the National Park Service states that longfin smelt are probably present within Olympic National Park (NPS 2011, p. 1). Longfin smelt appear to be common in Grays Harbor (U.S. Army Corps of Engineers 2000, p. 2). Longfin smelt have been infrequently documented in the upper Chehalis estuary at Cosmopolis; however, when they do occur, they have been reported as abundant (Anderson 2011). Ocean trawls off Willapa Bay have collected longfin smelt, although no spawning population has been identified in the basin (Anderson 2011).

A resident, freshwater population of longfin smelt occurs in Lake Washington (Chigbu and Sibley 1994, p. 1). First caught in 1959, it is believed that the longfin smelt either were introduced to the lake or became trapped during canal construction (Chigbu et al. 1998, p. 180). In the 1960s, the abundance of longfin smelt in Lake Washington was low but increased to higher levels in the 1980s (Chigbu and Sibley 1994, p. 4).

British Columbia

Longfin smelt populations occur in Pitt Lake and Harrison Lake in British Columbia (Page and Burr 1991, p. 57; Taylor 2011, pers. comm.); these populations are believed to be resident fish that are not anadromous (that is, they are thought to complete their entire life cycle in freshwater). Pitt Lake is located approximately 64 river km (40 mi) up the Fraser and Pitt Rivers, and Harrison Lake is located approximately 121 river km (75 mi) up the Fraser and Harrison Rivers. Longfin smelt are known to occur within the Fraser River near Vancouver

(Hart 1973, p. 147; Fishbase 2011a, p. 1; Fishbase 2011b, p. 1). Longfin smelt are also known to occur in the Skeena River estuary near

Prince Rupert (Hart 1973, p. 147; Kelson 2011, pers. comm.; Gottesfeld 2002, p. 54).

Alaska

In Alaska, longfin smelt are known from Hinchinbrook Island, Prince William Sound, Dixon Entrance, Yakutat Bay, and Cook Inlet (Alaska Natural Heritage Program 2006, p. 3). In nearly 1,000 recent beach seine surveys in Alaska, longfin smelt have only been caught off Fire Island in upper Cook Inlet in 2009 and 2010 (NOAA 2010b, p. 4; Johnson 2010, pers. comm.; Wing 2010, pers. comm.). However, as stated earlier, longfin smelt are unlikely to be caught in beach seine surveys because they are a pelagic species and do not typically occur near shore where beach seine surveys take place. Surveys in Prince William Sound did not collect longfin smelt in 2006 or 2007 (NOAA 2011, p. 1). Longfin smelt were collected in Wrangell-St. Elias National Park and Glacier Bay in 2001 and 2002 (Arimitsu 2003, pp. 35, 41). Longfin were collected in Kachemak Bay in 1996-1998 seine and trawling surveys (Abookire et al. 2000). The NPS was not able to confirm presence or absence in Lake Clark National Park and Preserve. The NPS concludes that presence is probable in Glacier Bay National Park and Preserve, Klondike Gold Rush National Historical Park, Sitka National Historical Park, and Wrangell-St. Elias National Park and Preserve (NPS 2011, p. 1).

Abundance

In most locations throughout their range, longfin smelt populations have not been monitored. Within the Bay-Delta, longfin smelt are consistently collected in the monitoring surveys that have been conducted by CDFG as far back as the late 1960s. We know of no similar monitoring data for other longfin smelt populations. CDFG did report catches of longfin smelt in Humboldt Bay from surveys conducted between 2003 and 2009; small numbers of longfin were collected each of the years except 2004 (CDFG 2010, unpublished data). Moyle (2002, p. 237; 2010, p. 4) noted that the longfin smelt population in Humboldt Bay appeared to have declined between the 1970s and 2002, but survey data are not available from that time.

Longfin smelt numbers in the Bay-Delta have declined significantly since the 1980s (Moyle 2002, p. 237; Rosenfield and Baxter 2007, p. 1590; Baxter et. al. 2010, pp. 61-64). Rosenfield and Baxter (2007, pp. 1577-1592) examined abundance trends in longfin smelt using three long-term data sets (1980-2004) and detected a significant decline in the Bay-Delta longfin smelt population. They confirmed the positive correlation between longfin smelt abundance and freshwater flow that had been previously documented by others (Stevens and Miller 1983, p. 432; Baxter et al. 1999, p. 185; Kimmerer 2002b, p. 47), noting that abundances of both adults and juveniles were significantly lower during the 1987-1994 drought than during either the pre- or post-drought periods (Rosenfield and Baxter 2007, pp. 1583-1584).

Despite the correlation between drought and low population in the 1980s and 90s, the declines in the first decade of this century appear to be caused in part by additional factors. Abundance of longfin smelt has remained very low since 2000, even though freshwater flows increased during several of these years (Baxter et al. 2010, p. 62). Abundance indices derived from the Fall Midwater Trawl (FMWT), Bay Study Midwater Trawl (BSMT), and Bay Study Otter Trawl (BSOT) all show marked declines in Bay-Delta longfin smelt populations from 2002 to 2009 (Messineo et al. 2010, p. 57). Longfin smelt abundance over the last decade is the lowest recorded in the 40-year history of CDFG's FMWT monitoring surveys. Scientists became concerned over the simultaneous population declines since the early 2000s of longfin smelt and three other Bay-Delta pelagic fish species--delta smelt (Hypomesus transpacificus), striped bass (Morone saxatilis), and threadfin shad (Dorosoma petenense) (Sommer et al. 2007, p. 273). The declines of longfin smelt and these other pelagic fish species in the Bay-Delta since the early 2000s has come to be known as the Pelagic Organism Decline, and considerable research efforts have been initiated since 2005, to better understand causal mechanisms underlying the declines (Sommer et al. 2007, pp. 270-277; MacNally et al. 2010, pp. 1417-1430; Thomson et al. 2010, pp. 1431-1448). The population did increase in the 2011 FMWT index to 477 (Contreras 2011, p. 2), probably a response to an exceptionally wet year.

The FMWT index of abundance in the Bay-Delta shows great annual variation in abundance but a severe decline over the past 40 years (Figure 2). The establishment of the overbite clam (Corbula amurensis) in the Bay-Delta in 1987 is believed to have contributed to the population decline of longfin smelt (See Factor E: Introduced Species, below), as well as to the declining abundance of other pelagic fish species in the Bay-Delta (Sommer et al. 2007, p. 274). Figure 2 shows low values of the abundance index for longfin smelt during drought years (1976-1977 and 1986-1992) and low values overall since the time that the overbite clam became established in the estuary.

[GRAPHIC] [TIFF OMITTED] TP02AP12.001

Using data from 1975-2004 from the FMWT survey, Rosenfield and Baxter 2007 (p. 1589) found that longfin smelt exhibit a significant stock-recruitment relationship--abundance of juvenile (age-0) fish is directly related to the abundance of adult (age-1) fish from the previous year. They found that the abundance of juvenile fish declined by 90 percent during the time period analyzed. Rosenfield and Baxter (2007, p. 1589) also found a decline in age-1 individuals that was significant even after accounting for the decline in the age-0 population. If unfavorable environmental conditions persist for one or more years, recruitment into the population could be suppressed, affecting the species' ability to recover to their previous abundance. The current low abundance of adult longfin smelt within the Bay-Delta could reduce the ability of the species to persist in the presence of various threats.

Conservation Actions

Bay-Delta

The CALFED program existed as a multi-purpose (water supply, flood protection, and conservation) program with significant ecosystem restoration and enhancement elements. Implemented by the California Bay-Delta Authority, the program brought together more than 20 State and Federal agencies to develop a long-term comprehensive plan to restore ecological health and improve water management for all beneficial uses in the Bay-Delta system. The program specifically addressed ecosystem quality, water quality, water supply, and levee system integrity. The California Bay-Delta Authority was replaced in 2009 by the Delta Stewardship Council, but many of its programs continue to be implemented and are now housed within the CALFED program's former member agencies.

The CALFED Ecosystem Restoration Program (ERP) developed a strategic plan for implementing an ecosystem-based approach for achieving conservation targets (CALFED 2000a, pp. 1-3). The CDFG is the primary implementing agency for the ERP. The goal of ERP in improving conditions for longfin smelt will carry forward, irrespective of the species Federal listing status. CALFED had an explicit goal to balance the water supply program elements with the restoration of the Bay-Delta and tributary ecosystems and recovery of the longfin smelt and other species. Because achieving the diverse goals of the program is iterative and subject to annual funding by diverse agencies, the CALFED agencies have committed to maintaining balanced implementation of the program within an adaptive management framework. The intention of this framework is that the storage,

conveyance, and levee program elements would be implemented in such a way that the longfin smelt's status would be maintained and eventually improved.

CALFED identified 54 species enhancement conservation measures for longfin smelt, more than half of which have been completed (CALFED Ecosystem Restoration Project 2011, entire). One such restoration action at Liberty Island at the southern end of the Yolo Bypass (a flood control project) has likely benefitted longfin smelt. After years of active agricultural production on Liberty Island, the levees were breached in 1997, and the island was allowed to return to a more natural state (Wilder 2010, slide 4). Wildlands Corporation has recently completed a restoration project removing several levees surrounding Liberty Island and creating 186 acres of various habitats for fish (Wildlands 2011, p. 1). Longfin smelt are utilizing the flooded island, and were collected in a number of surveys between 2003 and 2005 (Liberty Island Monitoring Program 2005, pp. 42-44; Marshall et al. 2006, p. 1).

The Bay-Delta Conservation Plan (BDCP), an effort to help provide restoration of the Bay-Delta ecosystem and reliable water supplies, is currently in preparation by a collaborative of water agencies, resource agencies, and environmental groups. The BDCP is intended to provide a basis for permitting take of listed species under sections 7 and 10 of the Act and the California Natural Communities Conservation Planning Act, and would provide a comprehensive habitat conservation and restoration plan for the Bay-Delta, as well as a new funding source. The BDCP shares many of the same goals outlined in the 2000 CALFED Record of Decision (CALFED 2000) but would not specifically address all listed-species issues. The BDCP would, however, target many of the threats to current and future listed species and could contribute to species recovery. However, the BDCP, if completed, would not be initiated until at least 2013 or later. The plan's implementation is anticipated to extend through 2060.

Humboldt Bay

The Humboldt Bay Watershed Advisory Committee has completed the Humboldt Bay Salmon and Steelhead Conservation Plan with funding from CDFG, National Oceanographic Atmospheric Administration (NOAA), and the California State Coastal Conservancy with the purpose of protecting and restoring salmon habitat in Humboldt Bay through cooperative planning (Humboldt Bay Watershed Advisory Committee 2005, pp. 1-2). Many of the habitat restoration activities proposed may benefit longfin smelt, including restoration in freshwater streams and brackish sloughs. The Natural Resource Services has designed an enhancement program that is based on the Humboldt Bay Salmon and Steelhead Conservation Plan. Natural Resource Services has completed a tidal marsh enhancement project on Freshwater Creek and has other projects in the design stage (Don Allen 2011, pers. comm.). The Natural Resource Services is a division of the Redwood Community Action Agency dedicated to improving the health of northern California communities and the watersheds that they depend on (NRS 2011, p. 1). These types of restoration efforts are current and ongoing and may benefit longfin smelt by increasing access to intertidal areas within Humboldt Bay.

Puget Sound

The Puget Sound Partnership is a Washington State Agency created in 2007, to oversee the restoration and protection of Puget Sound. The Puget Sound Partnership created an Action Agenda that identifies and prioritizes work needed to protect and restore Puget Sound (Puget Sound Partnership 2008b, p. 2). Protection actions including local watershed planning, shoreline management planning, and citizen involvement through groups such as beach watchers and shore stewards are among the current restoration efforts in Puget Sound watershed (Puget Sound Partnership 2008a, pp. 1-2). These measures are expected to benefit longfin smelt by protecting and restoring habitat through legislative approval and funding for land acquisition for protection and restoration of ecologically important lands and habitats and by adding lands to State Aquatic Reserves program (Puget Sound Partnership 2008a, pp. 1-2).

Alaska

State and Federal land ownership affords protection for vast distances of shoreline within Glacier Bay and Wrangell-St. Elias National Parks, Tongass National Forest, and State landholdings. Kachemak Bay, located near the mouth of lower Cook Inlet, is a National Estuarine Research Reserve regarded as extremely important for marine biodiversity conservation (ADFG 2006, pp. 133-134). Alaska's only State wilderness park, Kachemak Bay State Park, is also located in Kachemak Bay (ADNR 2011, p. 1). Yakutat Bay lies between peninsular and mainland Alaska and is bordered by Wrangell-St. Elias National Park to the northwest and Tongass National Forest. The Federal lands surrounding Yakutat Bay protect it from the effects of development. The Tongass National Forest management plan requires that logging activities be distanced from estuarine and riparian edges (ADFG 2006, p. 107). As a species group, the osmerids are identified in Alaska's Comprehensive Wildlife Conservation Strategy as Species of Greatest Conservation Need (ADFG 2006, pp. 140-143). The Conservation Action Plan for anadromous smelts identifies objectives, issues, and conservation actions to address information gaps. Determining life history, trophic ecology, instream flow and habitat needs, and monitoring protocols are included as measures that need to be undertaken as part of Alaska's Conservation Strategy to identify conservation status and needs of anadromous smelt including longfin.

Summary of Information Pertaining to the Five Factors

Section 4 of the Act (16 U.S.C. 1533) and implementing regulations (50 CFR part 424) set forth procedures for adding species to, removing species from, or reclassifying species on the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, a species may be determined to be endangered or threatened based on any of the following five factors:

(A) The present or threatened destruction, modification, or curtailment of its habitat or range;

(B) Overutilization for commercial, recreational, scientific, or educational purposes;

(C) Disease or predation;

(D) The inadequacy of existing regulatory mechanisms; or

(E) Other natural or manmade factors affecting its continued existence.

In making these findings, information pertaining to each species in relation to the five factors provided in section 4(a)(1) of the Act is discussed below. In considering what factors might constitute threats to a species, we must look beyond the exposure of the species to a particular factor to evaluate whether the species may respond to the factor in a way that causes actual impacts to the species. If there is exposure to a factor and the species responds negatively, the factor may be a threat, and during the status review, we attempt to determine how significant a threat it is. The threat is significant if it drives or contributes to the risk of extinction of the species such that the species warrants listing as

endangered or threatened as those terms are defined by the Act. However, the identification of factors that could impact a species negatively may not be sufficient to compel a finding that the species warrants listing. The information must include evidence sufficient to suggest that the potential threat has the capacity (i.e., it should be of sufficient magnitude and extent) to affect the species' status such that it meets the definition of endangered or threatened under the Act.

In making our 12-month finding on the petition, we considered and evaluated the best available scientific and commercial information. Much of the scientific and commercial information available on potential threats to longfin smelt comes from information on the Bay-Delta, and therefore the threats analysis is largely focused on the Bay-Delta longfin smelt population.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Potential threats to longfin smelt habitat include the effects of reduced freshwater flow, climate change, and channel disturbance. Nearly all information available on Factor A threats to longfin smelt come from the Bay-Delta estuary. Therefore, our analysis below focuses on habitat impacts to the Bay-Delta population.

Reduced Freshwater Flow

Most longfin smelt populations, other than those in a few freshwater lakes in Washington and British Columbia, are known from estuaries. Estuaries are complex ecosystems with boundaries between freshwater, brackish water, and saltwater that vary in time and space. Drought and water diversions affect these boundaries by altering the amounts and timing of freshwater flow into and within the estuary. These altered freshwater flows affect the physical and biological characteristics of the estuary, and the physical and biological characteristics of the estuary define longfin smelt habitat.

Many environmental attributes respond to variance in freshwater flow into the estuary, including patterns of flooding and drought, nutrient loading, sediment loading (turbidity), concentration of organic matter and planktonic biota, physical changes in the movement and compression of the salt field, and changes in the hydrodynamic environment (Kimmerer 2002a, p. 40). The San Francisco Estuary exhibits one of the strongest and most consistent responses of biota to flow among large estuaries (Kimmerer 2004, p. 14).

Reduced freshwater flows into estuaries may affect fish and other estuarine biota in multiple ways. Effects may include: (1) Decreased nutrient loading, resulting in decreased primary productivity; (2) decreased stratification of the salinity field, resulting in decreased primary productivity; (3) decreased organic matter loading and deposition into the estuary; (4) reduced migration cues; (5) decreased sediment loading and turbidity, which may affect both feeding efficiency and predation rates; (6) reduced dilution of contaminants; (7) impaired transport to rearing areas (e.g., low-salinity zones); and (8) reduction in physical area of, or access to, suitable spawning or rearing habitat (Kimmerer 2002b, p. 1280).

Bay-Delta Population

Freshwater flow is strongly related to the natural hydrologic cycles of drought and flood. In the Bay-Delta estuary, increased Delta outflow during the winter and spring is the largest factor positively affecting longfin smelt abundance (Stevens and Miller 1983, pp. 431-432; Jassby et al. 1995; Sommer et al. 2007, p. 274; Thomson et al. 2010, pp. 1439-1440). During high outflow periods, larvae presumably benefit from increased transport and dispersal downstream, increased food production, reduced predation through increased turbidity, and reduced loss to entrainment due to a westward shift in the boundary of spawning habitat and strong downstream transport of larvae (CFDG 1992;

Hieb and Baxter 1993; CDFG 2009a). Conversely, during low outflow periods, negative effects of reduced transport and dispersal, reduced turbidity, and potentially increased loss of larvae to predation and increased loss at the export facilities result in lower young-of-the-year recruitment. Despite numerous studies of longfin smelt abundance and flow in the Bay-Delta, the underlying causal mechanisms are still not fully understood (Baxter et al. 2010, p. 69; Rosenfield 2010, p. 9).

As California's population has grown, demands for reliable water supplies and flood protection have grown. In response, State and Federal agencies built dams and canals, and captured water in reservoirs, to increase capacity for water storage and conveyance resulting in one of the largest manmade water systems in the world (Nichols et al. 1986, p. 569). Operation of this system has altered the seasonal pattern of freshwater flows in the watershed. Storage in the upper watershed of peak runoff and release of the captured water for irrigation and urban needs during subsequent low flow periods result in a broader, flatter hydrograph with less seasonal variability in freshwater flows into the estuary (Kimmerer 2004, p. 15).

In addition to the system of dams and canals built throughout the Sacramento River-San Joaquin River basin, the Bay-Delta is unique in having a large water diversion system located within the estuary (Kimmerer 2002b, p. 1279). The State Water Project (SWP) and Central Valley Project (CVP) operate two water export facilities in the Delta (Sommer et al. 2007, p. 272). Project operation and management is dependent upon upstream water supply and export area demands. Despite the size of the water storage and diversion projects, much of the interannual variability in Delta hydrology is due to variability in precipitation from year to year. Annual inflow from the watershed to the Delta is strongly correlated to unimpaired flow (runoff that would hypothetically occur if upstream dams and diversions were not in existence), mainly due to the effects of high-flow events (Kimmerer 2004, p. 15). Water operations are regulated in part by the California State Water Resources Control Board (SWRCB) according to the Water Quality Control Plan (WQCP) (SWRCB 2000, entire). The WQCP limits Delta water exports in relation to Delta inflow (the Export/Inflow, or E/I ratio).

It is important to note that in the case of the Bay-Delta, freshwater flow is expressed as both Delta inflow (from the rivers into the Delta) and as Delta outflow (from the Delta into the lower estuary), which are closely correlated, but not equivalent. Freshwater flow into the Delta affects the location of the low salinity zone and X2 within the estuary. Because longfin smelt spawn in freshwater, they must migrate farther upstream to spawn as flow reductions alter the position of X2 and the low-salinity zone moves upstream (CDFG 2009, p. 17). Longer migration distances into the Bay-Delta make longfin smelt more susceptible to entrainment in the State and Federal water pumps (see Factor E: Entrainment Losses). In periods with greater freshwater flow into the Delta, X2 is pushed farther downstream (seaward); in periods with low flows, X2 is positioned farther landward (upstream) in the estuary and into the Delta. Not only is longfin smelt abundance in the Bay-Delta strongly correlated with Delta inflow and X2, but the spatial distribution of longfin smelt larvae is also strongly associated with X2 (Dege and Brown 2004, pp. 58-60; Baxter et al. 2010,

p. 61). As longfin hatch into larvae, they move from the areas where they are spawned and

orient themselves just downstream of X2 (Dege and Brown 2004, pp. 58-60). Larval (winter-spring) habitat varies with outflow and with the location of X2 (CDFG 2009, p. 12), and has been reduced since the 1990s due to a general upstream shift in the location of X2 (Hilts 2012, unpublished data). The amount of rearing habitat (salinity between 0.1 and 18 ppt) is also presumed to vary with the location of X2 (Baxter et al. 2010, p. 64). However, as previously stated, the location of X2 is of particular importance to the distribution of newly-hatched larvae and spawning adults. The influence of water project operations from November through April, when spawning adults and newly-hatched larvae are oriented to X2, is greater in drier years than in wetter years (Knowles 2002, p. 7).

Research on declines of longfin smelt and other pelagic fish species in the Bay-Delta since 2002 (referred to as Pelagic Organism Decline--see Abundance section, above) have most recently been summarized in the Interagency Ecological Program's 2010 Pelagic Organism Decline Work Plan and Synthesis of Results (Baxter et al. 2010, pp. 61-69). While Baxter et al. (2010, pp. 17-19) acknowledge significant uncertainties about the causal mechanisms underlying the Pelagic Organism Decline, they have identified reduced Delta freshwater flows as one of several key factors that they believe contribute to recent declines in the abundance of longfin smelt (Baxter et al. 2010, pp. 61-69, Figure 5).

Other Populations

Information on effects of reduced freshwater flows on longfin smelt populations other than the Bay-Delta population are lacking. Dams and reservoirs are located in the inland water basins of most of the estuaries where longfin smelt occur. Some of these systems are large and consist of multiple dams and diversions (e.g., Klamath River basin, Columbia River basin). Water diversion systems with dams, canals, and water pipelines located upstream of the estuary may affect longfin smelt aquatic habitat by reducing freshwater flows into the estuary--especially if water is diverted out of the drainage basin--and altering the timing of freshwater flows into the estuary.

Climate Change

``Climate'' refers to an area's long-term average weather statistics (typically for at least 20- or 30-year periods), including the mean and variation of surface variables such as temperature, precipitation, and wind, whereas ``climate change'' refers to a change in the mean and/or variability of climate properties that persists for an extended period (typically decades or longer), whether due to natural processes or human activity (Intergovernmental Panel on Climate Change (IPCC) 2007a, p. 78). Although changes in climate occur continuously over geological time, changes are now occurring at an accelerated rate. For example, at continental, regional, and ocean basin scales, recent observed changes in long-term trends include: a substantial increase in precipitation in eastern parts of North

American and South America, northern Europe, and northern and central Asia, and an increase in intense tropical cyclone activity in the North Atlantic since about 1970 (IPCC 2007a, p. 30); and an increase in annual average temperature of more than 2 [deg]F (1.1 [deg]C) across the United States since 1960 (Global Climate Change Impacts in the United States (GCCIUS) 2009, p. 27). Examples of observed changes in the physical environment include: an increase in global average sea level, and declines in mountain glaciers and average snow cover in both the northern and southern hemispheres (IPCC 2007a, p. 30); substantial and accelerating reductions in arctic sea-ice (e.g., Comiso et al. 2008, p. 1); and a variety of changes in ecosystem processes, the distribution of species, and the timing of seasonal events (e.g., GCCIUS 2009, pp. 79-88).

The IPCC used Atmosphere-Ocean General Circulation Models and various greenhouse gas emissions scenarios to make projections of climate change globally and for broad regions through the 21st century (Meehl et al. 2007, p. 753; Randall et al. 2007, pp. 596-599), and reported these projections using a framework for characterizing certainty (Solomon et al. 2007, pp. 22-23). Examples include: (1) It is virtually certain there will be warmer and more frequent hot days and nights over most of the earth's land areas; (2) it is very likely there will be increased frequency of warm spells and heat waves over most land areas, and the frequency of heavy precipitation events will increase over most areas; and (3) it is likely that increases will occur in the incidence of extreme high sea level (excludes tsunamis), intense tropical cyclone activity, and the area affected by droughts (IPCC 2007b, p. 8, Table SPM.2). More recent analyses using a different global model and comparing other emissions scenarios resulted in similar projections of global temperature change across the different approaches (Prinn et al. 2011, pp. 527, 529).

All models (not just those involving climate change) have some uncertainty associated with projections due to assumptions used, data available, and features of the models; with regard to climate change this includes factors such as assumptions related to emissions scenarios, internal climate variability, and differences among models. Despite this, however, under all global models and emissions scenarios, the overall projected trajectory of surface air temperature is one of increased warming compared to current conditions (Meehl et al. 2007, p. 762; Prinn et al. 2011, p. 527). Climate models, emissions scenarios, and associated assumptions, data, and analytical techniques will continue to be refined, as will interpretations of projections, as more information becomes available. For instance, some changes in conditions are occurring more rapidly than initially projected, such as melting of arctic sea ice (Comiso et al. 2008, p. 1; Polyak et al. 2010, p. 1797), and since 2000 the observed emissions of greenhouse gases, which are a key influence on climate change, have been occurring at the mid- to higher levels of the various emissions scenarios developed in the late 1990s and used by the IPPC for making projections (e.g., Raupach et al. 2007, Figure 1, p. 10289; Manning et al. 2010, Figure 1, p. 377; Pielke et al. 2008, entire). Also, the best scientific and commercial data available indicate that average global surface air temperature is increasing and that several climate-related changes are occurring and will continue for many decades even if emissions are stabilized soon (e.g. Meehl et al. 2007, pp. 822-829; Church et al. 2010, pp. 411-412;

Gillett et al. 2011, entire).

Changes in climate can have a variety of direct and indirect impacts on species, and can exacerbate the effects of other threats. Rather than assessing ``climate change'' as a single threat in and of itself, we examine the potential consequences to species and their habitats that arise from changes in environmental conditions associated with various aspects of climate change. For example, climate-related changes to habitats, predator-prey relationships, disease and disease vectors, or conditions that exceed the physiological tolerances of a species, occurring individually or in combination, may affect the status of a species. Vulnerability to climate change impacts is a function of sensitivity to those changes, exposure to those changes, and adaptive capacity (IPCC 2007, p. 89;

Glick et al. 2011, pp. 19-22). As described above, in evaluating the status of a species, the Service uses the best scientific and commercial data available, and this includes consideration of direct and indirect effects of climate change. As is the case with all potential threats, if a species is currently affected or is expected to be affected by one or more climate-related impacts, this does not necessarily mean the species is an endangered or threatened species as defined under the Act. If a species is listed as endangered or threatened, this knowledge regarding its vulnerability to, and impacts from, climate-associated changes in environmental conditions can be used to help devise appropriate strategies for its recovery.

The effects of climate change do not act in isolation, but act in combination with existing threats to species and systems. We considered the potential effects of climate change on the longfin smelt based on projections derived from various modeling scenarios. Temperature increases are likely to lead to a continued rise in sea level, further increasing salinity within longfin smelt estuarine rearing habitat and likely shifting spawning and early rearing upstream as the boundary of fresh and brackish water moves upstream (Baxter 2011, pers. comm.). Reduced snowpack, earlier melting of the snowpack, and increased water temperatures will likely alter freshwater flows, possibly shifting and condensing the timing of longfin smelt spawning (Baxter 2011, pers. comm.).

Effects of climate change could be particularly profound for aquatic ecosystems and include increased water temperatures and altered hydrology, along with changes in the extent, frequency, and magnitude of extreme events such as droughts, floods, and wildfires (Reiman and Isaak 2010, p. 1). Numerous climate models predict changes in precipitation frequency and pattern in the western United States (IPCC 2007b, p. 8). Projections indicate that temperature and precipitation changes will diminish snowpack, changing the availability of natural water supplies (USBR 2011, p. 143). Warming may result in more precipitation falling as rain and less storage as snow. This would result in increased rain-on-snow events and increase winter runoff as spring runoff decreases (USBR 2011, p. 147). Earlier seasonal warming increases the likelihood of rain-on-snow events, which are associated with mid-winter floods. Smaller snowpacks that melt earlier in the year result in increased drought frequency and severity (Rieman and Isaak

2010, p. 6). These changes may lead to increased flood and drought risk during the 21st century (USBR 2011, p. 149).

It is uncertain how a change in the timing and duration of freshwater flows will affect longfin smelt. The melting of the snowpack earlier in the year could result in higher flows in January and February, which are peak spawning and hatching months for longfin smelt. This would reduce adult migration distance and increase areas of freshwater spawning habitat during these months, potentially creating better spawning and larval rearing conditions. Associated higher turbidity may reduce predation on longfin smelt adults and larvae (Baxter 2011, pers. comm.). However, if high flows last only a short period, benefits may be negated by poorer conditions before and after the high flows. As the freshwater boundary moves farther inland into the Delta with increasing sea level (see below) and reduced flows, adults will need to migrate farther into the Delta to spawn, increasing the risk of predation and the potential for entrainment into water export facilities and diversions for both themselves and their progeny.

Global sea level rose at an average rate of 1.8 mm (0.07 in) per year from 1961 to 2003, and at an average rate of 3.1 mm (0.12 in) per year from 1993 to 2003 (IPCC 2007a, p. 49). The IPCC (2007b, p. 13) report estimates that sea levels could rise by 0.18 to 0.58 m (0.6 to 1.9 ft) by 2100; however, Rahmstorf (2007, p. 369) indicated that global sea level rise could increase by over 1.2 m (4 ft) in that time period (CEC 2009, p. 49). Even if emissions could be halted today, the oceans would continue to rise and expand for centuries due to their capacity to store heat (CEC 2009, pp. 49-50). In the Bay-Delta, higher tides combined with more severe drought and flooding events are likely to increase the likelihood of levee failure, possibly resulting in major alterations of the environmental conditions (Moyle 2008, pp. 362-363). It is reasonable to conclude that more severe drought and flooding events will also occur in other estuaries where the longfin smelt occurs. Sea level rise is likely to increase the frequency and range of saltwater intrusion. Salinity within the northern San Francisco Bay is projected to rise 4.5 psu by the end of the century (Cloern et al. 2011, p. 7). Elevated salinity levels could push the position of X2 farther up the estuary and could result in increased distances that longfin smelt must migrate to reach spawning habitats. Elevated sea levels could result in greater sedimentation, erosion, coastal flooding, and permanent inundation of low-lying natural ecosystems (CDFG 2009, p. 30).

Typically, longfin smelt spawning in the Bay-Delta occurs at water temperatures between 7.0 and 14.5 [deg]C (44.6-58.2 [deg]F), although spawning has been observed at lower temperatures in other areas, such as Lake Washington (Moyle 2002, p. 236). Mean annual water temperatures within the upper Sacramento River portion of the Bay-Delta estuary are expected to approach or exceed 14 [deg]C during the second half of this century (Cloern et al. 2011, p. 7). Increased water temperatures could compress the late-fall to early-spring spawning period and could result in shorter egg incubation time. Longfin smelt are adapted to hatching in cold, relatively unproductive waters where they grow slowly until ample food resources are available in spring. Warmer water during winter would likely result in increased metabolism of larvae, which may result in increased food needs for maintenance and growth and create a mismatch between food needs and availability (Baxter 2011, pers.

comm.). If increased water temperatures compress the spawning period and lead to more synchronized hatching during winter, then prevailing low sunlight and low food resources could result in greater intra-specific (within species) competition (Baxter 2011, pers. comm.). Moreover, increasing water temperatures might also lead to earlier spawning and hatching of other fishes, and to greater inter-specific (between species) competition.

Although climate change and sea level rise are projected to result in continued increases in water temperature and salinity, longfin smelt is considered euryhaline (tolerant of a wide range of salinities) (Moyle 2002, p. 236; Rosenfield and Baxter 2007 p. 1578) and is known to move between different parts of the estuary that vary greatly in temperature and salinity. Being able to move between aquatic habitats that vary greatly in water temperature and salinity may reduce the potential impacts of climate change and sea level rise to some degree.

Channel Disturbances

Dredging and other channel disturbances potentially degrade spawning habitat and cause entrainment loss of individual fish and eggs; disposal of dredge spoils also can create large sediment plumes that expose fish to gill-clogging sediments and possibly to decreased oxygen availability (Levine-Fricke 2004, p. 56). Longfin smelt is a pelagic species (living away from the bottom of the water column and

shoreline), and thus less likely to be directly affected by dredging, sand and gravel mining, and other disturbances to the channel bed compared to bottom-dwelling fish species. Longfin smelt are likely most vulnerable to entrainment by dredging during spawning and egg incubation because eggs are deposited and develop on channel bottom substrates (CDFG 2009, p. 27). Egg development takes approximately 40 days (Moyle 2002, p. 236).

We have found no information documenting population impacts of dredging or sand and gravel mining on longfin smelt. Channel maintenance dredging occurs regularly within the Bay-Delta and other estuaries that serve as shipping channels (e.g., Humboldt Bay, Coos Bay, Yaquina Bay, Columbia River). In their 2009 status review on longfin smelt, CDFG concluded that effects of regular maintenance dredging and sand mining within the Bay-Delta estuary on longfin smelt were expected to be small and localized (CDFG 2009, p. 26). They reviewed two studies on entrainment effects of channel dredging, and each study found that no longfin smelt were entrained during dredging (fish that were entrained were primarily bottom-dwelling species).

There is currently a proposal to deepen and selectively widen the Sacramento Deep Water Ship Channel and the lower portion of the Sacramento River in the Bay-Delta. This dredging project would remove between 6.1-7.6 million cubic meters (8 and 10 million cubic yards) of material from the channel and Sacramento River and extend for 74 km (45.8 mi) (USACE 2011a, entire). Potential effects of this new project to longfin smelt include mortality through loss of spawning substrate, habitat modification, and a shift in spawning and rearing habitat. The project also has potential to alter breeding and foraging behavior of the Bay-Delta longfin smelt population. However, this project is only a proposal at this time and is not certain to occur. Potential effects of the proposed project are currently under evaluation.

Summary of Factor A

Although we find that reduced freshwater flows are currently a threat to the Bay-Delta longfin smelt population, it is difficult to make inferences on the effects of reduced freshwater flows to longfin smelt populations throughout the species range. Because the Bay-Delta system includes one of the largest man made water system in the world, it would be impractical to compare diversions and alterations in other estuaries to diversions and alterations in the Bay-Delta. The effects of water development in the Bay-Delta are unique to the physical, geologic, and hydrologic environment of the estuary. Reduced flow from diversions and dams in other estuaries is not expected to be as significant as the reduced flows that have been shown in the Bay-Delta because less water is exported from other estuaries. We have no information to show that reduced freshwater flow is a threat to longfin smelt in other estuaries. Therefore, we conclude that while reduced flow is a threat to the Bay-Delta population of longfin smelt, the best available science does not indicate that the lack of freshwater flow is a threat to the species in other parts of its range.

Climate change will likely affect longfin smelt in multiple ways, but longfin smelt are able to move between a wide range of aquatic environments that vary greatly in water temperature and salinity. These behavioral and physiological characteristics of the species may help it adapt to effects of climate change. We conclude at this time that the best available information does not indicate that climate change threatens the continued existence of longfin smelt across its range.

Channel disturbances may have localized impacts to longfin smelt habitat suitability, but the best available information does not indicate that they pose significant threats to the species throughout its range.

Based on the best available scientific information, we conclude that reduced freshwater flows, climate change, and channel disturbances are not significant current or future threats to longfin smelt across its range except in the Bay-Delta, where reduced freshwater flow is a threat.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Recreational and Commercial Fishing

In California, longfin smelt was listed as a threatened species under the State's Endangered Species Act in 2009. This status makes take of longfin smelt illegal, unless authorized by an incidental take permit or other take authorization. However, longfin smelt are caught as bycatch in small bay shrimp trawl fishery and bait fishing (anchovies and sardines) operations in South San Francisco Bay, San Pablo Bay, and Carquinez Strait (CDFG 2009a, p. 1). CDFG (2009d, pp. 6, 9) estimated the total longfin smelt bycatch from shrimping in 1989 and 1990 at 15,539 fish, and in 2004 at 18,815-30,574 fish. CDFG noted in 2009 that the bay shrimp trawl fishery industry had declined since 2004 (CDFG 2009d, p. 3). No shrimp fishery currently takes place in Humboldt Bay (Mello 2011, pers. comm.).

In Oregon, smelt species may not be targeted in commercial fisheries, and if taken incidentally, smelt catch cannot exceed 1 percent of the total weight landed (ODFW 2011, p. 17). Rules limit in which estuaries bait fishing for herring, sardines, anchovies, and shad may occur. In Oregon, there is currently no known shrimping taking place within the estuaries where the longfin smelt might be found. Although a limited entry roe herring fishery is allowed in Yaquina Bay, no landings have occurred there since 2003, because biomass estimates have generally been too low to make the fishery economically viable (Krutzikowsky 2011, pers. comm.). Anchovy fishing is allowed in Tillamook Bay, Yaquina Bay, and Coos Bay, but because there is currently no anchovy fishing occurring in these areas (Krutzikowsky 2011, pers. comm.), longfin smelt are not taken as bycatch. Records for commercial landings in Oregon show a total of 9.1 kilograms (kg) (20 pounds (lb)) landed from 2005 to 2010 for smelt species other than eulachon. Recreational fishing for smelt species is allowed only in marine waters (Oregon Sport Fishing Regulations, p. 11).

The State of Washington includes longfin smelt in a class of fish referred to as forage fish (small schooling fish that are major food items for many species of fish, birds, and marine mammals) (Bargmann 1998, p. 1). Both recreational and commercial fisheries exist for forage fish in Washington, but the recreational fishery is much smaller than the commercial fishery. A sport fishing license is not needed to catch smelt. Smelt can be harvested recreationally using a dip net or jig. Dip net fishing for longfin smelt is allowed in the Nooksack River and there are approximately two hundred trips a year made to fish for longfin smelt in this area (O'Toole 2011, pers. comm.). It is unlawful to use a herring or smelt rake. Sport and tribal commercial fisheries have been reported to occur on the Nooksack River longfin smelt stock (Bargmann 1998, p. 37). Longfin smelt may be caught incidentally in a medium-sized shore or pier-based recreational fishery for surf smelt in Puget Sound.

There is currently no commercial fishing regulation specific to longfin smelt in Washington (Paulson 2011, pers. comm.). The daily limit for smelt is 4.5 kg (10 lb) and, like Oregon, is counted as an aggregate, which can include herring, sardines, sandlance,

and anchovies (WDFW 2011, p. 27). There is a robust commercial herring fishery in Washington that takes approximately 450 metric tons (500 tons) of fish per year (for sport bait) and a commercial surf smelt fishery that takes approximately 450,000 kg (100,000 lb) of fish per year (for human consumption). Longfin smelt bycatch in both of these fisheries is low. Anchovy fishing in Washington primarily takes place in Grays Harbor and the mouth of the Columbia River (O'Toole 2011, pers. comm.).

In British Columbia, take of smelt from recreational fishing is limited to 20 kilograms (kg) (44 lb) per day and 40 kg (88 lb) of total catch in possession. The fishing season takes place from April 1 to June 14 (Department of Fisheries and Oceans Canada 2011a, p. 47). A commercial fishing industry targeting surf smelt may incidentally take longfin smelt (Department of Fisheries and Oceans Canada 2011b, p. 1). British Columbia supports a year-round shrimp fishery in Prince Rupert and Chatham Sound. Sardine and shrimp fishing occurs near Vancouver.

In Alaska, a commercial fishery for smelt, which includes eulachon, was reopened in 2005. This fishery is restricted to the brackish waters of Cook Inlet, from May 1 to June 30. The total annual harvest of eulachon and longfin smelt may not exceed 90 metric tons (100 tons) of smelt. However, longfin smelt are unlikely to be specifically targeted in this fishery due to their small numbers in relation to eulachon in the region (Shields 2005, p. 4). Sport fishing is limited to salt water, where herring and smelt may be taken (Alaska Department of Fish and Game (ADFG) 2010, p. 1). In Prince William Sound, the herring fishery has closed due to low abundance of herring.

Monitoring Surveys

Fisheries monitoring surveys are conducted by NOAA's National Marine Fisheries Service, the Service and by State and local agencies in water bodies inhabited by longfin smelt throughout their range. Most of these surveys target other species, primarily salmonids, and rarely collect longfin smelt outside of the Bay-Delta area.

Within the Bay-Delta, longfin smelt are regularly captured in monitoring surveys. The Interagency Ecological Program (IEP) implements scientific research in the Bay-Delta. Although the focus of its studies and the level of effort have changed over time, in general, their surveys have been directed at researching the Pelagic Organism Decline in the Bay-Delta. Between the years of 1987 to 2011, combined take of longfin smelt less than 20 mm (0.8 in) in length ranged from 2,405 to 158,588 annually. All of these fish were preserved for research or assumed to die in processing. During the same time period, combined take for juveniles and adults (fish greater than or equal to 20 mm (0.8 in)) ranged from 461 to 68,974 annually (IEP 2011, no pagination). Although mortality is unknown, the majority of these fish likely do not survive. The Chipps Island survey, which is conducted by the Service, has captured an average of 2,697 longfin smelt per year during the past 10 years. Biologists attempt to release these fish unharmed, but at least 5,154 longfin smelt were known to have died during the Chipps Island survey between 2001 and 2008 (Service 2010, entire).

Survey methods have been modified recently to minimize potential impacts to delta smelt, a related species that also occurs in the Bay-Delta (75 FR 17669; April 7, 2010). These modifications are likely to result in reduced impacts to longfin smelt also. The Service conducts other surveys in the Bay-Delta to monitor salmon populations (Mossdale trawl, Sacramento trawl, beach seine surveys), but few longfin smelt are captured during these surveys. Mortality due to monitoring surveys was not identified by the Interagency Ecological Program in its most recent synthesis of results as a factor in the decline of longfin smelt and other pelagic fish species in the Bay-Delta since the early 2000s (Baxter et al. 2010, pp. 19-53, 61-69).

Summary of Factor B

The species is incidentally caught in commercial shrimp and bait fishing operations throughout much of its range, but the bycatch numbers are usually low. In California, take of longfin smelt is illegal without authorization because the species is listed as threatened under the California Endangered Species Act. Because of its small size, it is not targeted by recreational angling, although it is certainly caught and used as bait for other larger recreational fish species. Monitoring surveys have resulted in high numbers of longfin smelt mortality in the Bay-Delta in the past, but efforts being made to reduce survey mortality for delta smelt, such as reductions in tow times, likely have also benefitted longfin smelt. The scientific collection surveys being conducted in the Bay-Delta are limited to research designed to benefit the species, and mortality from monitoring surveys has not been identified as a factor in the longfin smelt's recent population decline. We have no information indicating that mortality from monitoring surveys threatens any populations within the species' range. We conclude that overutilization due to commercial, recreational, or scientific take is not a significant current or future threat to the longfin smelt throughout its range.

Factor C. Disease or Predation

Disease

All the information we found on disease in longfin populations originated from studies in the Bay-Delta. Two investigations published in 2006 and 2008 by the California-Nevada Fish Health Center detected no significant health problems in juvenile longfin smelt in the Bay-Delta (Foott and Stone 2008, pp. 15-16). The low observed rate of parasitic infection did not appear to affect the health of the fish, as indicated by the lack of associated tissue damage or inflammation (Foott and Stone 2008, p. 15). The only additional documentation of relevant wild fish disease in the Bay-Delta was a severe intestinal infection by a new species of myxozoan observed in nonnative juvenile yellowfin goby (Acanthogobius flavimanus) from Suisun Marsh (Baxa et al. in prep cited in Baxter et al. 2008, p. 16). The nonnative gobies could act as potential vectors of the parasite to other susceptible species in the Bay-Delta. It is unknown whether this or similar infections are affecting the health of longfin smelt.

The south Delta is fed by water from the San Joaquin River, where pesticides (e.g., chlorpyrifos, carbofuran, and diazinon), salts (e.g., sodium sulfates), trace elements (boron and selenium), and high levels of total dissolved solids are prevalent due to agricultural runoff (64 FR 5963; February 8, 1999). Pesticides and other toxic chemicals may adversely affect the immune system of longfin smelt and other fish in the Bay-Delta and other estuaries, but we found no information documenting such effects (see Factor E: Contaminants, below).

Predation

As a forage species, longfin smelt are preyed upon by a variety of fishes, birds, and mammals (Barnhart et al. 1992, p. 44). However, we found little information on predation of longfin smelt other than information for the Bay-Delta population and Lake Washington population. The striped bass (Morone saxatilis) is a potential predator of longfin smelt in the Bay-Delta. Striped bass were introduced into the Bay-Delta in 1879 and quickly became abundant throughout the estuary. However, their numbers have

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declined substantially over the last 40 years (Thomson et al. 2010, p. 1440), and they are one of the four species studied under Pelagic Organism Decline investigations (Baxter et al. 2010, p. 16). Numbers of largemouth bass (Micropterus dolomieui), another introduced species in the Bay-Delta, have increased in the Delta over the past few decades (Brown and Michniuk 2007, p. 196). Largemouth bass, however, occur in shallow freshwater habitats, closer to shore than the pelagic longfin smelt, and do not typically co-occur with longfin smelt. Baxter et al. (2010, p. 40) reported that no longfin smelt have been found in largemouth bass stomachs sampled in a recent study of largemouth bass diet. Moyle (2002, p. 238) believed that inland silverside (Menidia beryllina), another nonnative predatory fish, may be an important predator on longfin smelt eggs, larvae, juveniles, and adults. Rosenfield (2010, p. 18) acknowledged that they are likely major predators of longfin smelt eggs and larvae but thought it unlikely that they were an important predator on juveniles and subadults because inland silversides prefer shallow water habitats whereas juvenile and subadult longfin smelt do not.

In the Bay-Delta, predation of longfin smelt may be high in the Clifton Court Forebay, where the SWP water export pumping plant is located (Moyle 2002, p. 238; Baxter et al. 2010, p. 42). However, once they are entrained in the Clifton Court Forebay, longfin smelt mortality would be high anyway due to high water temperatures in the forebay (CDFG 2009b, p. 4) and entrainment into the SWP water export pumping plant. In addition to elevated predation levels in the Clifton Court Forebay, predation also is concentrated at sites where fish salvaged from the SWP and CVP export facilities are released (Moyle 2002, p. 238). However, few longfin smelt survive the salvage and transport process (see Factor E: Entrainment Losses, below) and therefore predation is not expected to be an important factor at drop-off sites. Reduced freshwater flows may result in lower turbidity and increased water clarity (see Factor A, above), which may contribute to increased risk of predation (Baxter et al. 2010, p. 64).

In Lake Washington, longfin are preyed upon by prickly sculpin (Cottus asper) (Tabor et al. 2007, p. 1085) and cutthroat trout (Oncorhynchus clarki) (Norwak et al. 2004, p. 632; Beauchamp et al. 1992, p. 156). Cutthroat trout have displaced the northern pikeminnow as the most important predator in Lake Washington and may be having an effect on other components of the ecosystem, including longfin smelt populations (Norwak et al. 2004, pp. 633-634).

Summary of Factor C

Similar to other threats, very little information is available about disease or predation threats to longfin smelt populations outside of the Bay-Delta. We found no information that disease is a threat to the longfin smelt throughout its range. Longfin smelt is a small fish that is preyed upon by a wide variety of fish, birds, and mammals, but we found no information documenting predation as a threat to the species rangewide. Predation, along with mortality from entrainment (see Factor E: Entrainment Losses, below), has been identified as a top-down effect that may be contributing to recent declines of longfin smelt and other pelagic fish species in the Bay-Delta estuary (Pelagic Organism Decline) (Sommer et al. 2007, p. 275). However, factors contributing to the Pelagic Organism Decline are numerous and complex, and the combination of underlying causal mechanisms remains uncertain (Baxter et al. 2010, pp. 61-69). Therefore, based on our review of the best available scientific and commercial information, we conclude that disease or predation are not significant current or future threats to the longfin smelt throughout its range.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

Federal Laws

A number of federal environmental laws and regulations exist that may provide some protection for longfin smelt: the National Environmental Policy Act, the Central Valley Project Improvement Act, and the Clean Water Act.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) requires all Federal agencies to formally document, consider, and publicly disclose the environmental impacts of major Federal actions and management decisions significantly affecting the human environment. NEPA documentation is provided in an environmental impact statement, an environmental assessment, or a categorical exclusion, and may be subject to administrative or judicial appeal. However, the Federal agency is not required to select an alternative having the least significant environmental impacts, and may select an action that will adversely affect sensitive species provided that these effects are known and identified in a NEPA document. Therefore, we do not consider the NEPA process in itself is to be a regulatory mechanism that is certain to provide significant protection for the longfin smelt.

Central Valley Project Improvement Act

The Central Valley Project Improvement Act (Pub. L. 102-575) (CVPIA) amends the previous Central Valley Project authorizations to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses, and fish and wildlife enhancement as having an equal priority with power generation (Pub. L. 102-575, October 30, 1992; Bureau of Reclamation 2009). Included in CVPIA section 3406 (b)(2) was a provision to dedicate 800,000 acre-feet of Central Valley Project yield annually (referred to as ``(b)(2) water'') for fish, wildlife, and habitat restoration. Since 1993, (b)(2) water has been used and supplemented with acquired environmental water (Environmental Water Account and CVPIA section 3406 (b)(3) water) to increase stream flows and reduce Central Valley Project export pumping in the Delta. These management actions were taken to contribute to the CVPIA salmonid population doubling goals and to protect Delta smelt and their habitat (Guinee 2011, pers. comm.). As discussed above, (see Biology and Factor A discussions), increased freshwater flows have been shown to be positively correlated with longfin smelt abundance; therefore, these management actions, although targeted towards other species, should also benefit longfin smelt.

Clean Water Act

Established in 1977, the Clean Water Act (33 U.S.C. 1251 et seq.) is the primary Federal law in the United States regulating water pollution. It employs a variety of regulatory and non-regulatory means to reduce direct water quality impacts and manage polluted runoff. The Clean Water Act provides the basis for the National Pollutant Discharge Elimination System (NPDES) and gives the Environmental Protection

Agency (EPA) the authority to set effluent limits and require any entity discharging pollutants to obtain a NPDES permit. The EPA is authorized through the Clean Water Act to delegate the authority to issue NPDES permits to State governments and has done so in California. In States that have been authorized to implement Clean Water Act programs, EPA retains oversight responsibilities. Water bodies that do not meet applicable water quality

standards are placed on the section 303(d) list of impaired water bodies, and the State is required to develop appropriate total maximum daily loads (TMDL) for the water body. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards. At present, TMDLs are not in place in all impaired watersheds in which longfin smelt are known to occur. The Clean Water Act has not effectively limited ammonia input into the system, and ammonia has been shown to negatively affect the longfin smelt's food supply.

State Laws

The State of California has a number of environmental laws and regulations which may provide some protection for longfin smelt: California Endangered Species Act, California Environmental Quality Act, California Marine Invasive Species Act, Porter-Cologne Water Quality Control Act, and regulatory prohibitions on streambed alterations.

California Endangered Species Act

Longfin smelt was listed as threatened under the California Endangered Species Act (CESA) (California Fish and Game Code 2050 et seq.) in 2009. The CESA prohibits unpermitted possession, purchase, sale, or take of listed species. However, the CESA definition of take does not include harm, which under the Act's implementing regulations includes significant modification or degradation of habitat that actually kills or injures wildlife by significantly impairing essential behavioral patterns (50 CFR 17.3). CESA allows take of species for otherwise lawful projects through use of an incidental take permit. An incidental take permit requires that impacts be minimized and fully mitigated (CESA sections 2081 (b) and (c)). Furthermore, CESA requires that the issuance of the permit will not jeopardize the continued existence of a State-listed species. The CESA does require consultation between CDFG and other State agencies to ensure that activities of State agencies will not jeopardize the continued existence of State-listed species (CERES 2009, p. 1). Longfin Smelt Incidental Take Permit No. 2081-2009-001-03 specifies that the Smelt Working Group, which was created under the Service's 2008 delta smelt biological opinion (Service 2008, p. 30), provide recommendations for export pumping reduction to CDFG if any of several criteria is reached. One of the criteria is that total salvage of adult longfin smelt (fish greater than or equal to 80 mm in length) at the State Water Project and Central Valley Project export pumps between December and February may not exceed five times the Fall Midwater Trawl longfin smelt annual abundance index. Also, if longfin abundance is low and surveys indicate that adults are distributed close to the export pumps, the Smelt Working Group may consider making recommendations for Old and Middle River Flows that would reduce pumping (CDFG 2009c, pp. 1-34; Smelt Working Group 2011, p. 4).

California Environmental Quality Act

The California Environmental Quality Act ((CEQA) (Public Resources Code section 21000 et seq.)) requires review of any project that is undertaken, funded, or permitted by the State of California or a local government agency. If significant effects are identified, the lead agency has the option of requiring mitigation through changes in the project or to decide that overriding considerations make mitigation infeasible (CEQA sec. 21002). In the latter case, projects may be approved that cause significant environmental damage, such as destruction of listed endangered species or their habitat. Protection of listed species through CEQA is, therefore, dependent on the discretion of the lead agency. The CEQA review process ensures that a full environmental review is undertaken prior to the permitting of any project within longfin smelt habitat.

California Marine Invasive Species Act

The California Marine Invasive Species Act (AB 433) was passed in 2003. This 2003 act requires ballast water management for all vessels that intend to discharge ballast water in California waters. All qualifying vessels coming from ports within the Pacific Coast region must conduct an exchange in waters at least 50 nautical mi offshore and 200 m (656 ft) deep or retain all ballast water and associated sediments. To determine the effectiveness of the management provisions of this 2003 act, the legislation also requires State agencies to conduct a series of biological surveys to monitor new introductions to coastal and estuarine waters. These measures should further minimize the introduction of new invasive species into California's coastal waters that could be a threat to the longfin smelt. The Coastal Ecosystems Protection Act of 2006 deleted a sunset provision of the Marine Invasive Species Act, making the program permanent.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Control Act (California Water Code 13000 et seq.) is a California State law that establishes the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards that are responsible for the regulation of activities and factors that could degrade California water quality and for the allocation of surface water rights (California Water Code Division 7). In 1995, the SWRCB developed the Bay-Delta Water Quality Control Plan that established water quality objectives for the Delta. This plan is currently implemented by Water Rights Decision 1641, which imposes flow and water quality standards on State and Federal water export facilities to assure protection of beneficial uses in the Delta (USFWS 2008, pp. 21-27). The various flow objectives and export restraints were designed, in part, to protect fisheries. These objectives include specific freshwater flow requirements throughout the year, specific water export restraints in the spring, and water export limits based on a percentage of estuary inflow throughout the year. The water quality objectives were designed to protect agricultural, municipal, industrial, and fishery uses; they vary throughout the year and by the wetness of the year.

In December 2010, the California Central Valley Regional Water Quality Control Board (Regional Board) adopted a new National Pollutant Discharge and Elimination System (NPDES) permit for the Sacramento Regional Wastewater Treatment Plant to address ammonia loading to the Sacramento River and the Delta. In January 2011, the Sacramento Regional County Sanitation District petitioned the Regional Board for a review of the permit, which may require a year or more. There is currently no TMDL in place for ammonia discharge into the Sacramento watershed. The EPA is currently updating freshwater ammonia criteria that will include new discharge limits on ammonia (EPA 2009, pp. 1-46). Ammonia has been shown to have negative effects on prey items that longfin smelt rely upon (see Factor E: Contaminants, below). This regulation does not adequately mitigate potential negative effects to longfin smelt from ammonia in the Bay-Delta.

Streambed Alteration

In California, section 1600 et seq. of the California Fish and Game Code authorizes CDFG to regulate streambed alteration. The CDFG must be notified of and approve any work that substantially diverts, alters, or obstructs the natural flow or that substantially changes the bed, channel, or banks of any river, stream, or lake. If an existing fish or wildlife resource, including longfin smelt, may be substantially adversely

affected by a project, the project proponent must submit proposals to protect the species to the CDFG at least 90 days before the start of the project. However, these proposals are subject to agreement by the project proponent. If CDFG deems proposed measures to be inadequate, a third party arbitration may be initiated. However, projects that cause significant environmental damage such as destruction of species and their habitat including longfin smelt may be approved because the CDFG has no authority to deny requests for streambed alteration.

Oregon Environmental Regulations

Oregon classifies longfin smelt as a native migratory fish under Oregon Administrative Rule (Division 412, 635-412-0005). Operators of artificial obstructions located in waters in which any native migratory fish are currently or were historically present must provide for fish passage requirements during installation, replacement, or abandonment of artificial obstructions (ODFW 2011, p. 1). This State law helps ensure passage of migratory longfin smelt between rearing and spawning habitat.

Washington Environmental Regulations

Washington's State Environmental Policy Act (RCW 43.21C) provides a process similar to CEQA and is applicable to every State and local agency in Washington State. This law requires State and local governments to consider impacts to the environment and include public participation in project planning and decision making (Washington Division of Wildlife 2011, p. 1). Project proponents must submit a proposal for their project to the appropriate city, county, or State lead agency where the project is taking place. The lead agency then makes a determination of whether or not the project will have significantly adverse environmental impacts. The lead agency then may require the applicant to change the proposal to minimize environmental impacts or in rare cases may deny the application (Washington State Department of Ecology (WSDE) 2002, pp. 1-2).

Alaska Environmental Regulations

The Anadromous Fish Act (AS 16.05.871-.901) requires that anyone desiring to alter a streambed or waterbody first obtain a permit from the Alaska Department of Fish and Game (ADFG). Regulated activities include construction, road crossings, gravel mining, water withdrawal, stream realignment, and bank stabilization. Although there are no minimization or mitigation components to this law, the ADFG commissioner has the ability to deny a permit if he or she finds the plans and specifications are insufficient for the proper protection of anadromous fish. The Fishway or Fish Passage Act (AS 15.05.841) requires that activities within or crossing a stream obtain permission from ADFG if they will impede the passage of resident or anadromous fish. This provides some degree of protection for longfin smelt, which is categorized as an anadromous fish in the State of Alaska.

Canadian Environmental Regulations

The Canadian Environmental Assessment Act (S.C. 1992, c. 37) was passed by the Canadian Parliament in 1992. The Act requires Federal departments to conduct environmental assessments for proposals where the government is the proposer or the project involves Federal funding or permitting. The Canadian Environmental Protection Act of 1999 is intended to prevent pollution, protect the environment and human health, and contribute to promoting sustainable development. Canada has the Canadian Environmental Protection Act (CEPA), which is equivalent to the United States' NEPA. It was enacted to protect Canada's natural resources through pollution prevention and sustainable development. This provides some level of protection for longfin smelt from pollution and habitat degradation. The longfin smelt is not currently a protected species under the Species at Risk Act (SARA) of 2002 (S.C. 2002 c. 29; SARA). SARA is similar to the United States' Endangered Species Act. If the longfin smelt were determined by the Canadian government to need protection in the future, it could be listed under SARA.

Summary of Factor D

We evaluate existing regulatory mechanisms that have an effect on threats that we have identified elsewhere in the threats analysis. We do not evaluate the lack of a regulatory mechanism that may address a particular threat if that regulatory mechanism does not exist. We find that the threats to the longfin smelt and its habitat on Federal, State, and private lands on a range-wide basis are minimal (Factors A, B, C and E). Existing federal regulatory mechanisms provide a degree of protection for longfin smelt from these threats. Therefore, we find that regulatory mechanisms provide adequate protections to longfin smelt and its habitat throughout its range.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Other natural or manmade factors potentially affecting the continued existence of longfin smelt include entrainment losses from water diversions, introduced species, and contaminants.

Entrainment Losses

The only information we found on entrainment losses of longfin smelt comes from the Bay-Delta population. Entrainment occurs when fish are drawn toward water diversions, where they are typically trapped or killed. In the Bay-Delta, water is diverted and fish potentially entrained at four major water export facilities within the Delta, two power plants, and numerous small water diversions throughout the Delta for agriculture and in Suisun Marsh for waterfowl habitat. In their 2009 status review of longfin smelt, CDFG (2009, pp. 19-26) summarized entrainment losses at these water diversions.

Water Export Facilities

The four State and Federal water export facilities (pumping stations) in the Delta are the State Water Project (SWP) facility in the south Delta, the Central Valley Project (CVP) in the south Delta, the Contra Costa facility in the south Delta, and the North Bay Aqueduct facility in the north Delta. The SWP and CVP facilities pump the majority of the water exported from the Delta. Average annual volumes of water exported from these facilities between 1995 and 2005 were 3.60 km\3\ at the SWP facility, 3.10 km\3\ at the CVP facility, 0.15 km\3\ at the Contra Costa facility, and 0.05 km\3\ at the North Bay Aqueduct facility (Sommer et al. 2007, p. 272). Depending on upstream flow through the Delta, operation of the SWP and CVP facilities often causes reverse flows in the river channels leading to them; longfin smelt that occupy these channels during certain times of the year may be entrained by these reverse flows. The SWP and CVP water export facilities are equipped with their own fish collection facilities that divert entrained fish into holding pens using louver-bypass systems to protect them from being killed in the pumps. The fish collected at the facilities are referred to as ``salvaged,'' and are loaded onto tanker trucks and returned to the western Delta downstream (Aasen 2009, p. 36). The movement of fish can result in mortality due to overcrowding in the tanks, stress, moving procedures, or predation at locations where the fish are released. Salvage is an index of

entrainment, not an estimate, and is much smaller than total entrainment (Castillo et al. in review). Of spawning age fish (age-1 and age-2), which contribute most to longfin smelt population dynamics in the Bay-Delta, the total number of longfin smelt salvaged at both pumps between 1993 and 2007 was 1,133 (CDFG 2009, Attachment 3, p. 2).

Fish entering the intake channel of the CVP or the radial gates of the 31,000-acre Clifton Court Forebay reservoir (SWP) are considered entrained (Fujimura 2009, p. 5; CDFG 2009b, p. 2). Most longfin smelt that become entrained in Clifton Court Forebay are unable to escape (CDFG 2009b, p. 4). The number of fish entrained at the SWP and CVP facilities has never been determined directly, but entrainment losses have been estimated indirectly using data from research and monitoring efforts. The magnitude of entrainment of larval longfin smelt is unknown because only fish greater than 20 mm in length are salvaged at the two facilities (Baxter et al. 2008, p. 21). In years with low freshwater flows, approximately half of the longfin smelt larvae and early juveniles may remain for weeks within the Sacramento-San Joaquin Delta (Dege and Brown 2004), where model simulations indicate they are vulnerable to entrainment into State Water Project, Central Valley Project, and other diversions (Kimmerer and Nobriga 2008, CDFG 2009a, p. 8).

Entrainment is no longer considered a major threat to longfin smelt in the Bay-Delta because of current regulations. Efforts to reduce delta smelt entrainment loss through the implementation of the 2008 delta smelt biological opinion and the listing of longfin smelt under the CESA have likely reduced longfin smelt entrainment losses. The high rate of entrainment that occurred in 2002 that threatened the Bay Delta longfin smelt population is unlikely to recur, and would no longer be allowed under today's regulations because limits on longfin smelt take due to CESA regulations (see Factor D discussion, below) would trigger reductions in the magnitude of reverse flows.

Power Plants

Two power plants located near the confluence of the Sacramento and San Joaquin Rivers, the Contra Costa Generating Station and the Pittsburg Generating Station, pose an entrainment risk to longfin smelt. Past entrainment losses of delta smelt at these two facilities were significant and considered a threat to delta smelt (75 FR 17671; April 7, 2010). Power plant operations have been substantially reduced since the late 1970s, when high entrainment and impingement were documented (CDFG 2009, p. 24); the power plants are now either kept offline or operating at very low levels, except as necessary to meet peak power needs. From 2007-2010, capacity utilization of these units averaged only 2.3 percent of maximum capacity. No longfin smelt were detected during impingement sampling conducted between May of 2010 and April of 2011 to monitor entrainment losses at the two power plants (Tenera Environmental 2011, entire). The company that owns the two power plants has committed to retiring one of the two power stations in 2013 (Contra Costa Generating Station) and has made this commitment enforceable through amendments to its Clean Air Act Title V permit (Raifsnider 2011, pers. comm.).

Agricultural Diversions

Water is diverted at numerous sites throughout the Bay-Delta for agricultural irrigation. Herren and Kawasaki (2001) reported over 2,200 such water diversions within the Delta, but CDFG (2009, p. 25) notes that number may be high because Herren and Kawasaki (2001) did not accurately distinguish intake siphons and pumps from discharge pipes.

CALFED's Ecosystem Restoration Program (ERP) includes a program to screen remaining unscreened small agricultural diversions in the Delta and the Sacramento and San Joaquin Rivers. The purpose of screening fish diversions is to prevent entrainment losses; however, very little information is available on the efficacy of screening these diversions (Moyle and Israel 2005, p. 20). Agricultural operations begin to divert water in March and April, and many longfin smelt have begun leaving the Delta by this time. Water diversions are primarily located on the edge of channels and along river banks. Longfin smelt are a pelagic fish species and tend to occupy the middle of the channel and the middle of the water column, where they are unlikely to be vulnerable to entrainment into these diversions.

Suisun Marsh Diversions

There are 366 diversions in Suisun Marsh used to enhance waterfowl habitat (USFWS 2008, p. 172). Water is pumped at these diversions between October and May. Longfin larvae are abundant in the Marsh from February through April, while adults are abundant from October to February (Meng and Mattern 2001, p. 756; Rosenfield and Baxter 2007, p. 1588). During a 2-year study sampling 2.3 million m\3\ (81.2 million ft\3\) of water entering intakes, entrainment was found to be low, capturing only 124 adult longfin and 160 larvae (Enos et al. 2007, p. 16). Restrictions on pumping have been put in place to protect delta smelt and salmon. These restrictions likely also benefit longfin smelt.

Introduced Species

Nonnative introduced species (both plants and animals) are common in many of the estuaries within the range of the longfin smelt. Introduced species can significantly alter food webs in aquatic ecosystems. Introduced animal species can adversely affect longfin smelt through predation (see Factor C discussion, above) or competition. Although introduced species are common within many of the estuaries occupied by longfin smelt, most of the information we found on effects of introduced species on longfin smelt was for the Bay-Delta population.

Bay-Delta Population

The Bay-Delta is considered one of the most highly invaded estuaries in the world (Sommer et al. 2007, p. 272). Longfin smelt abundance in the Bay-Delta has remained low since the mid-1980s (see Abundance section, above). This long-term decline has been at least partially attributed to effects of the introduced overbite clam (Kimmerer 2002a, p. 47; Sommer et al. 2007, p. 274; Rosenfield and Baxter 2007, p. 1589; Baxter et al. 2010, pp. 61-62). The overbite clam has impacted zooplankton abundance and species composition by grazing on the phytoplankton that comprise part of the zooplankton's food base (Orsi and Mecum 1996, pp. 384-386) and by grazing on larval stages of certain zooplankton like Eurytemora affinis (no common name) (Kimmerer 2002, p. 51; Sommer et al. 2007, pp. 274-276). Longfin smelt recruitment (replacement of individuals by the next generation) has steadily declined since 1987, even after adjusting for Delta freshwater flows (Nobriga 2010, slide 5). These data suggest that changes in the estuary's food web following introduction of the overbite clam may have had substantial and long-term impacts on longfin smelt population dynamics in the Bay-Delta.

Numerous other invasive plant and animal species have been introduced into the Bay-Delta, and ecosystem disruptions will undoubtedly continue as new species are introduced. Sommer et al. (2007, p. 272) note that the quagga mussel (Dreissna bugensis) was discovered in southern California in late 2006, and that it could become

established in the Bay-Delta and cause substantial ecosystem disruption.

Other Populations

The Eel River is undergoing a shift from native anadromous to resident introduced fish species. Of particular importance are the California roach (Hesperoleucus symmetricus) and the Sacramento pikeminnow (Ptychocheilus grandis) (Brown and Moyle 1997, p. 274). The Sacramento pikeminnow is known to cause shifts in spatial distribution of native species (Brown & Moyle 1991, p. 856). The Sacramento pikeminnow preys on native fishes, particularly emigrating juvenile salmonids (Moyle 2002, p. 156) and likely preys upon the longfin smelt when present.

In Humboldt Bay, one study recorded 73 nonnative species, with another 13 species of uncertain status (Boyd 2002, pp. 89-91). Many of the nonnative species, most of which are invertebrates, have been present in the Bay for over 100 years, although some introductions have also occurred more recently (Boyd 2002, pp. 89-91). It is possible that the presence of some of these introduced species have resulted in changes to the food web resulting in changes to longfin smelt food availability in Humboldt Bay, as has occurred in the Bay-Delta. However, there are no data with which to evaluate this hypothesis. Commercial oyster culturing in Humboldt Bay began in 1955 (Barrett 1963, p. 38). Oyster culture beds within the bay are located in areas that are favorable to eelgrass (Zostera marina), and the harvesting of oysters in these beds has resulted in a reduction of and damage to native eelgrass in Humboldt Bay (Trianni 1996, p. 4; Rummrill and Poulton 2004, p. 2). Longfin smelt are known to feed on fauna found on native eelgrass, and therefore loss of eelgrass communities could result in lower levels of longfin smelt prey, possibly resulting in decreased longfin smelt survival.

Over 100 species of nonnative, invasive aquatic plants and animals have been documented in the Yaquina Bay estuary in Oregon (Oregon State University 2011, p. 1). One of the plants that has become established is Zostera japonica, a seagrass that was introduced to Yaquina Bay as live packing material for Japanese oysters. It poses a competitive threat to the native eelgrass (Brown et al. 2007, p. 9), and longfin smelt are known to feed on fauna found on native eelgrass (Phillips 1984, pp. 1-85). Invasive fish species in Yaquina Bay include American shad (Alosa sapidissima), common carp (Cyprinus carpio), bass (Micropterus spp.), and walleye (Sander vitreum).

Numerous nonnative, invasive plant and animal species have established populations within the Columbia River estuary. Nonnative, invasive plants and fish are the largest taxa to inhabit the estuary, followed by mollusks and crustaceans (Sanderson et al. 2009, pp. 245-256). American shad was introduced in the Columbia River soon after 1871 (Petersen et al. 2011, pp. 1-42). The spawning adult shad population in the Columbia River is more than 5,000,000 individuals, the largest anywhere (Petersen et al. 2011, pp. 1-42). Shad may have large, negative effects on Columbia River ecosystems, as adult and juvenile shad prey on zooplankton, thereby reducing the availability of prey for other fish species (Sanderson et al. 2009, pp. 245-256). Also present in the lower Columbia River are channel catfish (Ictalurus punctatus), striped bass, smallmouth bass (Microperterus dolomieui), largemouth bass (Micropterus salmoides), and walleye (Sander vitreus). These nonnative fishes are aggressive predators and have likely substantially altered food webs in the Columbia River estuary (Sanderson et al. 2009, pp. 245-256). The Eurasian water milfoil (Myriophyllum spicatum) may have been introduced into the lower Columbia River by ballast water from European ships in the 1800s (Aiken et al. 1979, pp. 201-215). It forms dense mats of vegetation and results in reduced dissolved oxygen concentrations as the plants decompose, altering aquatic ecosystem chemistry and function (Cronin et al. 2006, pp. 37-43; Unmuth et al. 2000, pp. 497-503), which could potentially restrict longfin smelt distribution in the region.

Hundreds of invasive plants and animals have found their way into Puget Sound through importation of soils, plants, fruits, and seeds; through boat hulls and ship ballast water discharge; and through intentional human releases. Invasive tunicate species that reproduce quickly and cover docks and boat hulls are also present in the sound (Puget Sound Partnership 2008b, p. 26).

Contaminants

Bay-Delta

Similar to other potential threats to longfin smelt, most of the information available is for the Bay-Delta. In 2009, over 15 million pounds of pesticides were applied within the five-county Bay-Delta area (California Department of Pesticide Regulation 2011, p. 1). Toxicity to invertebrates has been noted in water and sediments from the Delta and associated watersheds (e.g., Werner et al. 2000, pp. 218, 223). Fish exposed to agricultural drainage water from the San Joaquin River watershed can exhibit body burdens of selenium exceeding the level at which reproductive failure and increased juvenile mortality occur (Saiki et al. 2001, p. 629). Toxicity studies specific to longfin smelt are not available, but data do exist for other fish species such as the delta smelt, a related species. Longfin smelt could be similarly affected by contaminants as some life stages utilize similar habitat and prey resources, and longfin smelt have a physiology similar to delta smelt. Kuivila and Moon (2004, p. 239) found that peak densities of larval and juvenile delta smelt sometimes coincided in time and space with elevated concentrations of dissolved pesticides in the spring. These periods of co-occurrence lasted for up to 2 to 3 weeks. Concentrations of individual pesticides were low and much less than would be expected to cause acute mortality; however, the effects of exposure to the complex mixtures of pesticides are unknown.

Bay-Delta waters are listed as impaired for several legacy and currently used pesticides under the Clean Water Act section 303(d) (California Department of Pesticide Regulation 2011, p. 1). Concentrations of dissolved pesticides vary in the Delta both temporally and spatially (Kuivila 2000, p. 1). Several areas of the Delta, particularly the San Joaquin River and its tributaries, are impaired due to elevated levels of diazinon and chlorpyrifos, which are toxic at low concentrations to some aquatic organisms (MacCoy et al. 1995, pp. 21-30). Several studies have demonstrated the acute and chronic toxicity of two common dormant-spray insecticides, diazinon and esfenvalerate, in fish species (Barry et al. 1995, p. 273; Goodman et al. 1979, p. 479; Holdway et al.; 1994, p. 169; Scholz et al. 2000, p. 1911; Tanner and Knuth 1996, p. 244).

Pyrethroid pesticides are of particular concern because of their widespread use, and their tendency to be genotoxic (DNA damaging) to fishes at low doses (in the range of micrograms per liter) (Campana et al. 1999, p. 159). The pyrethroid esfenvalerate is associated with delayed spawning and reduced larval survival of bluegill sunfish (Lepomis macrochirus) (Tanner and Knuth 1996, pp. 246-250) and increased susceptibility of juvenile Chinook salmon (Oncorhynchus tshawytscha) to disease (Clifford et al. 2005, pp. 1770-1771). In addition, synthetic pyrethroids may interfere with nerve cell function, which could eventually result in paralysis (Bradbury and Coats 1989, pp.

377-378; Shafer and Meyer 2004, pp. 304-305).

Weston and Lydy (2010, p. 1835) found the largest source of pyrethroids flowing into the Delta to be coming from the Sacramento Regional Water Treatment Plant (SRWTP), where only secondary treatment occurs. Their data not only indicate the presence of these contaminants, but the concentrations found exceeded acute toxicity thresholds for the amphipod Hyalella azteca. This is of substantial concern because the use of insecticides in the urban environment had not before been considered the primary source of insecticides flowing into the Delta. Furthermore, this was not the case for the Stockton Waste Water Treatment facility, where tertiary treatment occurs, suggesting that the tertiary treatment that occurs at the Stockton facility could minimize or eliminate toxic effluent being dispersed from wastewater facilities (Baxter et.al. 2010, p. 33).

Several studies were initiated in 2005 to address the possible role of contaminants and disease in the declines of Bay-Delta fish and other aquatic species. The primary study consists of twice-monthly monitoring of ambient water toxicity at 15 sites in the Bay-Delta and Suisun Bay (Baxter et al. 2010, pp. 16, 17, 30). Significant mortality of amphipods was observed in 5.6 percent of samples collected in 2006-2007 and 0.5 percent of samples collected in 2008-2009. Werner et al. (2010b, p. 3) found that larval delta smelt were between 1.8 and 11 times more sensitive than fathead minnows (Pimephales promelas) to copper, ammonia, and all insecticides except permethrin. Aquatic insects in which the longfin smelt relies upon for food have been shown to be sensitive to ammonia. H. azteca was the most sensitive to all pyrethroids tested, while E. affinis and C. Dubia were the most sensitive to ammonia (Werner et al. 2010b, pp. 18, 23). Pyrethroids are of particular interest because use of these insecticides has increased within the Bay-Delta watershed as use of organophosphate insecticides has declined. Longfin smelt are probably most vulnerable to the effects of toxic substances during the winter and spring, when their early life stages occur in the Delta and Suisun and San Pablo Bays, where they are closer to point and non-point inputs of contaminants from runoff.

The largest source of ammonia entering the Delta ecosystem is the Sacramento Regional Wastewater Treatment Plant (SRWTP), which accounts for 90 percent of the total ammonia load released into the Delta. Ammonia is un-ionized and has the chemical formula NH_3. Ammonium is ionized and has the formula NH_4^+. The major factors determining the proportion of ammonia or ammonium in water are water pH and temperature. This is important, as NH_3 ammonia is the form that can be directly toxic to aquatic organisms, and NH_4^+ ammonium is the form documented to interfere with uptake of nitrates by phytoplankton (Dugdale et al. 2007, p. 17; Jassby 2008, p. 3).

Effects of elevated ammonia levels on fish range from irritation of skin, gills, and eyes to reduced swimming ability and mortality (Wicks et al. 2002, p. 67). Delta smelt have been shown to be directly sensitive to ammonia at the larval and juvenile stages (Werner et al. 2008, pp. 85-88). Longfin smelt could similarly be affected by ammonia as they utilize similar habitat and prey resources and have a physiology similar to delta smelt. Ammonia also can be toxic to several species of copepods important to larval and juvenile fishes (Werner et al. 2010, pp. 78-79; Teh et al. 2011, pp. 25-27).

In addition to direct effects on fish, ammonia in the form of ammonium has been shown to alter the food web by adversely impacting phytoplankton and zooplankton dynamics in the estuary ecosystem. Historical data show that decreases in Suisun Bay phytoplankton biomass coincide with increased ammonia discharge by the SRWTP (Parker et al. 2004, p. 7; Dugdale et al. 2011, p. 1). Phytoplankton preferentially take up ammonium over nitrate when it is present in the water. Ammonium is insufficient to provide for growth in phytoplankton, and uptake of ammonium to the exclusion of nitrate results in decreases in phytoplankton biomass (Dugdale et al. 2007, p. 23). Therefore, ammonium impairs primary productivity by reducing nitrate uptake in phytoplankton. Ammonium's negative effect on the food web has been documented in the longfin smelt rearing areas of San Francisco Bay and Suisun Bay (Dugdale et al. 2007, pp. 26-28). Decreased primary productivity results in less food available to longfin smelt and other fish in these bays.

Several streams that flow into the Bay-Delta are listed as impaired because of high concentrations of metals such as cadmium, copper, lead, and zinc. Metal concentrations have been found to be toxic to fish in the upper Sacramento River near and downstream from Redding (Alpers et al. 2000a, p. 4; 2000b, p. 5). Elevated levels of metals such as copper in streambed sediment continue to occur in the upper Sacramento River Basin downstream from Redding (MacCoy and Domagalski 1999, p. 35). Copper and other metals may affect aquatic organisms in upper portions of contributing watersheds of the Delta. Mercury and its bioavailable form (methylmercury) are distributed throughout the estuary, although unevenly. Mercury has been known to bioaccumulate and cause neurological effects in some fish species, but it has not been associated with the Pelagic Organism Decline (Baxter et al. 2010, p. 28). No specific information is available on the effects of mercury exposures to longfin smelt. Selenium, introduced into the estuary primarily from agricultural irrigation runoff via the San Joaquin River drainage and oil refineries, has been implicated in toxic and reproductive effects in fish and wildlife (Baxter 2010 et al., p. 28; Linville et al. 2002, p. 52). Selenium exposure has been shown to have effects on some benthic foraging species; however there is no evidence that selenium exposure is contributing to the decline of longfin smelt or other pelagic species in the Bay-Delta (Baxter et al. 2010, p. 28).

Large blooms of toxic Microcystis aeruginosa (blue-green algae) were first documented in the Bay-Delta during the summer of 1999 (Lehman et al. 2005, p. 87). M. aeruginosa forms large colonies throughout most of the Delta and increasingly down into eastern Suisun Bay (Lehman et al. 2005, p. 92). Blooms typically occur when water temperatures are above 20 [deg]C (68[emsp14][deg]F) (Lehman et al. 2005, p. 87). Preliminary evidence indicates that the toxins produced by local blooms are not directly toxic to fishes at current concentrations (Baxter et al. 2010, p. 10). However, the copepods that the related delta smelt eat are particularly susceptible to those toxins (Ger 2008, pp. 12, 13). Microcystis blooms may also decrease dissolved oxygen to lethal levels for fish (Lehman et al. 2005, p. 97). Blooms typically occur between late spring and early fall when the majority of longfin smelt occur farther downstream, so effects are expected to be minimal.

Other Populations

As in the Bay-Delta, pesticide and metals contamination occurs in Yaquina Bay, the Columbia River, and the Fraser River (Johnson et al. 2007, p. 1; Lower Columbia River Estuary Partnership (LCREP) 2011, p. 1; Blomquist, 2005, p. 8). Ammonia contamination occurs in the Klamath River (Oregon Department of Environmental Quality (ODEQ) 2011, p. 1) and Cook Inlet (ADEC 2011a, p. 1), and toxic algal blooms occur in the Klamath River (California State Water

Resources Control Board (CSWRCB) 2010, p. 1) and Yaquina Bay (ODEQ Water Quality Assessment Online Database 2011).

Industrial contaminants such as dioxins, polychlorinated biphenyls (PCBs), and polyaromatic hydrocarbons (PAHs) occur in Humboldt Bay (NCRWQCB 2010 pp. 3-4), Yaquina Bay (Johnson et al. 2007, p. 1), the Columbia River (LCREP 2011, p. 1), Puget Sound (Puget Sound Partnership 2008b, p. 21), and the Fraser River (British Columbia Ministry of Environment 2001, pp. 5-6; Blomquist, 2005, p. 8). Suspended sediment is a contaminant in the Eel River (Downie 2010, p. 10), Humboldt Bay (NCRWQCB 2010 pp. 3-4), Yaquina Bay (ODEQ Water Quality Assessment Online Database 2011), and Puget Sound (WA Department Ecology 2008, p. 1). Nutrient enrichment and low levels of dissolved oxygen occur in the Klamath River (CSWRCB 2010, p.1), Yaquina Bay (Bricker et al. 1999, pp. 1-71), and Fraser River (British Columbia Ministry of Environment 2001, pp. 5-6). Fecal coliform and other forms of bacteria contaminate

Yaquina Bay, Puget Sound, the Fraser River, and Cook Inlet (Brown et al 2007, pp. 16-17, WA Department Ecology 2008, p. 1, Blomquist, 2005, p. 8, ADEC 2011a, p. 1).

Oregon and Washington States have listed multiple reaches of the Lower Columbia River on their Federal Clean Water Act 303(d) lists, due to total dissolved gas levels exceeding State water quality standards. This occurs at several dams on these rivers where water flowing over the spillway of a dam creates air bubbles. When these are carried to depth in the dam's stilling basin, the higher hydrostatic pressure forces air from the bubbles into solution. The result is water supersaturated with dissolved nitrogen, oxygen, and the other constituents of air (ODEQ 2002, p. ix). High total dissolved gas levels can cause gas bubble trauma in fish, which can result in injury or mortality to fish species (ODEQ 2002, pp. 1-150).

Summary of Contaminants

Most fish including longfin smelt can be sensitive to adverse effects from contaminants in their larval or juvenile stages. Adverse effects to longfin smelt would be more likely to occur where sources of contaminants occur in close proximity to spawning and rearing habitats (brackish or fresh waters). Laboratory studies have shown certain contaminants to potentially have adverse effects on individual delta smelt, a related species. Field studies have shown that the contaminants of concern are elevated in some of the estuaries throughout the species' range, including the Bay-Delta.

Summary of Factor E

We evaluated whether entrainment losses, introduced species, and contaminants threaten the longfin smelt throughout its range. Longfin smelt is broadly distributed across a wide variety of estuaries from central California to Alaska, and there is no monitoring data documenting a population decline other than the population decline in the Bay-Delta.

Because the Bay-Delta system is one of the largest man made water systems in the world, it would be impractical to compare diversions and alterations in other estuaries to diversions and alterations in the Bay-Delta. The effects of entrainment in the Bay-Delta are unique to the estuary because of the large water diversions. Because diversions in other estuaries are much smaller, we expect that the effects from these diversions would be minimal in relation to the effects in the Bay-Delta. We have no information to show that entrainment is a threat to longfin smelt throughout its range.

Introduced species and contaminants are threats to the Bay-Delta long smelt population, but there is no information indicating that they are threats to the species in other parts of its range. Although invasive species are present in other estuaries, none have been documented to be having an effect on the longfin smelt food supply like the overbite clam has had. Similarly, although contaminants are present in other estuaries where the longfin smelt resides, none have been shown to have effects on the longfin smelt food supply like ammonia in the Bay-Delta has been shown to have.

Finding

As required by the Act, we considered the five factors in assessing whether the longfin smelt is endangered or threatened throughout all of its range. We have carefully examined the best scientific and commercial information available regarding the past, present, and future threats faced by the longfin smelt. We reviewed the petition, information available in our files, other available published and unpublished information, and we consulted with recognized longfin experts and other Federal and State agencies.

Little information is available on longfin smelt populations other than the Bay-Delta and Lake Washington populations. Smelt caught along the Pacific Coast are rarely identified to species. Therefore, information on longfin smelt distribution and abundance outside the Bay-Delta is limited. Although monitoring data indicate a significant decline in the abundance of longfin smelt in the Bay-Delta, population monitoring for other populations is not available. Estuaries are complex ecosystems, and different estuaries within the longfin smelt's range vary greatly in their environmental characteristics and in how they are managed. For example, in no estuary within the range of the longfin smelt, other than the Bay-Delta, are large volumes (up to 35 percent of freshwater inflow between February and June, and up to 65 percent of inflow between July and January) of freshwater pumped directly out of the estuary.

Under Factor A, channel disturbances may have localized impacts to longfin smelt habitat suitability. However, we conclude that these activities are not significant threats to longfin smelt throughout its range. Climate change will likely affect longfin smelt in multiple ways, but longfin smelt are able to move between a wide range of aquatic environments that vary greatly in water temperature and salinity, and these behavioral and physiological characteristics of the species may help it adapt to the effects of climate change. We conclude that the best available information does not indicate that climate change threatens the continued existence of longfin smelt across its range. We conclude that reduced freshwater flows are a threat to the Bay-Delta longfin smelt population, but not to the species in the rest of its range. The Bay-Delta is unique among estuaries occupied by longfin smelt because large volumes of freshwater are exported away from the estuary on an annual basis. In addition, it is difficult to extrapolate from the Bay-Delta to other estuaries because the effects of water management in the Bay-Delta are likely unique to the physical, geologic, and hydrologic environment of that estuary. We conclude that the best scientific information available indicates that continued existence of the longfin smelt is not threatened in any part of its range outside of the Bay-Delta by the present or threatened destruction, modification, or curtailment of its habitat or range now or in the foreseeable future

Under Factor B, we evaluated potential threats from recreational and commercial fishing and from monitoring surveys on longfin smelt. Longfin smelt are protected from intentional take in California because the species is listed as threatened under CESA. Efforts have been made to reduce mortality of longfin smelt as bycatch in a bay shrimp trawl commercial fishery and in monitoring surveys in the Bay-Delta. Longfin smelt is caught as part of recreational or commercial fisheries in Oregon, Washington, British Columbia, and Alaska, but numbers of fish caught are considered low, and we found no evidence that fisheries harvest was causing population declines of longfin smelt. We conclude that overutilization is not a significant current or future threat to longfin smelt across its range.

Under Factor C, we evaluated potential threats from disease and predation. We found no evidence of rangewide threats to the continued existence of the species due to disease or predation, now or in the foreseeable future.

Under Factor D, we conclude that several Federal and State laws and regulations provide varying levels of protection for the longfin smelt throughout its range. Several of these regulatory mechanisms promote protection of longfin smelt habitat and provide tools to implement these habitat protections. We conclude that longfin smelt is not threatened throughout its range by inadequate regulatory mechanisms, now or in the foreseeable future.

Under Factor E, we evaluated potential threats due to entrainment losses from water diversions, introduced species, and contaminants. Information indicates that introduced species are a threat to the Bay-Delta longfin smelt population and that ammonium may constitute a threat to the Bay-Delta longfin smelt population, but information does not indicate that entrainment losses, introduced species, or contaminants are threatening longfin smelt populations in other parts of its range, now or in the foreseeable future.

Based upon our review of the best available scientific and commercial information pertaining to the five factors, we find that the threats are not of sufficient imminence, intensity, or magnitude to indicate that the longfin smelt is in danger of extinction (endangered), or likely to become endangered within the foreseeable future (threatened), throughout all of its range. Therefore, we find that listing the longfin smelt as an endangered or threatened species throughout all of its range is not warranted at this time.

Distinct Vertebrate Population Segment

Having found that the best available information does not indicate that the longfin smelt warrants listing rangewide, we now assess whether any distinct population segments of longfin smelt meet the definition of endangered or are likely to become endangered in the foreseeable future (threatened). Under the Services' (joint policy of the Fish and Wildlife Service and National Marine Fisheries Service) DPS policy (61 FR 4722; February 7, 1996), three elements are considered in the decision concerning the establishment and classification of a possible DPS. These are applied similarly for additions to or removal from the Federal List of Endangered and Threatened Wildlife. These elements include: (1) The discreteness of a population in relation to the remainder of the species to which it belongs; (2) the significance of the population segment to the species to which it belongs; and (3) the population segment's conservation status in relation to the Act's standards for listing, delisting, or reclassification (i.e., is the population segment endangered or threatened). We have identified one population that potentially meets all three elements of the 1996 DPS policy--the population that occurs in the Bay-Delta estuary. During the rangewide five-factor analysis, significant threats were identified only for the Bay-Delta population. Therefore, we determined that only the Bay-Delta population potentially meets the third element of the DPS.

Discreteness

Under the DPS policy, a population segment of a vertebrate taxon may be considered discrete if it satisfies either one of the following conditions:

(1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation.

(2) It is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the Act.

Marked Separation From Other Populations as a Consequence of Physical, Physiological, Ecological, or Behavioral Factors

The limited swimming capabilities of the longfin smelt, existing ocean current patterns, and the great distances between the Bay-Delta and other known breeding populations make it unlikely that regular interchange occurs between the Bay-Delta and other longfin smelt breeding populations. Longfin smelt is a relatively short-lived species that completes its 2- to 3-year life cycle moving between freshwater spawning habitat in the Delta and brackish water rearing habitat downstream (seaward) in the estuary within Suisun Bay, San Pablo Bay, and central San Francisco Bay. At least a portion of the population also migrates into the near-coastal waters of the Gulf of Farallones (Rosenfield and Baxter 2007, p. 1590). Although its swimming capabilities have not been studied, it is a small fish believed to have a limited swimming capacity (Moyle 2010, pp. 5-6). How longfin smelt return to the Bay-Delta from the Gulf of Farallones is not known (Rosenfield and Baxter 2007, p.1590).

The Bay-Delta population is the southernmost population of longfin smelt and is separated from other longfin smelt breeding populations by 56 km (35 mi). The nearest location to the Bay-Delta where longfin smelt have been caught is the Russian River, located north of the Bay-Delta; however, little information is available for this population (see Distribution section, above). Due to limited freshwater flow into the estuary and interannual variation in freshwater flow, it is unlikely that the estuary provides sufficient potential spawning and rearing habitat to support a regularly breeding longfin smelt population (Moyle 2010, p. 4).

The Eel River and Humboldt Bay are the next nearest locations where longfin smelt are known to occur, and they are located much farther to the north--Eel River is located 394 km (245 mi) north of the Bay-Delta, and Humboldt Bay is located 420 km (260 mi) north of the Bay-Delta. Moyle (2010, p. 4) considered Humboldt Bay to be the only other estuary in California potentially capable of supporting longfin smelt in most years.

In our April 9, 2009, longfin smelt 12-month finding (74 FR 16169), we concluded that the Bay-Delta population was not markedly separated from other populations and, therefore, did not meet the discreteness element of the 1996 DPS policy. This conclusion was based in part on the assumption that ocean currents likely facilitated dispersal of anadromous longfin smelt to and from the Bay-Delta to other estuaries in numbers that could readily sustain the Bay-Delta population group if it was to be extirpated. Since 2009, we have obtained information relevant to assumptions that we made in the 2009 12-month finding. Additional clarifying information comes in part from a declaration submitted to the U.S. District Court for the Northern District of California on June 29, 2010, by Dr. Peter Moyle, Professor of Fisheries Biology at the University of California at Davis (Moyle 2010, pp. 1-8). Moyle (2010, pp. 5-6) notes that he believes that we overestimated the swimming

capacity of longfin smelt in our 2009 12-month finding. Moyle (2010, p. 8) states that longfin smelt that migrate out of and back into the Bay-Delta estuary may primarily be feeding on the rich planktonic food supply in the Gulf of Farallones, and that this migration between the Bay-Delta and near coastal waters of the Gulf of Farallones does not indicate that longfin smelt are necessarily dispersing long distances to other estuaries to the north.

At the time of our last finding, we did not have information available assessing the ability of longfin smelt to disperse northward from the Bay-Delta or southward to the Bay-Delta using currents in the Pacific Ocean. Since the time of our previous finding (74 FR 16169; April 9, 2009), we have reviewed additional information on ocean currents in nearshore waters and over the continental shelf from approximately the Gulf of Farallones north to Coos Bay. We have evaluated the potential for longfin smelt to disperse northward from the Bay-Delta or southward to the Bay-Delta. On October 28, 2011, we convened a panel of experts to evaluate the potential of longfin smelt dispersal via ocean currents. Oceanographers on the panel were tasked with answering a series of questions on how ocean currents would affect longfin smelt potentially dispersing into or out of the Bay-Delta. Much of the following analysis was derived from that panel discussion. Our analysis relies upon ocean current information as it relates to what is known of longfin smelt biology and life history from the Bay-Delta population.

Table 2 overlays longfin smelt life history with general ocean current patterns in central and northern California. However, the California Current System exhibits a high degree of seasonality as well as weekly variability. Currents are highly variable in fall and winter but tend to be predominately northward. Surface currents are northward during the storm season from December to March and transition to southward in March or April. Offshore of central California the surface currents remain generally southward during summer. However, despite the predominant southward surface current, northward currents are common at depths around 60 to 200 m along the continental slope at all times of the year. This deeper current is known as the California Undercurrent (Paduan 2011, pers. comm.)

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Eddies (clockwise water circulation areas) exist at various points between the Bay-Delta and Humboldt Bay at landmarks such as Point Arena and Cape Mendocino. These eddies vary in their distance from shore between 10 to 100 km (6 to 62 mi) (Padaun 2011, pers. comm.). During the summer upwelling season, northerly winds drive a southward offshore flow of near-surface waters (Dever et al. 2006, p. 2109) and also set up a strong current over the continental shelf that is deflected offshore at capes such as Cape Mendocino, Point Arena, and Point Reyes (Magnell et al. 1990, p. 7; Largier 2004, p. 107; Halle and Largier 2011, pp. 1-24). Several studies have used drifters (flotation devices tracked by satellites) and pseudo-drifters (computer-simulated satellite-tracked flotation devices) to evaluate currents in the California region of the Pacific Ocean. These studies indicate that the

circulation patterns located off Point Arena and Cape Mendocino limit dispersal (particularly southward) of flotation devices in the region (Sotka et al. 2004, p. 2150; Drake et al. 2011, pp. 1-51; Halle and Largier 2011, posters). This limitation is important because Cape Mendocino and Point Arena are between the Bay-Delta and the nearest likely self-sustaining population of longfin smelt in Humboldt Bay.

Longfin smelt are an euryhaline species, of which an unknown fraction of the population exhibits anadromy (Moyle 2002, p. 236; Rosenfield and Baxter 2007 p. 1578). Based on their small size and limited swimming ability, we expect that longfin smelt would be largely dependent on ocean currents to travel the large distance between the Bay-Delta and the Humboldt Bay. During wet years, newly spawned longfin smelt larvae may be flushed out to the ocean between December and March. It is unlikely that longfin smelt larvae can survive ocean transport because larvae are not known to tolerate salinities greater than 8 ppt (Baxter 2011b, pers. comm.), and surface salinities less than 8 ppt do not exist consistently in the ocean (Bograd and Paduan 2011, pers. comm.).

A portion of the longfin smelt that spawn in the Bay-Delta make their way to the ocean once they are able to tolerate full marine salinities, sometime during the late spring or summer of their first year of life (age-0) (City of San Francisco and CH2MHill 1984 and 1985, entire), and may remain there for 18 months or longer before returning to the Bay-Delta to spawn (Baxter 2011c, pers. comm.). A larger portion of longfin smelt enter the coastal ocean during their second year of life (age-1) (City of San Francisco and CH2MHill 1984 and 1985, entire) and remain there for 3 to 7 months until they re-enter the Bay-Delta to spawn in early winter (Rosenfield and Baxter 2007, p 1590; Baxter 2011c, pers. comm.). Most of these age-1 longfin smelt move to coastal waters in July and August, possibly to escape warm water temperatures or to obtain food (Moyle 2010, p. 8; Rosenfield and Baxter 2007, p. 1290). Some longfin smelt may live to 3 years of age and may remain in the coastal ocean until they are 3 years old. However, no 3-year old longfin smelt have been observed in the coastal ocean (Baxter 2011d, pers. comm.; Service 2011, unpublished data).

It is possible that some of these juvenile or adult longfin smelt could make their way into the Russian River, Eel River, or Humboldt Bay and supplement or sustain those populations by utilizing northward ocean currents (Padaun 2011, pers. comm.; Service 2011b, pp. 1-4), but there is no documentation of such long-distance coastal movements. The northward ocean currents are strongest and most reliable in winter, when satellite-tracked particles move between the Bay-Delta and Humboldt Bay in as little as 2 months (Service 2011, p. 3).

Opportunities for longfin smelt dispersal utilizing ocean currents from northern estuaries to the Bay-Delta are more limited. Studies have revealed that currents near Cape Mendocino and Point arena would carry small objects to the west away from the coast (Padaun 2011b, pers. comm.; Bograd 2011, pers. comm.). It is possible that longfin smelt in nearshore waters could travel south past these eddies if they stay close enough to shore. It is even possible that some longfin smelt may be moved closer to shore by the eddies (Bograd 2011, pers. comm.; Paduan 2011, pers. comm.). However, any longfin smelt that do travel south past the Cape Mendocino and Point Arena escarpments would be unlikely to re-enter the Bay-Delta. These offshore ocean currents could displace any longfin smelt potentially moving south more than 100 km (62 mi) offshore of the Bay-Delta (Paduan 2011a, pers. comm.). Pathways that transport objects close to shore would be expected to be rare, if they exist at all (Padaun 2011b, pers. comm.; Bograd 2011, pers. comm.). So while we considered whether ocean currents may transport or facilitate movement of longfin smelt from northern estuaries to the Bay-Delta estuary, there is no information showing that such dispersal movement occurs.

Using the best scientific data available, we compared longfin smelt biology and life history with the latest available ocean current data provided by oceanographers. We conclude that longfin smelt in the Bay-Delta population do not regularly breed or interact with longfin smelt in other breeding populations to the north and are therefore markedly separated from other longfin smelt populations.

Under the 1996 DPS policy, the discreteness standard does not require absolute separation of a DPS from other members of its species, nor does the standard require absolute reproductive isolation (61 FR 4722). Because of the great distances between the Bay-Delta and known breeding populations to the north, the small size of the longfin smelt, and the low likelihood that ocean currents could facilitate longfin smelt movements between widely separated populations, we conclude that the Bay-Delta population is markedly separated from other longfin smelt populations and therefore discreet.

Quantitative Measures of Genetic or Morphological Discontinuity

The 1996 DPS policy states that quantitative measures of genetic or morphological discontinuity may provide evidence of marked separation and discreteness. Stanley et al. (1995, p. 395) compared allozyme variation between longfin smelt from the Bay-Delta population and the Lake Washington population using electrophoresis. They found that individuals from the populations differed significantly in allele (portions of a chromosome that code for the same trait) frequencies at several loci (gene locations). However, the authors also stated that the overall genetic dissimilarity was within the range of other conspecific (of the same species) fish species, and concluded that longfin smelt from Lake Washington and the Bay-Delta are conspecific, despite the large geographic separation (Stanley et al. 1995, p. 395). This study provided evidence that the Bay-Delta population of longfin smelt differed in genetic characteristics from the Lake Washington population, but did not compare other populations rangewide to the Bay-Delta population. More recently, Israel et al. (2011, pp. 1-10) presented preliminary results from an ongoing study, but these results were inconclusive in providing evidence of whether the Bay-Delta population is markedly separated from other longfin smelt populations (Cope 2011, pers. comm.; Service 2011a, pp. 1-3).

We conclude that the limited quantitative genetic and morphological information available does not provide additional evidence of marked separation of the Bay-Delta longfin smelt population beyond the evidence presented above under Marked Separation from Other Populations as a Consequence of Physical, Physiological, Ecological, or Behavioral Factors.

Delimited by International Governmental Boundaries Within Which Differences in Control of Exploitation, Management of Habitat, Conservation Status, or Regulatory Mechanisms Exist That Are Significant in Light of Section 4(a)(1)(D) of the Act

The Bay-Delta population of longfin smelt is not delimited by an international boundary. Therefore, we conclude that it does not meet the international governmental boundaries criterion for discreteness.

Conclusion for Discreteness

Because of its limited swimming capabilities and because of the great distances between the Bay-Delta and known breeding populations to the north, we conclude that the Bay-Delta population is markedly separated from other longfin smelt populations, and thus meets the discreteness element of the 1996 DPS policy. The best available information indicates that longfin smelt from the Bay-Delta population complete their life cycle moving between freshwater, brackish water, and saltwater portions of the estuary and nearby coastal ocean waters in the Gulf of Farallones. The nearest known breeding population of longfin smelt is Humboldt Bay, 420 km (260 mi) north of the Bay-Delta. As a result, potential interchange between the Bay-Delta population and other longfin smelt breeding populations is limited. Although the best scientific information suggests that potential movement of longfin smelt northward from the Bay-Delta would be facilitated by ocean currents, potential movement from more northern estuaries south to the Bay-Delta would be more difficult and unlikely because of ocean currents. Based on our review of the best available scientific and commercial information available, we conclude that the Bay-Delta population of longfin smelt is markedly separated from other longfin smelt populations as a consequence of physical, physiological, ecological, or behavioral factors.

Significance

Since we have found that the Bay-Delta longfin smelt population meets the discreteness element of the 1996 DPS policy, we now consider its biological and ecological significance in light of Congressional guidance that the authority to list DPSes be used ``sparingly'' while encouraging the conservation of genetic diversity. In making this determination, we consider available scientific evidence of the discrete population segment's importance to the taxon to which it belongs. As precise circumstances are likely to vary considerably from case to case, the DPS policy does not describe all the classes of information that might be used in determining the biological and ecological importance of a discrete population. However, the DPS policy describes four possible classes of information that provide evidence of a population segment's biological and ecological importance to the taxon to which it belongs. As specified in the DPS policy, this consideration of the population segment's significance may include, but is not limited to, the following:

(1) Persistence of the discrete population segment in an ecological setting unusual or unique to the taxon;

(2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon;

(3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or

(4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

A population segment needs to satisfy only one of these conditions to be considered significant. Furthermore, other information may be used as appropriate to provide evidence for significance.

(1) Persistence of the discrete population segment in an ecological setting unusual or unique to the taxon.

The Bay-Delta population is the southernmost breeding population in the range of the species. Populations at the edge of a species' range may be important in species conservation because environmental conditions at the periphery of a species' range can be different from environmental conditions nearer the center of a species' range. Thus, populations at the edge of the taxon's range may experience different natural selection pressures that promote divergent evolutionary adaptations (Scudder 1989, entire; Fraser 2000, entire). Lomolino and Channell (1998, p. 482) hypothesized that because peripheral populations should be adapted to a greater variety of environmental conditions, they may be better suited to deal with anthropogenic (human-caused) disturbances than populations in the central part of a species' range; however, this hypothesis remains unproven. This could be especially important because of changing natural selection pressures associated with climate change.

For example, increasing ocean temperatures is an environmental change to which the Bay-Delta population of longfin smelt may be uniquely adapted. Because it is the southern-most estuary within the species' range, the Bay-Delta has warmer average water temperatures than estuaries in central and northern parts of the species' range. As a result, the Bay-Delta longfin smelt population may have behavioral or physiological adaptations for coping with higher water temperatures that may come as a result of climate change (see discussion under Factor A: Climate Change). Baxter et al. (2010, p. 68) conclude that high water temperatures in the Bay-Delta influence spatial distribution of longfin smelt in the estuary. Rosenfield and Baxter (2007, p. 1290) hypothesize that the partial anadromy exhibited by the population (part of the population is believed to migrate out into the cooler, nearby coastal ocean waters in the Gulf of Farallones) and concentrations of longfin smelt in deeper water habitat in summer months is at least partly a behavioral response to warm water temperatures found during summer and early fall in the shallows of south San Francisco Bay and San Pablo Bay (Rosenfield and Baxter 2007, p. 1590).

The Bay-Delta estuary, although greatly degraded, is the largest estuary on the Pacific Coast of the United States (Sommer et al. 2007, p. 271). Because of its large size and diverse habitat, it is capable of supporting a large longfin smelt population. Large populations are valuable in the conservation of species because of their lower extinction risks compared to small populations. Historically, longfin smelt is believed to have been one of the more abundant pelagic fishes in the Bay-Delta. The areal extent of tidal freshwater habitat in the Bay-Delta estuary exceeds that of other California estuaries by an order of magnitude (NOAA 2007, p. 1), providing not only more available spawning habitat but also important habitat diversity should conditions at any one location become unsuitable. The Bay-Delta contains significant amounts of tidal freshwater and mixing zone habitat (Monaco et al. 1992, p. 255), which is crucial for spawning and rearing of juvenile longfin smelt. Other Pacific Coast estuaries where longfin smelt occur are predominately river-dominated estuaries (e.g., Russian River, Eel River, Klamath River, Columbia River), which have much smaller areas of low-salinity brackish water for longfin smelt rearing habitat.

(2) Evidence that loss of the discrete population segment would result in a significant gap in the range of a taxon.

Loss of the Bay-Delta population of longfin smelt would result in a significant gap in the range of the taxon because the nearest persistent longfin smelt breeding population to the Bay-Delta population is in Humboldt Bay, which is located approximately 420 km (260 mi) away. Loss of the Bay-Delta population would truncate the range of the species by hundreds of miles.

(3) Evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as

an introduced population outside its historic range.

This factor does not apply to the Bay-Delta longfin smelt population because other naturally occurring populations are found within the species' range.

(4) Evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

As discussed above under Quantitative Measures of Genetic or Morphological Discontinuity, two studies have evaluated genetic characteristics of the Bay-Delta longfin smelt population. One study concluded that genetic characteristics of the Bay-Delta population differed from the Lake Washington population but did not compare any other populations (Stanley et al. 1995, pp. 390-396). Israel et al. (2011, pp. 1-10) presented preliminary results from an ongoing study, but these results are inconclusive in determining whether the Bay-Delta population differs markedly from other longfin smelt populations in its genetic characteristics. Therefore, although information indicates that the genetic characteristics of the Bay-Delta population differs from at least one other longfin smelt population (Lake Washington), there is no other information currently available indicating that the genetic characteristics of the Bay-Delta population differ markedly from other longfin smelt populations.

Conclusion for Significance

We conclude that the Bay-Delta population is biologically significant to the longfin smelt species because the population occurs in an ecological setting unusual or unique for the species and its loss would result in a significant truncation of the range of the species. The Bay-Delta longfin smelt population occurs at the southern edge of the species' range and has likely experienced different natural selection pressures than those experienced by populations in middle portions of the species' range. The population may therefore possess unique evolutionary adaptations important to the conservation of the species. The Bay-Delta also is unique because it is the largest estuary on the Pacific Coast of the United States. Because of its large size and diverse aquatic habitats, the Bay-Delta has the potential to support a large longfin smelt population and is thus potentially important in the conservation of the species. The Bay-Delta population also is significant to the taxon because the nearest known breeding population of longfin smelt is hundreds of miles away, so loss of the Bay-Delta population would significantly truncate the range of the species and result in a significant gap in the species' range. Based on our review of the best available scientific and commercial information, we conclude that the Bay-Delta population meets the significance element of the 1996 DPS policy.

Determination of Distinct Population Segment

Because we have determined that the Bay-Delta population meets both the discreteness and significance elements of the 1996 DPS policy, we find that the Bay-Delta longfin smelt population is a valid DPS and thus is a listable entity under the Act. Therefore, we next evaluate its conservation status in relation to the Act's standards for listing (i.e., is the population segment, when treated as if it were a species, endangered or threatened?).

Distinct Population Segment Five-Factor Analysis

Because the Bay-Delta population of longfin smelt meets the criteria for a DPS, we will now evaluate its status with regard to its potential for listing as endangered or threatened under the five factors enumerated in section 4(a) of the Act. Our evaluation of the Bay-Delta DPS of longfin smelt follows.

Under Summary of Information Pertaining to the Five Factors, we evaluated threats to longfin smelt throughout its range. Much of this rangewide analysis focused on threats to the Bay-Delta population because so little information exists for other parts of the species' range. Although the threats of lack of freshwater flow, contaminants, and invasive species do not rise to the level of being significant threats rangewide, the best available scientific and commercial data indicates that these threats are significant to the species within the Bay-Delta. We utilized the vast amounts of research that have been conducted within the Bay-Delta by the Interagency Ecological Program and University of California at Davis to make our determinations of threats in the Bay-Delta.

Factor A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Reduced Freshwater Flow

As we discussed above in the rangewide analysis, a primary threat to the Bay-Delta longfin smelt is reduced freshwater flows. In the Bay-Delta, freshwater flow is strongly related to the natural hydrologic cycles of drought and flood. Studies of Bay-Delta longfin smelt have found that increased Delta outflow during the winter and spring is the largest factor positively affecting longfin smelt abundance (Stevens and Miller 1983, pp. 431-432; Jassby et al. 1995, p. 285; Sommer et al. 2007, p. 274; Thomson et al. 2010, pp. 1439-1440). During high outflow periods larvae are believed to benefit from increased transport and dispersal downstream, increased food production, reduced predation through increased turbidity, and reduced loss to entrainment due to a westward shift in the boundary of spawning habitat and strong downstream transport of larvae (CFDG 1992, pp. 45-61; Hieb and Baxter 1993, pp. 106-107; CDFG 2009a, p. 18). Conversely, during low outflow periods, the negative effects of reduced transport and dispersal, reduced turbidity, and potentially increased loss of larvae to predation and increased loss at the export facilities result in lower young-of-the-year recruitment. Despite numerous studies of longfin smelt abundance and flow in the Bay-Delta, the underlying causal mechanisms are still not fully understood (Baxter et al. 2010, p. 69; Rosenfield 2010, p. 9).

As California's population has grown, demands for reliable water supplies and flood protection have grown. In response, State and Federal agencies built dams and canals, and captured water in reservoirs, to increase capacity for water storage and conveyance resulting in one of the largest manmade water systems in the world (Nichols et al. 1986, p. 569). Operation of this system has altered the seasonal pattern of freshwater flows in the watershed. Storage in the upper watershed of peak runoff and release of the captured water for irrigation and urban needs during subsequent low flow periods result in a broader, flatter hydrograph with less seasonal variability in freshwater flows into the estuary (Kimmerer 2004, p. 15).

In addition to the system of dams and canals built throughout the Sacramento River-San Joaquin River basin, the Bay-Delta is unique in having a large water diversion system located within the estuary (Kimmerer 2002b, p. 1279). The State Water Project (SWP) and Central Valley Project (CVP) operate two water export facilities in the Delta (Sommer et al. 2007, p. 272). Project operation and management is dependent upon upstream water supply and export area demands. Despite the size of the water storage and diversion projects, much of the interannual variability in Delta hydrology is due to variability in precipitation from year to year. Annual inflow from the watershed to the Delta is strongly correlated to unimpaired flow (runoff that would hypothetically

occur if upstream dams and diversions were not in existence), mainly due to the effects of high-flow events (Kimmerer 2004, p. 15). Water operations are regulated in part by the California State Water Resources Control Board (SWRCB) according to the Water Quality Control Plan (WQCP) (SWRCB 2000, entire). The WQCP limits Delta water exports in relation to Delta inflow (the Export/Inflow, or E/I ratio).

It is important to note that in the case of the Bay-Delta, freshwater flow is expressed as both Delta inflow (from the rivers into the Delta) and as Delta outflow (from the Delta into the lower estuary), which are closely correlated, but not equivalent. Freshwater flow into the Delta affects the location of the low salinity zone and X2 within the estuary. As longfin smelt spawn in freshwater, they must migrate farther upstream to spawn as flow reductions alter the position of X2 and the low-salinity zone moves upstream (CDFG 2009, p. 17). Longer migration distances into the Bay-Delta make longfin smelt more susceptible to entrainment in the State and Federal water pumps (see Factor E: Entrainment Losses, below). In periods with greater freshwater flow into the Delta, X2 is pushed farther downstream (seaward); in periods with low flows, X2 is positioned farther landward (upstream) in the estuary and into the Delta. Not only is longfin smelt abundance in the Bay-Delta strongly correlated with Delta inflow and X2, but the spatial distribution of longfin smelt larvae is also strongly associated with X2 (Dege and Brown 2004, pp. 58-60; Baxter et al. 2010, p. 61). As longfin hatch into larvae, they move from the areas where they are spawned and orient themselves just downstream of X2 (Dege and Brown 2004, pp. 58-60). Larval (winter-spring) habitat varies with outflow and with the location of X2 (CDFG 2009, p. 12), and has been reduced since the 1990s due to a general upstream shift in the location of X2 (Hilts 2012, unpublished data). The amount of rearing habitat (salinity between 0.1 and 18 ppt) is also presumed to vary with the location of X2 (Baxter et al. 2010, p. 64). However, as previously stated, the location of X2 is of particular importance to the distribution of newly-hatched larvae and spawning adults. The influence of water project operations from November through April, when spawning adults and newly-hatched larvae are oriented to X2, is greater in drier years than in wetter years (Knowles 2002, p. 7).

In addition to the effects of reduced freshwater flow on habitat suitability for longfin smelt and other organisms in the Bay-Delta, one of the principal concerns over the biological impacts of these water export facilities has been entrainment of fish and other aquatic organisms. For a detailed discussion, see Factor E: Entrainment Losses, below.

Given the observed negative association between the reduction of freshwater outflow and longfin smelt abundance, we consider the current reductions in freshwater outflow to pose a significant threat to the Bay-Delta DPS of longfin smelt. Based on the observed associations in the Bay-Delta between freshwater outflow and longfin abundance, the lack of effective control mechanisms, and projections of freshwater outflow fluctuations, we expect the degree of this threat to continue and likely increase within the foreseeable future. We conclude that lack of freshwater flow is a significant current and future threat to the Bay-Delta DPS of longfin smelt.

Climate Change

Climate change may affect the Bay-Delta DPS of longfin smelt habitat as a result of (1) Changes in the timing and availability of freshwater flow into the estuary due to reduced snowpack and earlier melting of the snowpack; (2) sea level rise and saltwater intrusion into the estuary; (3) effects associated with increased water temperatures; and (4) effects related to changes in frequency and intensity of storms, floods, and droughts. It is difficult to evaluate effects related to changes in the timing and availability of freshwater flow into the estuary due to reduced snowpack and earlier melting of the snowpack because these potential effects will likely be impacted to some extent through decisions on water management in the intensively managed Sacramento River-San Joaquin River water basin. Continued sea level rise will result in saltwater intrusion and landward displacement of the low-salinity zone, which would likely negatively affect longfin smelt habitat suitability. Increasing water temperatures would likely affect distribution and movement patterns of longfin smelt in the estuary; longfin smelt may be displaced to locations with deeper and cooler water temperatures. This displacement may result in decreased survival and productivity. Increased frequency and severity of storms, floods, and droughts could result in reduced longfin smelt habitat suitability, but it is difficult to estimate these effects because of uncertainty about the frequency and severity of these events. However, warming may result in more precipitation falling as rain and less storage as snow, increasing winter runoff as spring runoff decreases (USBR 2011, p. 147).

It is uncertain how a change in the timing and duration of freshwater flows will affect longfin smelt. Higher flows in January and February (peak spawning and hatching months) resulting from snow packs that melt sooner and rain-on-snow events could potentially create better spawning and larval rearing conditions. This would reduce adult migration distance and increase areas of freshwater spawning habitat during these months. In addition, the higher turbidity associated with these flows may reduce predation on longfin smelt adults and larvae (Baxter 2011, pers. comm.). However, if high flows last only a short period, benefits may be negated by poorer conditions before and after the high flows. As the freshwater boundary moves farther inland into the Delta with increasing sea level (see below) and reduced flows, adults will need to migrate farther into the Delta to spawn, increasing the risk of predation and the potential for entrainment into water export facilities and diversions for both themselves and their progeny. Because of the uncertainties surrounding climate change and the potential for increased winter runoff that could benefit longfin smelt, we determined that there is not sufficient information to conclude that climate change threatens the continued existence of the Bay-Delta DPS of longfin smelt.

Channel Disturbances

Channel dredging in the Bay-Delta is an ongoing periodic disturbance of longfin smelt habitat, but most activity occurs in areas where longfin smelt are not likely to be present. We conclude that the effects of ongoing channel maintenance dredging are small and localized and do not rise to a level that would significantly affect the population as a whole.

There is currently a proposal to deepen and selectively widen the Sacramento Deep Water Ship Channel and the lower portion of the Sacramento River in the Bay-Delta. This dredging project would remove between 6.1-7.6 million cubic meters (8 and 10 million cubic yards) of material from the channel and Sacramento River and extend for 74 km

(45.8 mi) (USACE 2011a, entire). Potential effects of this new project to longfin smelt include mortality through loss of spawning substrate, habitat modification, and a shift in spawning and rearing habitat. The project also has potential to alter breeding and foraging behavior of the Bay-Delta longfin smelt population. However, this project is only a proposal

at this time and is not certain to occur. Potential effects of the proposed project are currently under evaluation.

Summary of Factor A

In summary, we conclude that the best available scientific and commercial information available indicates that the effects of reduced freshwater flows constitute a current and future threat to the Bay-Delta DPS of longfin smelt. We find that the Bay-Delta DPS of longfin smelt is currently threatened in part due to the present or threatened destruction, modification, or curtailment of its habitat or range due to reduced freshwater flow.

Factor B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Commercial and Recreational Take

Because of its status as a threatened species under the California Endangered Species Act, take of longfin smelt in the Bay-Delta is illegal, unless authorized by an incidental take permit or other take authorization. However, longfin smelt are caught as bycatch in a small bay shrimp trawl commercial fishery that operates in South San Francisco Bay, San Pablo Bay, and Carquinez Strait (Hieb 2009, p. 1). CDFG (Hieb 2009, pp. 6, 9) estimated the total longfin smelt bycatch from this fishery from 1989-1990 at 15,539 fish, and in 2004 at 18,815-30,574 fish. CDFG noted in 2009 that they thought the bay shrimp trawl fishery had declined since 2004 (Hieb, p. 3) and just recently reported the number of active shrimp permits at less than 10 (Hieb 2011, pers. comm.).

Scientific Take

Within the Bay-Delta, longfin smelt are regularly captured in monitoring surveys. The Interagency Ecological Program (IEP) implements scientific research in the Bay-Delta. Although the focus of its studies and the level of effort have changed over time, in general, their surveys have been directed at researching the Pelagic Organism Decline in the Bay-Delta. Between the years of 1987 to 2011, combined take of longfin smelt less than 20 mm (0.8 in) in length ranged from 2,405 to 158,588 annually. All of these fish were preserved for research or assumed to die in processing. During the same time period, combined take for juveniles and adults (fish greater than or equal to 20 mm (0.8 in)) ranged from 461 to 68,974 annually (IEP 2011). Although mortality is unknown, the majority of these fish likely do not survive. The Chipps Island survey, which is conducted by the Service, has captured an average of 2,697 longfin smelt per year during the past 10 years. Biologists attempt to release these fish unharmed, but at least 5,154 longfin smelt were known to have died during the Chipps Island survey between 2001 and 2008 (Service 2010, entire).

Incidental take from bycatch and monitoring surveys has not been identified as a possible factor related to recent longfin smelt population declines in the Bay-Delta (Baxter et al. 2010, pp. 61-69). CDFG (2009, p. 32) recommended adaptively managing scientific collection of longfin smelt to avoid adverse population effects, and survey methods have been modified recently to minimize potential impacts to delta smelt (75 FR 17669; April 7, 2010). These modifications likely have resulted in reduced impacts to longfin smelt. Based on the best scientific and commercial information, we conclude that the Bay-Delta DPS of longfin smelt is not currently threatened by overutilization for commercial, recreational, scientific, or educational purposes, nor do we anticipate overutilization posing a significant threat in the future.

Factor C. Disease or Predation

Disease

Little information is available on incidence of disease in the Bay-Delta longfin smelt DPS. Larval and juvenile longfin smelt were collected from the Bay-Delta in 2006 and 2007 and analyzed for signs of disease and parasites (Foott and Stone 2006, entire; Foott and Stone 2007, entire). No significant health problem was detected in either year (Foott and Stone 2007, p. 15). The south Delta is fed by water from the San Joaquin River, where pesticides (e.g., chlorpyrifos, carbofuran, and diazinon), salts (e.g., sodium sulfates), trace elements (boron and selenium), and high levels of total dissolved solids are prevalent due to agricultural runoff (64 FR 5963; February 8, 1999). Pesticides and other toxic chemicals may adversely affect the immune system of longfin smelt and other fish in the Bay-Delta and other estuaries, but we found no information documenting such effects.

Predation

Striped bass were introduced into the Bay-Delta in 1879 and quickly became abundant throughout the estuary. However, their numbers have declined substantially over the last 40 years (Thomson et al. 2010, p. 1440), and they are themselves one of the four species studied under Pelagic Organism Decline investigations (Baxter et al. 2010, p. 16). Numbers of largemouth bass, another introduced species in the Bay-Delta, have increased in the Delta over the past few decades (Brown and Michniuk 2007, p. 195). Largemouth bass, however, occur in shallow freshwater habitats, closer to shore than the pelagic longfin smelt, and so do not tend to co-occur with longfin for much of their life history. Baxter et al. (2010, p. 40) reported that no longfin smelt have been found in largemouth bass stomachs sampled in a recent study of largemouth bass diet. Moyle (2002, p. 238) believed that inland silverside, another nonnative predatory fish, may be an important predator on longfin eggs and larvae, but Rosenfield et al. (2010, p. 18) believed that to be unlikely because inland silversides prefer shallow water habitats where juvenile and subadult longfin smelt are rare.

In the Bay-Delta, predation of longfin smelt may be high in the Clifton Court Forebay, where the SWP water export pumping plant is located (Moyle 2002, p. 238; Baxter et al. 2010, p. 42). However, once they are entrained in the Clifton Court Forebay, longfin smelt mortality would be high anyway due to high water temperatures in the

Forebay (CDFG 2009b, p. 4) and entrainment into the SWP water export pumping plant. In addition to elevated predation levels in the Clifton Court Forebay, predation also is concentrated at sites where fish salvaged from the SWP and CVP export facilities are released (Moyle 2002, p. 238). However, few longfin smelt survive the salvage and transport process (see Factor E: Entrainment Losses, below), and therefore predation is not expected to be an important factor at drop off sites. As discussed above, reduced freshwater flows may result in lower turbidity and increased water clarity (see discussion under DPS' Factor A), which may contribute to increased risk of predation (Baxter et al. 2010, p. 64).

Based on a review of the best available scientific and commercial information, we conclude that disease does not constitute a threat to the Bay-Delta longfin smelt DPS. Available information indicates that Bay-Delta longfin smelt experience elevated levels of predation near the water diversions at the SWP and CVP water export facilities in the south Delta and at the salvage release sites. Reduced freshwater flows resulting from water diversions result in increased water clarity, and increased water clarity may result in increased predation risks to longfin smelt.

In summary, striped bass predation is in decline and largemouth bass predation is unlikely a threat because of

the minimal overlap in time and space of largemouth bass and longfin smelt. Therefore, the current rates of predation on longfin smelt are not expected to be having a substantial effect on the overall population level. Based on the best available scientific and commercial information, we conclude that neither disease nor predation are significant current or future threats to the Bay-Delta longfin smelt DPS.

Factor D. The Inadequacy of Existing Regulatory Mechanisms

Existing Federal and State regulatory mechanisms discussed under Factor D of the rangewide analysis that provide protections or reduce threats to the Bay-Delta DPS of longfin smelt include: California Endangered Species Act, Porter-Cologne Water Quality Control Act, California Marine Invasive Species Act, Central Valley Project Improvement Act, and Clean Water Act (including the National Pollutant Discharge Elimination System). Several of these regulatory mechanisms provide important protections for the Bay-Delta DPS of longfin smelt and act to reduce threats, such as reduction of freshwater outflow, the invasion of the overbite clam and ammonia discharges (See Factors A, above, and E, below).

The longfin smelt was listed under the California Endangered Species Act as threatened throughout its range in California on March 5, 2009 (CDFG 2009, p. V). CESA does allow take of species for otherwise lawful projects through use of an incidental take permit. A take permit requires that impacts be minimized and fully mitigated (CESA sections 2081 (b) and (c)). Furthermore, the CESA ensures through the issuance of a permit for a project that may affect longfin smelt or its habitat, that the project will not jeopardize the continued existence of a State-listed species.

The Porter-Cologne Water Quality Control Act is the California State law that establishes the State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards that are responsible for the regulation of activities and factors that could degrade California water quality and for the allocation of surface water rights. The State Water Resources Control Board Water Rights Decision 1641 (D-1641) imposes flow and water quality standards on the State and Federal water export facilities to assure protection of beneficial uses in the Delta (FWS 2008, pp. 21-27). The various flow objectives and export restraints are designed, in part, to protect fisheries. These objectives include specific outflow requirements throughout the year, specific water export restraints in the spring, and water export limits based on a percentage of estuary inflow throughout the year. The water quality objectives are designed to protect agricultural, municipal, industrial, and fishery uses; they vary throughout the year and by the wetness of the year. These protections have had limited effectiveness in providing adequate freshwater flows within the Delta. Lack of freshwater outflow continues to be the primary contributing factor to the decline of the longfin smelt in the Bay-Delta (see Factor A, above, for further discussion).

The California Marine Invasive Species Act requires ballast water management for all vessels that intend to discharge ballast water in California waters. All qualifying vessels coming from ports within the Pacific Coast region must conduct an exchange in waters at least 50 nautical mi offshore and 200 m (656 ft) deep or retain all ballast water and associated sediments. To determine the effectiveness of the management provisions of the this State act, the legislation also requires State agencies to conduct a series of biological surveys to monitor new introductions to coastal and estuarine waters. These measures should further minimize the introduction of new invasive species into California's coastal waters that could be a threat to the longfin smelt.

The Central Valley Project Improvement Act amends the previous Central Valley Project authorizations to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses, and fish and wildlife enhancement as having an equal priority with power generation. Included in CVPIA section 3406 (b)(2) was a provision to dedicate 800,000 acre-feet of Central Valley Project yield annually (referred to as ``(b)(2) water'') for fish, wildlife, and habitat restoration. Since 1993, (b)(2) water has been used and supplemented with acquired environmental water (Environmental Water Account and CVPIA section 3406 (b)(3) water) to increase stream flows and reduce Central Valley Project export pumping in the Delta. These management actions were taken to contribute to the CVPIA salmonid population doubling goals and to protect Delta smelt and their habitat (Guinee 2011, pers. comm.). As discussed above (under Biology and Factor A), increased freshwater flows have been shown to be positively correlated with longfin smelt abundance; therefore, these management actions, although targeted towards other species, should also benefit longfin smelt.

The Clean Water Act (CWA) provides the basis for the National Pollutant Discharge Elimination System (NPDES). The CWA gives the EPA the authority to set effluent limits and requires any entity discharging pollutants to obtain a NPDES permit. The EPA is authorized through the CWA to delegate the authority to issue NPDES Permits to State governments. In States that have been authorized to implement CWA programs, the EPA still retains oversight responsibilities (EPA 2011, p. 1). California is one of these States to which the EPA has delegated CWA authority. The Porter-Cologne Water Quality Control Act established the California State Water Resources Control Board (SWRCB) and nine Regional Water Quality Control Boards that are now responsible for issuing these NPDES permits, including permits for the discharge of effluents such as ammonia. The SWRCB is responsible for regulating activities and factors that could degrade California water quality (California Water Code Division 7, section 13370-13389).

The release of ammonia into the estuary is having detrimental effects on the Delta ecosystem and food chain (see Factor E, below). The release of ammonia is controlled primarily by the CWA (Federal law) and secondarily through the Porter-Cologne Water Quality Control Act (State law). EPA is currently updating freshwater discharge criteria that will include new limits on ammonia (EPA 2009, pp. 1-46). An NPDES permit for the Sacramento Regional Wastewater Treatment Plant, a major discharger, was prepared by the California Central Valley Regional Water Quality Control Board in the fall of 2010, with new ammonia limitations intended to reduce loadings to the Delta. The permit is currently undergoing appeal, but it is likely that the new ammonia limits will take effect in 2020. Until that time, CWA protections for longfin smelt are limited, and do not reduce the current threat to longfin smelt.

Summary of Factor D

A number of Federal and State regulatory mechanisms exist that can provide some protections for the Bay-Delta DPS of longfin smelt. However, the continued decline in longfin smelt trend indicators suggests that existing regulatory mechanisms, as currently implemented, are not adequate to reduce threats to the species. Therefore, based on a review of the best scientific information available, we conclude that

existing regulatory mechanisms are not sufficient to protect the species.

Factor E. Other Natural or Manmade Factors Affecting Its Continued Existence

Other factors affecting the continued existence of the Bay-Delta DPS of longfin smelt are entrainment losses due to water diversions, introduced species, and contaminants (see Factor E of the Summary of Information Pertaining to the Five Factors section, above).

Entrainment Losses Due to Water Diversions

Entrainment losses at the SWP and CVP water export facilities are a known source of mortality of longfin smelt and other pelagic fish species in the Bay Delta, although the full magnitude of entrainment losses and population-level implications of these losses is still not fully understood. High entrainment losses of longfin smelt and other Bay-Delta pelagic fish between 2000 and 2005 correspond with high volumes of water exports during winter (Baxter et al. 2010, p. 63).

Baxter et al. (2010, p. 62) hypothesize that entrainment is having an important effect on the longfin smelt population during winter, particularly during years with low freshwater flows when a higher proportion of the population may spawn farther upstream in the Delta. However, Baxter et al. (2010, p. 63) conclude that these losses have yet to be placed in a population context, and no conclusions can be drawn regarding their effects on recent longfin smelt abundance. CDFG (2009, p. 22) believes that efforts to reduce past delta smelt entrainment loss through the implementation of the 2008 delta smelt biological opinion for SWP and CVP operations may have reduced longfin smelt entrainment losses, incidentally providing a benefit to the longfin smelt. These efforts to manage entrainment losses in drier years, when entrainment risk is greater, substantially reduce the threat of entrainment for longfin smelt.

Estimates of entrainment have shown that it may have been a threat to the Bay-Delta longfin smelt DPS in the past. Fujimura (2009) estimated cumulative longfin smelt entrainment at the SWP facility between 1993 and 2008 at 1,376,432 juveniles and 11,054 adults, and estimated that 97.6 percent of juveniles and 95 percent of adults entrained were lost. Fujimura (2009) estimated cumulative longfin entrainment at the CVP facility between 1993 and 2008 at 224,606 juveniles and 1,325 adults, and estimated that 85.2 percent of the juveniles and 82.1 percent of the adults entrained were lost. These estimated losses are 4 times higher than observed salvage at the CVP and 21 times higher than the actual salvage numbers at the SWP (Fujimura 2009, p. 2). The estimated entrainment numbers were much higher than the actual salvage numbers at the SWP, due in large part to the high pre-screen losses in the Clifton Court Forebay (CDFG 2009a, p. 21). It should be noted that these estimates were calculated using equations and parameters devised for other species and may not accurately estimate longfin smelt losses. Further, estimates may be misleading because the majority of estimated losses occurred during the dry year of 2002 (1.1 million juveniles estimated at the SWP) while during all other years estimated entrainment was below 70,000 individuals.

Entrainment is no longer considered a threat to longfin in the Bay-Delta because of current regulations. Efforts to reduce delta smelt entrainment loss through the implementation of the 2008 delta smelt biological opinion and the listing of longfin smelt under the CESA have likely reduced longfin smelt entrainment losses. The high rate of entrainment that occurred in 2002 that threatened the Bay Delta longfin smelt DPS is very unlikely to recur, and would no longer be allowed under today's regulations because limits on longfin smelt take due to CESA regulations (see DPS' Factor D discussion, above) would trigger reductions in the magnitude of reverse flows.

Although larval and adult longfin smelt are lost as a result of entrainment in the water export facilities in the Delta, we conclude that the risk of entrainment is generally greatest when X2 is upstream and export volumes from the CVP and SWP pumps are high. Therefore, we have determined that longfin smelt are not currently threatened by entrainment, nor do we anticipate longfin smelt will be threatened by entrainment in the future.

Introduced Species

In Suisun Bay, a key longfin smelt rearing area, phytoplankton biomass is influenced by the overbite or Amur River clam. A sharp decline in phytoplankton biomass occurred following the invasion of the estuary by this species, even though nutrients were not found to be limiting (Alpine and Cloern 1992, pp. 950-951). Abundance of zooplankton decreased across several taxa, and peaks that formerly occurred in time and space were absent, reduced or relocated after 1987 (Kimmerer and Orsi 1996, p. 412). The general decline in phytoplankton and zooplankton is likely affecting longfin smelt by decreasing food supply for their prey species, such as N. mercedis (Kimmerer and Orsi 1996, pp. 418-419). Models indicate that the longfin smelt abundance index has been on a steady linear decline since about the time of the invasion of the non-native overbite (or Amur) clam in 1987 (Rosenfield and Swanson 2010, p. 14).

Given the observed negative association between the introduction of the overbite clam and longfin smelt abundance in the Bay-Delta and the documented decline of key longfin smelt prey items, we consider the current overbite clam population to pose a significant threat to the Bay-Delta DPS of longfin smelt. Based on the observed associations in the Bay-Delta between overbite clam invasion and longfin abundance and the lack of effective control mechanisms, we expect the degree of this threat will continue into the foreseeable future. The Bay-Delta has numerous other invasive species that have disrupted ecosystem dynamics; however, only the overbite clam has been shown to have an impact on the longfin smelt population. We consider the overbite clam to be a significant ongoing threat to the Bay-Delta longfin smelt population.

Contaminants

Extensive research on the role of contaminants in the Pelagic Organism Decline is currently being conducted (Baxter et al. 2010, pp. 28-36). Of potential concern are effects of high levels of mercury and other metals; high ammonium concentrations from municipal wastewater; potentially harmful cyanobacteria algal blooms; and pesticides, especially pyrethroid pesticides, which are heavily used in San Joaquin Valley agriculture. Contaminants may have direct toxic effects to longfin smelt and other pelagic fish and indirect effects as a result of impacts to prey abundance and composition. Ammonium has been shown to impact longfin smelt habitat by affecting primary production and prey abundance within the Bay-Delta (Dugdale et al. 2007, p. 26). While contaminants are suspected of playing a role in declines of pelagic fish species in the Bay-Delta (Baxter et al. 2010, p. 28), contaminant effects remain unresolved.

The largest source of ammonia entering the Delta ecosystem is the Sacramento Regional Wastewater Treatment Plant (SRWTP), which accounts for 90 percent of the total ammonia load released into the Delta. Ammonia is un-ionized and has the chemical formula NH_3.
Ammonium is

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ionized and has the formula NH_4^+. The major factors determining the proportion of ammonia or ammonium in water are water pH and temperature. This is important, as NH_3 ammonia is the form that can be directly toxic to aquatic organisms, and NH_4^+ ammonium is the form documented to interfere with uptake of nitrates by phytoplankton (Dugdale et al. 2007, p. 17; Jassby

2008, p. 3).

In addition to potential direct effects on fish, ammonia in the form of ammonium has been shown to alter the food web by adversely impacting phytoplankton and zooplankton dynamics in the estuary ecosystem. Historical data suggest that decreases in Suisun Bay phytoplankton biomass coincide with increased ammonia discharge by the SRWTP (Parker et al. 2004, p. 7; Dugdale et al. 2011, p. 1). Phytoplankton preferentially take up ammonium over nitrate when it is present in the water. Ammonium is insufficient to provide for growth in phytoplankton, and uptake of ammonium to the exclusion of nitrate results in decreases in phytoplankton biomass (Dugdale et al. 2007, p. 23). Therefore, ammonium impairs primary productivity by reducing nitrate uptake in phytoplankton. Ammonium's negative effect on the food web has been documented in the longfin smelt rearing areas of San Francisco Bay and Suisun Bay (Dugdale et al. 2007, pp. 27-28). Decreased primary productivity results in less food available to longfin smelt and other fish in these bays.

In summary, although no direct link has been made between contaminants and longfin smelt (Baxter et al. 2010, p. 68), ammonium has been shown to have a direct effect on the food supply that the Bay-Delta longfin smelt DPS relies upon. Therefore, we conclude that high ammonium concentrations may be a significant current and future threat to the Bay-Delta DPS of longfin smelt.

Summary of Factor E

The best available information indicates that introduced species constitute a threat to the Bay-Delta DPS of longfin smelt and that and contaminants (high ammonium concentrations) may constitute a threat to the Bay-Delta DPS of longfin smelt. Entrainment is a potential threat to the DPS, but information currently available does not indicate that entrainment threatens the continued existence of the Bay-Delta longfin smelt population. Although entrainment results in mortality of longfin smelt, Baxter et al. (2010, p. 63) concluded that these losses have yet to be placed in a population context, and no conclusions can be drawn regarding their effects on recent longfin smelt abundance. Therefore, based on the best scientific evidence available, we conclude that the Bay-Delta longfin smelt DPS is threatened in part due to other natural or manmade factors including the nonnative overbite clam and high ammonium concentrations.

Finding

This status review identified threats to the Bay-Delta DPS of longfin smelt attributable to Factors A, D, and E, as well as interactions between these threats. The primary threat to the DPS is from reduced freshwater flows. Upstream dams and water storage exacerbated by water diversions, especially from the SWP and CVP water export facilities, result in reduced freshwater flows within the estuary, and these reductions in freshwater flows result in reduced habitat suitability for longfin smelt (Factor A). Freshwater flows, especially winter-spring flows, are significantly correlated with longfin smelt abundance--longfin smelt abundance is lower when winter-spring flows are lower. While freshwater flows have been shown to be significantly correlated with longfin smelt abundance, causal mechanisms underlying this correlation are still not fully understood and are the subject of ongoing research on the Pelagic Organism Decline.

In addition to the threat caused by reduced freshwater flow into the Bay-Delta, and alteration of natural flow regimes resulting from water storage and diversion, there appear to be other factors contributing to the Pelagic Organism Decline (Baxter 2010 et al., p. 69). Models indicate a steady linear decline in abundance of longfin smelt since about the time of the invasion of the nonnative overbite clam in 1987 (Rosenfield and Swanson 2010, pp. 13-14; see Factor E: Introduced Species) in the Bay-Delta. However, not all aspects of the longfin smelt decline can be attributed to the overbite clam invasion, as a decline in abundance of pre-spawning adults in Suisun Marsh occurred before the invasion of the clam, and a partial rebound in longfin smelt abundance occurred in the early 2000s (Rosenfield and Baxter 2007, p. 1589).

The long-term decline in abundance of longfin smelt in the Bay-Delta has been partially attributed to reductions in food availability and disruptions of the Bay-Delta food web caused by establishment of the nonnative overbite clam in 1987 (Factor E) and ammonium concentrations (Factor E). Impacts of the overbite clam and ammonium on the Bay-Delta food web have been long-lasting and are ongoing. We conclude that ongoing disruptions of the food web caused by the overbite clam are a threat to the continued existence of the Bay-Delta DPS of longfin smelt. We also conclude that high ammonium concentrations in the Bay-Delta may constitute a threat to the continued existence of the overbite clam.

Multiple existing Federal and State regulatory mechanisms provide important protections for the Bay-Delta DPS of longfin smelt and act to reduce threats to the DPS. However, the continued decline in the abundance of the Bay-Delta longfin smelt DPS indicates that existing regulatory mechanisms, as currently implemented, are not adequate to sufficiently reduce threats identified in this finding. Therefore, we find that inadequate existing regulatory mechanisms contribute to threats faced by the Bay-Delta longfin smelt DPS.

The threats identified are likely acting together to contribute to the decline of the population (Baxter et al. 2010, p. 69). Reduced freshwater flows result in effects to longfin smelt habitat suitability, at the same time that the food web has been altered by introduced species and ammonium concentrations. It is possible that climate change could exacerbate these threats; however, due to uncertainties of how longfin smelt will respond to climate change effects, we cannot conclude that climate change will threaten the continued existence of the Bay-Delta longfin smelt DPS. The combined effects of reduced freshwater flows, the invasive overbite clam (reduced levels of phytoplankton and zooplankton that are important to the Bay-Delta food web), and high ammonium concentrations act to significantly reduce habitat suitability for longfin smelt.

The best scientific and commercial information available indicates that the threats facing the Bay-Delta DPS of longfin smelt are of sufficient imminence, intensity and magnitude to threaten the continued existence of the species now or in the foreseeable future. Therefore, we find that listing the Bay-Delta longfin smelt DPS is warranted. We will make a determination on the status of the DPS as endangered or threatened when we prepare a proposed listing determination. However, as explained in more detail below, an immediate proposal of a regulation implementing this action is precluded by higher priority listing actions, and progress is being made to add or remove qualified species from the Lists of Endangered and Threatened Wildlife and Plants.

We reviewed the available information to determine if the existing and foreseeable threats render the species at risk of extinction now such that issuing an emergency regulation temporarily listing the species under section 4(b)(7) of the Act is warranted. We determined that issuing an emergency regulation temporarily listing the DPS is not warranted at this time because the threats are not of sufficient magnitude and imminence to pose an immediate threat to the continued existence of the DPS. However, if at any time we determine that issuing an emergency regulation temporarily listing the Bay-Delta DPS of longfin smelt is warranted, we will initiate this action at that time.

Significant Portion of Its Range

The Act defines ``endangered species'' as any species which is ``in danger of extinction throughout all or a significant portion of its range,'' and ``threatened species'' as any species which is ``likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' The definition of ``species'' is also relevant to this discussion. The Act defines ``species'' as ``any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife which interbreeds when mature'' (16 U.S.C. 1532(16)). The phrase ``significant portion of its range'' (SPR) is not defined by the statute, and we have never addressed in our regulations: (1) The consequences of a determination that a species is either endangered or likely to become so throughout a significant portion of its range, but not throughout all of its range; or (2) what qualifies a portion of a range as ``significant.''

Two recent district court decisions have addressed whether the SPR language allows the Service to list or protect less than all members of a defined ``species'': Defenders of Wildlife v. Salazar, 729 F. Supp. 2d 1207 (D. Mont. 2010), concerning the Service's delisting of the Northern Rocky Mountain gray wolf (74 FR 15123, April 2, 2009); and WildEarth Guardians v. Salazar, 2010 U.S. Dist. LEXIS 105253 (D. Ariz. September 30, 2010), concerning the Service's 2008 finding on a petition to list the Gunnison's prairie dog (73 FR 6660, February 5, 2008). The Service had asserted in both of these determinations that it had authority, in effect, to protect only some members of a ``species,'' as defined by the Act (i.e., species, subspecies, or DPS), under the Act. Both courts ruled that the determinations were arbitrary and capricious on the grounds that this approach violated the plain and unambiguous language of the Act. The courts concluded that reading the SPR language to allow protecting only a portion of a species' range is inconsistent with the Act's definition of ``species.'' The courts concluded that once a determination is made that a species (i.e., species, subspecies, or DPS) meets the definition of ``endangered species'' or ``threatened species,'' it must be placed on the list in its entirety and the Act's protections applied consistently to all members of that species (subject to modification of protections through special rules under sections 4(d) and 10(j) of the Act).

Consistent with that interpretation, and for the purposes of this finding, we interpret the phrase ``significant portion of its range'' in the Act's definitions of ``endangered species'' and ``threatened species'' to provide an independent basis for listing; thus there are two situations (or factual bases) under which a species would qualify for listing: a species may be endangered or threatened throughout all of its range; or a species may be endangered or threatened in only a significant portion of its range. If a species is in danger of extinction throughout an SPR, it, the species, is an ``endangered species.'' The same analysis applies to ``threatened species.'' Based on this interpretation and supported by existing case law, the consequence of finding that a species is endangered or threatened in only a significant portion of its range is that the entire species will be listed as endangered or threatened, respectively, and the Act's protections will be applied across the species' entire range.

We conclude, for the purposes of this finding, that interpreting the SPR phrase as providing an independent basis for listing is the best interpretation of the Act because it is consistent with the purposes and the plain meaning of the key definitions of the Act; it does not conflict with established past agency practice (i.e., prior to the 2007 Solicitor's Opinion), as no consistent, long-term agency practice has been established; and it is consistent with the judicial opinions that have most closely examined this issue. Having concluded that the phrase ``significant portion of its range'' provides an independent basis for listing and protecting the entire species, we next turn to the meaning of ``significant'' to determine the threshold for when such an independent basis for listing exists.

Although there are potentially many ways to determine whether a portion of a species' range is ``significant,'' we conclude, for the purposes of this finding, that the significance of the portion of the range should be determined based on its biological contribution to the conservation of the species. For this reason, we describe the threshold for ``significant'' in terms of an increase in the risk of extinction for the species. We conclude that a biologically based definition of ``significant'' best conforms to the purposes of the Act, is consistent with judicial interpretations, and best ensures species' conservation. Thus, for the purposes of this finding, and as explained further below, a portion of the range of a species is ``significant'' if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction.

We evaluate biological significance based on the principles of conservation biology using the concepts of redundancy, resiliency, and representation. Resiliency describes the characteristics of a species and its habitat that allow it to recover from periodic disturbance. Redundancy (having multiple populations distributed across the landscape) may be needed to provide a margin of safety for the species to withstand catastrophic events. Representation (the range of variation found in a species) ensures that the species' adaptive capabilities are conserved. Redundancy, resiliency, and representation are not independent of each other, and some characteristic of a species or area may contribute to all three. For example, distribution across a wide variety of habitat types is an indicator of representation, but it may also indicate a broad geographic distribution contributing to redundancy (decreasing the chance that any one event affects the entire species), and the likelihood that some habitat types are less susceptible to certain threats, contributing to resiliency (the ability of the species to recover from disturbance). None of these concepts is intended to be mutually exclusive, and a portion of a species' range may be determined to be ``significant'' due to its contributions under any one or more of these concepts.

For the purposes of this finding, we determine if a portion's biological contribution is so important that the portion qualifies as ``significant'' by asking whether without that portion, the representation, redundancy, or resiliency of the species would be so impaired that the species would have an increased vulnerability to threats to the point that the overall species would be in danger of extinction (i.e., would be ``endangered''). Conversely, we would

not consider the portion of the range at issue to be ``significant'' if there is sufficient resiliency, redundancy, and representation elsewhere in the species' range that the species would not be in danger of extinction throughout its range if the population in that portion of the range in question became extirpated (extinct locally).

We recognize that this definition of ``significant'' (a portion of the range of a species is ``significant'' if its contribution to the viability of the species is so important that without that portion, the species would be in danger of extinction) establishes a threshold that is relatively high. On the one hand, given that the consequences of finding a species to be endangered or threatened in an SPR would be listing the species throughout its entire range, it is important to use a threshold for ``significant'' that is robust. It would not be meaningful or appropriate to establish a very low threshold whereby a portion of the range can be considered ``significant'' even if only a negligible increase in extinction risk would result from its loss. Because nearly any portion of a species' range can be said to contribute some increment to a species' viability, use of such a low threshold would require us to impose restrictions and expend conservation resources disproportionately to conservation benefit: listing would be rangewide, even if only a portion of the range of minor conservation importance to the species is imperiled. On the other hand, it would be inappropriate to establish a threshold for ``significant'' that is too high. This would be the case if the standard were, for example, that a portion of the range can be considered ``significant'' only if threats in that portion result in the entire species' being currently endangered or threatened. Such a high bar would not give the SPR phrase independent meaning, as the Ninth Circuit held in Defenders of Wildlife v. Norton, 258 F.3d 1136 (9th Cir. 2001).

The definition of ``significant'' used in this finding carefully balances these concerns. By setting a relatively high threshold, we minimize the degree to which restrictions will be imposed or resources expended that do not contribute substantially to species conservation.

But we have not set the threshold so high that the phrase ``in a significant portion of its range'' loses independent meaning. Specifically, we have not set the threshold as high as it was under the interpretation presented by the Service in the Defenders litigation. Under that interpretation, the portion of the range would have to be so important that current imperilment there would mean that the species would be currently imperiled everywhere. Under the definition of ``significant'' used in this finding, the portion of the range need not rise to such an exceptionally high level of biological significance. (We recognize that if the species is imperiled in a portion that rises to that level of biological significance, then we should conclude that the species is in fact imperiled throughout all of its range, and that we would not need to rely on the SPR language for such a listing.) Rather, under this interpretation we ask whether the species would be endangered everywhere without that portion, i.e., if that portion were completely extirpated. In other words, the portion of the range need not be so important that even the species being in danger of extinction in that portion would be sufficient to cause the species in the remainder of the range to be endangered; rather, the complete extirpation (in a hypothetical future) of the species in that portion would be required to cause the species in the remainder of the range to be endangered.

The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that have no reasonable potential to be significant or to analyzing portions of the range in which there is no reasonable potential for the species to be endangered or threatened. To identify only those portions that warrant further consideration, we determine whether there is substantial information indicating that: (1) The portions may be ``significant,'' and (2) the species may be in danger of extinction there or likely to become so within the foreseeable future. Depending on the biology of the species, its range, and the threats it faces, it might be more efficient for us to address the significance question first or the status question first. Thus, if we determine that a portion of the range is not ``significant,'' we do not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we do not need to determine if that portion is ``significant.'' In practice, a key part of the determination that a species is in danger of extinction in a significant portion of its range is whether the threats are geographically concentrated in some way. If the threats to the species are essentially uniform throughout its range, no portion is likely to warrant further consideration. Moreover, if any concentration of threats to the species occurs only in portions of the species' range that clearly would not meet the biologically based definition of ``significant,'' such portions will not warrant further consideration.

We have determined that the longfin smelt does not face elevated threats in most portions of its range, and we have determined that the portion of the range that has concentrated threats (the Bay-Delta portion of the range) is a DPS. The rangewide five factor analysis for longfin smelt does not identify any portions of the species' range outside of Bay-Delta where threats are concentrated. Potential threats to the species are by and large uniform throughout its range with the exception of the Bay-Delta. Therefore, we will not further consider the Bay-Delta DPS as an SPR.

Listing Priority Number

The Service adopted guidelines on September 21, 1983 (48 FR 43098) to establish a rational system for utilizing available resources for the highest priority species when adding species to the Lists of Endangered or Threatened Wildlife and Plants or reclassifying species listed as threatened to endangered status. The system places greatest importance on the immediacy and magnitude of threats, but also factors in the level of taxonomic distinctiveness by assigning priority in descending order to monotypic genera (genus with one species), full species, and subspecies (or equivalently, distinct population segments of vertebrates (DPS)). As a result of our analysis of the best available scientific and commercial information, we assign the Bay-Delta DPS of longfin smelt a listing priority number of 3, based on the high magnitude and immediacy of threats. A number three listing priority is the highest listing allowed for a DPS under the current listing priority guidance. One or more of the threats discussed above are occurring (or we anticipate they will occur in the near future) within the range of the Bay-Delta DPS of the longfin smelt. These threats are ongoing and, in some cases (such as nonnative species), are considered irreversible. While we conclude that listing the Bay-Delta DPS of longfin smelt is warranted, an immediate proposal to list this species is precluded by other higher priority listings, which we address below.

Preclusion and Expeditious Progress

Preclusion is a function of the listing priority of a species in relation to the resources that are available and the cost

and relative priority of competing demands for those resources. Thus, in any given fiscal year (FY), multiple factors dictate whether it will be possible to undertake work on a listing proposal regulation or whether promulgation of such a proposal is precluded by higher priority listing actions.

The resources available for listing actions are determined through the annual Congressional appropriations process. The appropriation for the Listing Program is available to support work involving the following listing actions: Proposed and final listing rules; 90-day and 12-month findings on petitions to add species to the Lists of Endangered and Threatened Wildlife and Plants (Lists) or to change the status of a species from threatened to endangered; annual ``resubmitted'' petition findings on prior warranted-but-precluded petition findings as required under section 4(b)(3)(C)(i) of the Act; critical habitat petition findings; proposed and final rules designating critical habitat; and litigation-related, administrative, and program-management functions (including preparing and allocating budgets, responding to Congressional and public inquiries, and conducting public outreach regarding listing and critical habitat). The work involved in preparing various listing documents can be extensive and may include, but is not limited to: Gathering and assessing the best scientific and commercial data available and conducting analyses used as the basis for our decisions; writing and publishing documents; and obtaining, reviewing, and evaluating public comments and peer review comments on proposed rules and incorporating relevant information into final rules. The number of listing actions that we can undertake in a given year also is influenced by the complexity of those listing actions; that is, more complex actions generally are more costly. The median cost for preparing and publishing a 90-day finding is $39,276; for a 12-month finding, $100,690; for a proposed rule with critical habitat, $345,000; and for a final listing rule with critical habitat, $305,000.

We cannot spend more than is appropriated for the Listing Program without violating the Anti-Deficiency Act (see 31 U.S.C. 1341(a)(1)(A)). In addition, in FY 1998 and for each fiscal year since then, Congress has placed a statutory cap on funds that may be expended for the Listing Program, equal to the amount expressly appropriated for that purpose in that fiscal year. This cap was designed to prevent funds appropriated for other functions under the Act (for example, recovery funds for removing species from the Lists), or for other Service programs, from being used for Listing Program actions (see House Report 105-163, 105th Congress, 1st Session, July 1, 1997).

Since FY 2002, the Service's budget has included a critical habitat subcap to ensure that some funds are available for other work in the Listing Program (``The critical habitat designation subcap will ensure that some funding is available to address other listing activities'' (House Report No. 107-103, 107th Congress, 1st Session, June 19, 2001)). In FY 2002 and each year until FY 2006, the Service has had to use virtually the entire critical habitat subcap to address court-mandated designations of critical habitat, and consequently none of the critical habitat subcap funds have been available for other listing activities. In some FYs since 2006, we have been able to use some of the critical habitat subcap funds to fund proposed listing determinations for high-priority candidate species. In other FYs, while we were unable to use any of the critical habitat subcap funds to fund proposed listing determinations, we did use some of this money to fund the critical habitat portion of some proposed listing determinations so that the proposed listing determination and proposed critical habitat designation could be combined into one rule, thereby being more efficient in our work. At this time, for FY 2012, we plan to use some of the critical habitat subcap funds to fund proposed listing determinations.

We make our determinations of preclusion on a nationwide basis to ensure that the species most in need of listing will be addressed first and also because we allocate our listing budget on a nationwide basis. Through the listing cap, the critical habitat subcap, and the amount of funds needed to address court-mandated critical habitat designations, Congress and the courts have in effect determined the amount of money available for other listing activities nationwide. Therefore, the funds in the listing cap, other than those needed to address court-mandated critical habitat for already listed species, set the limits on our determinations of preclusion and expeditious progress.

Congress identified the availability of resources as the only basis for deferring the initiation of a rulemaking that is warranted. The Conference Report accompanying Public Law 97-304 (Endangered Species Act Amendments of 1982), which established the current statutory deadlines and the warranted-but-precluded finding, states that the amendments were ``not intended to allow the Secretary to delay commencing the rulemaking process for any reason other than that the existence of pending or imminent proposals to list species subject to a greater degree of threat would make allocation of resources to such a petition [that is, for a lower-ranking species] unwise.'' Although that statement appeared to refer specifically to the ``to the maximum extent practicable'' limitation on the 90-day deadline for making a ``substantial information'' finding, that finding is made at the point when the Service is deciding whether or not to commence a status review that will determine the degree of threats facing the species, and therefore the analysis underlying the statement is more relevant to the use of the warranted-but-precluded finding, which is made when the Service has already determined the degree of threats facing the species and is deciding whether or not to commence a rulemaking.

In FY 2011, on April 15, 2011, Congress passed the Full-Year Continuing Appropriations Act (Pub. L. 112-10), which provided funding through September 30, 2011. The Service had $20,902,000 for the listing program. Of that, $9,472,000 was used for determinations of critical habitat for already listed species. Also $500,000 was appropriated for foreign species listings under the Act. The Service thus had $10,930,000 available to fund work in the following categories: Compliance with court orders and court-approved settlement agreements requiring that petition findings or listing determinations be completed by a specific date; section 4 (of the Act) listing actions with absolute statutory deadlines; essential litigation-related, administrative, and listing program-management functions; and high-priority listing actions for some of our candidate species. In FY 2010, the Service received many new petitions and a single petition to list 404 species. The receipt of petitions for a large number of species is consuming the Service's listing funding that is not dedicated to meeting court-ordered commitments. Absent some ability to balance effort among listing duties under existing funding levels, the Service was only able to initiate a few new listing determinations for candidate species in FY 2011. For FY 2012, on December 17, 2011, Congress passed a continuing resolution which provides funding at the FY 2011 enacted level with a 1.5 percent rescission through December 23, 2011 (Pub. L. 112-68). Until Congress appropriates funds for FY 2012, we will fund listing work

based on the FY 2011 amount minus the 1.5 percent.

In 2009, the responsibility for listing foreign species under the Act was transferred from the Division of Scientific Authority, International Affairs Program, to the Endangered Species Program. Therefore, starting in FY 2010, we used a portion of our funding to work on the actions described above for listing actions related to foreign species. In FY 2011, we anticipated using $1,500,000 for work on listing actions for foreign species, which reduces funding available for domestic listing actions; however, only $500,000 was allocated for this function. Although there are no foreign species issues included in our high-priority listing actions at this time, many actions have statutory or court-approved settlement deadlines, thus increasing their priority. The budget allocations for each specific listing action are identified in the Service's FY 2011 and FY 2012 Allocation Tables (part of our record).

For the above reasons, funding a proposed listing determination for the Bay-Delta DPS of longfin smelt is precluded by court-ordered and court-approved settlement agreements, listing actions with absolute statutory deadlines, and work on proposed listing determinations for those candidate species with a higher listing priority (i.e., candidate species with LPNs of 1 or 2).

Based on our September 21, 1983, guidelines for assigning an LPN for each candidate species (48 FR 43098), we have a significant number of species with a LPN of 2. Using these guidelines, we assign each candidate an LPN of 1 to 12, depending on the magnitude of threats (high or moderate to low), immediacy of threats (imminent or nonimminent), and taxonomic status of the species (in order of priority: Monotypic genus (a species that is the sole member of a genus); species; or part of a species (subspecies, or distinct population segment)). The lower the listing priority number, the higher the listing priority (that is, a species with an LPN of 1 would have the highest listing priority).

Because of the large number of high-priority species, we have further ranked the candidate species with an LPN of 2 by using the following extinction-risk type criteria: International Union for the Conservation of Nature and Natural Resources (IUCN) Red list status/rank, Heritage rank (provided by NatureServe), Heritage threat rank (provided by NatureServe), and species currently with fewer than 50 individuals, or 4 or fewer populations. Those species with the highest IUCN rank (critically endangered), the highest Heritage rank (G1), the highest Heritage threat rank (substantial, imminent threats), and currently with fewer than 50 individuals, or fewer than 4 populations, originally comprised a group of approximately 40 candidate species (``Top 40''). These 40 candidate species have had the highest priority to receive funding to work on a proposed listing determination. As we work on proposed and final listing rules for those 40 candidates, we apply the ranking criteria to the next group of candidates with LPNs of 2 and 3 to determine the next set of highest priority candidate species. Finally, proposed rules for reclassification of threatened species to endangered species are lower priority, because as listed species, they are already afforded the protections of the Act and implementing regulations. However, for efficiency reasons, we may choose to work on a proposed rule to reclassify a species to endangered if we can combine this with work that is subject to a court-determined deadline.

With our workload so much bigger than the amount of funds we have to accomplish it, it is important that we be as efficient as possible in our listing process. Therefore, as we work on proposed rules for the highest priority species in the next several years, we are preparing multi-species proposals when appropriate, and these may include species with lower priority if they overlap geographically or have the same threats as a species with an LPN of 2. In addition, we take into consideration the availability of staff resources when we determine which high-priority species will receive funding to minimize the amount of time and resources required to complete each listing action.

As explained above, a determination that listing is warranted but precluded must also demonstrate that expeditious progress is being made to add and remove qualified species to and from the Lists of Endangered and Threatened Wildlife and Plants. As with our ``precluded'' finding, the evaluation of whether progress in adding qualified species to the Lists has been expeditious is a function of the resources available for listing and the competing demands for those funds. (Although we do not discuss it in detail here, we are also making expeditious progress in removing species from the list under the Recovery program in light of the resource available for delisting, which is funded by a separate line item in the budget of the Endangered Species Program. During FY 2011, we completed delisting rules for three species.) Given the limited resources available for listing, we find that we made expeditious progress in FY 2011 and are making expeditious progress in FY 2012 in the Listing Program. This progress included preparing and publishing the following determinations:

FY 2011 and FY 2012 Completed Listing Actions

Publication date	Title	Actions	FR Pages
10/6/2010	Endangered Status for the Altamaha Spinymussel and Designation of Critical Habitat.	Proposed Listing Endangered.	75 FR 61664-61690
10/7/2010	12-month Finding on a Petition to list the Sacramento Splittail as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	75 FR 62070-62095
10/28/2010	Endangered Status and Designation of Critical Habitat for Spikedace and Loach Minnow.	Proposed Listing Endangered (uplisting).	75 FR 66481-66552
11/2/2010	90-Day Finding on a Petition to List the Bay Springs Salamander as Endangered.	Notice of 90-day Petition Finding, Not substantial.	75 FR 67341-67343

11/2/2010	Determination of Endangered Status for the Georgia Pigtoe Mussel, Interrupted Rocksnail, and Rough Hornsnail and Designation of Critical Habitat.	Final Listing Endangered.	75 FR 67511-67550
11/2/2010	Listing the Rayed Bean and Snuffbox as Endangered.	Proposed Listing Endangered.	75 FR 67551-67583
11/4/2010	12-Month Finding on a Petition to List Cirsium wrightii (Wright's Marsh Thistle) as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 67925-67944

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12/14/2010	Endangered Status for Dunes Sagebrush Lizard.	Proposed Listing Endangered.	75 FR 77801-77817
12/14/2010	12-month Finding on a Petition to List the North American Wolverine as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 78029-78061
12/14/2010	12-Month Finding on a Petition to List the Sonoran Population of the Desert Tortoise as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	75 FR 78093-78146
12/15/2010	12-Month Finding on a Petition to List Astragalus microcymbus and Astragalus schmolliae as	Notice of 12-month petition finding, Warranted but precluded.	75 FR 78513-78556

	Endangered or Threatened.		
12/28/2010	Listing Seven Brazilian Bird Species as Endangered Throughout Their Range.	Final Listing Endangered.	75 FR 81793-81815
1/4/2011	90-Day Finding on a Petition to List the Red Knot subspecies Calidris canutus roselaari as Endangered.	Notice of 90-day Petition Finding, Not substantial.	76 FR 304-311
1/19/2011	Endangered Status for the Sheepnose and Spectaclecase Mussels.	Proposed Listing Endangered.	76 FR 3392-3420
2/10/2011	12-Month Finding on a Petition to List the Pacific Walrus as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 7634-7679
2/17/2011	90-Day Finding on a Petition To List the Sand Verbena Moth as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 9309-9318
2/22/2011	Determination of Threatened Status for the New Zealand-Australia Distinct Population Segment of the Southern Rockhopper Penguin.	Final Listing Threatened.	76 FR 9681-9692
2/22/2011	12-Month Finding on a Petition to List Solanum conocarpum (marron bacora) as Endangered.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 9722-9733
2/23/2011	12-Month Finding on a	Notice of 12-month	76 FR 9991-10003

	Petition to List Thorne's Hairstreak Butterfly as Endangered.	petition finding, Not warranted.		
2/23/2011	12-Month Finding on a Petition to List Astragalus hamiltonii, Penstemon flowersii, Eriogonum soredium, Lepidium ostleri, and Trifolium friscanum as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded & Not Warranted.	76 FR 10166-10203	
2/24/2011	90-Day Finding on a Petition to List the Wild Plains Bison or Each of Four Distinct Population Segments as Threatened.	Notice of 90-day Petition Finding, Not substantial.	76 FR 10299-10310	
2/24/2011	90-Day Finding on a Petition to List the Unsilvered Fritillary Butterfly as Threatened or Endangered.	Notice of 90-day Petition Finding, Not substantial.	76 FR 10310-10319	
3/8/2011	12-Month Finding on a Petition to List the Mt. Charleston Blue Butterfly as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 12667-12683	
3/8/2011	90-Day Finding on a Petition to List the Texas Kangaroo Rat as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 12683-12690	
3/10/2011	Initiation of Status Review for Longfin	Notice of Status Review.	76 FR 13121-13122	

	Smelt.		
3/15/2011	Withdrawal of Proposed Rule to List the Flat-tailed Horned Lizard as Threatened.	Proposed rule withdrawal.	76 FR 14210-14268
3/15/2011	Proposed Threatened Status for the Chiricahua Leopard Frog and Proposed Designation of Critical Habitat.	Proposed Listing Threatened; Proposed Designation of Critical Habitat.	76 FR 14126-14207
3/22/2011	12-Month Finding on a Petition to List the Berry Cave Salamander as Endangered.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 15919-15932
4/1/2011	90-Day Finding on a Petition to List the Spring Pygmy Sunfish as Endangered.	Notice of 90-day Petition Finding, Substantial.	76 FR 18138-18143
4/5/2011	12-Month Finding on a Petition to List the Bearmouth Mountainsnail, Byrne Resort Mountainsnail, and Meltwater Lednian Stonefly as Endangered or Threatened.	Notice of 12-month petition finding, Not Warranted and Warranted but precluded.	76 FR 18684-18701
4/5/2011	90-Day Finding on a Petition To List the Peary Caribou and Dolphin and Union population of the Barren-ground Caribou as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 18701-18706
4/12/2011	Proposed Endangered	Proposed Listing	76 FR 20464-20488

	Status for the Three Forks Springsnail and San Bernardino Springsnail, and Proposed Designation of Critical Habitat.	Endangered; Proposed Designation of Critical Habitat.	
4/13/2011........................	90-Day Finding on a Petition To List Spring Mountains Acastus Checkerspot Butterfly as Endangered.	Notice of 90-day Petition Finding, Substantial.	76 FR 20613-20622
4/14/2011........................	90-Day Finding on a Petition to List the Prairie Chub as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	76 FR 20911-20918
4/14/2011........................	12-Month Finding on a Petition to List Hermes Copper Butterfly as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 20918-20939
4/26/2011........................	90-Day Finding on a Petition to List the Arapahoe Snowfly as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 23256-23265

4/26/2011........................	90-Day Finding on a Petition to List the Smooth-Billed Ani as Threatened or Endangered.	Notice of 90-day Petition Finding, Not substantial.	76 FR 23265-23271
5/12/2011........................	Withdrawal of the	Proposed Rule,	76 FR 27756-27799

	Proposed Rule to List the Mountain Plover as Threatened.	Withdrawal.	
5/25/2011........................	90-Day Finding on a Petition To List the Spot-tailed Earless Lizard as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 30082-30087
5/26/2011........................	Listing the Salmon-Crested Cockatoo as Threatened Throughout its Range with Special Rule.	Final Listing Threatened.	76 FR 30758-30780
5/31/2011........................	12-Month Finding on a Petition to List Puerto Rican Harlequin Butterfly as Endangered.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 31282-31294
6/2/2011.........................	90-Day Finding on a Petition to Reclassify the Straight-Horned Markhor (Capra falconeri jerdoni) of Torghar Hills as Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 31903-31906
6/2/2011.........................	90-Day Finding on a Petition to List the Golden-winged Warbler as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 31920-31926
6/7/2011.........................	12-Month Finding on a Petition to List the Striped Newt as Threatened.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 32911-32929
6/9/2011.........................	12-Month Finding on a Petition to List	Notice of 12-month petition finding,	76 FR 33924-33965

	Abronia ammophila, Agrostis rossiae, Astragalus proimanthus, Boechera (Arabis) pusilla, and Penstemon gibbensii as Threatened or Endangered.	Not Warranted and Warranted but precluded.	
6/21/2011	90-Day Finding on a Petition to List the Utah Population of the Gila Monster as an Endangered or a Threatened Distinct Population Segment.	Notice of 90-day Petition Finding, Not substantial.	76 FR 36049-36053
6/21/2011	Revised 90-Day Finding on a Petition To Reclassify the Utah Prairie Dog From Threatened to Endangered.	Notice of 90-day Petition Finding, Not substantial.	76 FR 36053-36068
6/28/2011	12-Month Finding on a Petition to List Castanea pumila var. ozarkensis as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	76 FR 37706-37716
6/29/2011	90-Day Finding on a Petition to List the Eastern Small-Footed Bat and the Northern Long-Eared Bat as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	76 FR 38095-38106
6/30/2011	12-Month Finding on a Petition to List a Distinct Population Segment of the Fisher	Notice of 12-month petition finding, Not warranted.	76 FR 38504-38532

	in Its United States Northern Rocky Mountain Range as Endangered or Threatened with Critical Habitat.		
7/12/2011.......................	90-Day Finding on a Petition to List the Bay Skipper as Threatened or Endangered.	Notice of 90-day Petition Finding, Substantial.	76 FR 40868-40871
7/19/2011.......................	12-Month Finding on a Petition to List Pinus albicaulis as Endangered or Threatened with Critical Habitat.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 42631-42654
7/19/2011.......................	Petition To List Grand Canyon Cave Pseudoscorpion.	Notice of 12-month petition finding, Not warranted.	76 FR 42654-42658
7/26/2011.......................	12-Month Finding on a Petition to List the Giant Palouse Earthworm (Driloleirus americanus) as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	76 FR 44547-44564
7/26/2011.......................	12-month Finding on a Petition to List the Frigid Ambersnail as Endangered.	Notice of 12-month petition finding, Not warranted.	76 FR 44566-44569
7/27/2011.......................	Determination of Endangered Status for Ipomopsis polyantha (Pagosa Skyrocket) and Threatened Status for Penstemon debilis (Parachute Beardtongue) and Phacelia submutica	Final Listing Endangered, Threatened.	76 FR 45054-45075

	(DeBeque Phacelia).		
7/27/2011	12-Month Finding on a Petition to List the Gopher Tortoise as Threatened in the Eastern Portion of its Range.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 45130-45162
8/2/2011	Proposed Endangered Status for the Chupadera Springsnail (Pyrgulopsis chupaderae) and Proposed Designation of Critical Habitat.	Proposed Listing Endangered.	76 FR 46218-46234
8/2/2011	90-Day Finding on a Petition to List the Straight Snowfly and Idaho Snowfly as Endangered.	Notice of 90-day Petition Finding, Not substantial.	76 FR 46238-46251
8/2/2011	12-Month Finding on a Petition to List the Redrock Stonefly as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 46251-46266
8/2/2011	Listing 23 Species on Oahu as Endangered and Designating Critical Habitat for 124 Species.	Proposed Listing Endangered.	76 FR 46362-46594
8/4/2011	90-Day Finding on a Petition To List Six Sand Dune Beetles as Endangered or Threatened.	Notice of 90-day Petition Finding, Not substantial and substantial.	76 FR 47123-47133
8/9/2011	Endangered Status for the Cumberland Darter, Rush Darter, Yellowcheek Darter, Chucky Madtom, and	Final Listing Endangered.	76 FR 48722-48741

Laurel Dace.

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8/9/2011	12-Month Finding on a Petition to List the Nueces River and Plateau Shiners as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	76 FR 48777-48788
8/9/2011	Four Foreign Parrot Species [crimson shining parrot, white cockatoo, Philippine cockatoo, yellow-crested cockatoo].	Proposed Listing Endangered and Threatened; Notice of 12-month petition finding, Not warranted.	76 FR 49202-49236
8/10/2011	Proposed Listing of the Miami Blue Butterfly as Endangered, and Proposed Listing of the Cassius Blue, Ceraunus Blue, and Nickerbean Blue Butterflies as Threatened Due to Similarity of Appearance to the Miami Blue Butterfly.	Proposed Listing Endangered Similarity of Appearance.	76 FR 49408-49412
8/10/2011	90-Day Finding on a Petition To List the Saltmarsh Topminnow as Threatened or Endangered Under the Endangered Species Act.	Notice of 90-day Petition Finding, Substantial.	76 FR 49412-49417
8/10/2011	Emergency Listing of the Miami Blue Butterfly as Endangered, and Emergency Listing of	Emergency Listing Endangered and Similarity of Appearance.	76 FR 49542-49567

	the Cassius Blue, Ceraunus Blue, and Nickerbean Blue Butterflies as Threatened Due to Similarity of Appearance to the Miami Blue Butterfly.		
8/11/2011........................	Listing Six Foreign Birds as Endangered Throughout Their Range.	Final Listing Endangered.	76 FR 50052-50080
8/17/2011........................	90-Day Finding on a Petition to List the Leona's Little Blue Butterfly as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 50971-50979
9/01/2011........................	90-Day Finding on a Petition to List All Chimpanzees (Pan troglodytes) as Endangered.	Notice of 90-day Petition Finding, Substantial.	76 FR 54423-54425
9/6/2011.........................	12-Month Finding on Five Petitions to List Seven Species of Hawaiian Yellow-faced Bees as Endangered.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 55170-55203
9/8/2011.........................	12-Month Petition Finding and Proposed Listing of Arctostaphylos franciscana as Endangered.	Notice of 12-month petition finding, Warranted; Proposed Listing Endangered.	76 FR 55623-55638
9/8/2011.........................	90-Day Finding on a Petition To List the Snowy Plover and Reclassify the Wintering Population of Piping Plover.	Notice of 90-day Petition Finding, Not substantial.	76 FR 55638-55641

9/13/2011	90-Day Finding on a Petition To List the Franklin's Bumble Bee as Endangered.	Notice of 90-day Petition Finding, Substantial.	76 FR 56381-56391
9/13/2011	90-Day Finding on a Petition to List 42 Great Basin and Mojave Desert Springsnails as Threatened or Endangered with Critical Habitat.	Notice of 90-day Petition Finding, Substantial and Not substantial.	76 FR 56608-56630
9/21/2011	12-Month Finding on a Petition to List Van Rossem's Gull-billed Tern as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 58650-58680
9/22/2011	Determination of Endangered Status for Casey's June Beetle and Designation of Critical Habitat.	Final Listing Endangered.	76 FR 58954-58998
9/27/2011	12-Month Finding on a Petition to List the Tamaulipan Agapema, Sphingicampa blanchardi (no common name), and Ursia furtiva (no common name) as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 59623-59634
9/27/2011	Partial 90-Day Finding on a Petition to List 404 Species in the Southeastern United States as Endangered or Threatened With Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	76 FR 59836-59862

9/29/2011	90-Day Finding on a Petition to List the American Eel as Threatened.	Notice of 90-day Petition Finding, Substantial.	76 FR 60431-60444
10/4/2011	12-Month Finding on a Petition to List the Lake Sammamish Kokanee Population of Oncorhynchus nerka as an Endangered or Threatened Distinct Population Segment.	Notice of 12-month petition finding, Not warranted.	76 FR 61298-61307
10/4/2011	12-Month Finding on a Petition to List Calopogon oklahomensis as Threatened or Endangered.	Notice of 12-month petition finding, Not warranted.	76 FR 61307-61321
10/4/2011	12-Month Finding on a Petition To List the Amargosa River Population of the Mojave Fringe-toed Lizard as an Endangered or Threatened Distinct Population Segment.	Notice of 12-month petition finding, Not warranted.	76 FR 61321-61330
10/4/2011	Endangered Status for the Alabama Pearlshell, Round Ebonyshell, Southern Sandshell, Southern Kidneyshell, and Choctaw Bean, and Threatened Status for the Tapered Pigtoe, Narrow Pigtoe, and Fuzzy Pigtoe; with Critical Habitat.	Proposed Listing Endangered.	76 FR 61482-61529
10/4/2011	90-Day Finding on a Petition To List 10	Notice of 90-day Petition Finding,	76 FR 61532-61554

	Subspecies of Great Basin Butterflies as Threatened or Endangered with Critical Habitat.	Substantial and Not substantial.	

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10/5/2011........................	90-Day Finding on a Petition to List 29 Mollusk Species as Threatened or Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Substantial and Not substantial.	76 FR 61826-61853
10/5/2011........................	12-Month Finding on a Petition to List the Cactus Ferruginous Pygmy-Owl as Threatened or Endangered with Critical Habitat.	Notice of 12-month petition finding, Not warranted.	76 FR 61856-61894
10/5/2011........................	12-Month Finding on a Petition to List the Northern Leopard Frog in the Western United States as Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 61896-61931
10/6/2011........................	Endangered Status for the Ozark Hellbender Salamander.	Final Listing Endangered.	76 FR 61956-61978
10/6/2011........................	Red-Crowned Parrot......	Notice of 12-month petition finding, Warranted but precluded.	76 FR 62016-62034
10/6/2011........................	12-Month Finding on a Petition to List Texas	Notice of 12-month petition finding,	76FR 62166-62212

	Fatmucket, Golden Orb, Smooth Pimpleback, Texas Pimpleback, and Texas Fawnsfoot as Threatened or Endangered.	Warranted but precluded.	
10/6/2011	12-Month Finding on a Petition to List the Mohave Ground Squirrel as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 62214-62258
10/6/2011	Partial 90-Day Finding on a Petition to List 404 Species in the Southeastern United States as Threatened or Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Not substantial.	76 FR 62260-62280
10/7/2011	12-Month Finding on a Petition to List the Black-footed Albatross as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 62504-62565
10/11/2011	12-Month Finding on a Petition to List Amoreuxia gonzalezii, Astragalus hypoxylus, and Erigeron piscaticus as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 62722-62740
10/11/2011	12-Month Finding on a Petition and Proposed Rule to List the Yellow-Billed Parrot.	Notice of 12-month petition finding, Warranted Propose Listing, threatened.	76 FR 62740-62754
10/11/2011	12-Month Finding on a	Notice of 12-month	76 FR 62900-62926

	Petition to List the Tehachapi Slender Salamander as Endangered or Threatened.	petition finding, Not warranted.	
10/11/2011......................	Endangered Status for the Altamaha Spinymussel and Designation of Critical Habitat.	Final Listing Endangered.	76 FR 62928-62960
10/11/2011......................	12-Month Finding for a Petition to List the California Golden Trout as Endangered.	Notice of 12-month petition finding, Not warranted.	76 FR 63094-63115
10/12/2011......................	12-Month Petition Finding, Proposed Listing of Coqu[iacute] Llanero as Endangered, and Designation of Critical Habitat for Coqu[iacute] Llanero.	Notice of 12-month petition finding, Warranted; Proposed Listing Endangered.	76 FR 63420-63442
10/12/2011......................	12-Month Finding on a Petition to List Northern Leatherside Chub as Endangered or Threatened.	Notice of 12-month petition finding, Not warranted.	76 FR 63444-63478
10/12/2011......................	12-Month Finding on a Petition to List Two South American Parrot Species.	Notice of 12-month petition finding, Not warranted.	76 FR 63480-63508
10/13/2011......................	12-Month Finding on a Petition to List a Distinct Population Segment of the Red Tree Vole as Endangered or Threatened.	Notice of 12-month petition finding, Warranted but precluded.	76 FR 63720-63762

12/19/2011	90-Day Finding on a Petition To List the Western Glacier Stonefly as Endangered With Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	76 FR 78601-78609
1/3/2012	90-Day Finding on a Petition to List Sierra Nevada Red Fox as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	77 FR 45-52
1/5/2012	Listing Two Distinct Population Segments of Broad-Snouted Caiman as Endangered or Threatened and a Special Rule.	Proposed Reclassification.	77 FR 666-697
1/12/2012	90-Day Finding on a Petition To List the Humboldt Marten as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	77 FR 1900-1908
1/24/2012	90-Day Finding on a Petition to List the `I'iwi as Endangered or Threatened.	Notice of 90-day Petition Finding, Substantial.	77 FR 3423-3432
2/1/2012	90-Day Finding on a Petition to List the San Bernardino Flying Squirrel as Endangered or Threatened With Critical Habitat.	Notice of 90-day Petition Finding, Substantial.	77 FR 4973-4980
2/14/2012	Determination of Endangered Status for the Rayed Bean and Snuffbox Mussels Throughout Their Ranges.	Final Listing Endangered.	77 FR 8632-8665

Our expeditious progress also includes work on listing actions that we funded in previous fiscal years and in FY 2012 but have not yet been completed to date. These actions are listed below. Actions in the top section of the table are being conducted under a deadline set by a court. We are implementing a work plan that

establishes a framework and schedule for resolving by September 30, 2016, the status of all of the species that the Service had determined to be qualified as of the 2010 Candidate Notice of Review. The Service submitted such a work plan to the U.S. District Court for the District of Columbia in In re Endangered Species Act Section 4 Deadline Litigation, No. 10-377 (EGS), MDL Docket No. 2165 (D. D.C. May 10, 2011), and obtained the court's approval. The Service had already begun to implement that work plan last FY and many of these initial actions in our work plan include work on proposed rules for candidate species with an LPN of 2 or 3. As discussed above, selection of these species is partially based on available staff resources, and when appropriate, include species with a lower priority if they overlap geographically or have the same threats as the species with the high priority. Including these species together in the same proposed rule results in considerable savings in time and funding, when compared to preparing separate proposed rules for each of them in the future. Actions in the lower section of the table are being conducted to meet statutory timelines, that is, timelines required under the Act.

Actions Funded in Previous FYs and in FY 2012 But Not Yet Completed

Species	Action
Actions Subject to Court Order/Settlement Agreement	
4 parrot species (military macaw, yellow-billed parrot, scarlet macaw).\5\	12-month petition finding.
Longfin smelt....................	12-month petition finding.
20 Maui-Nui candidate species \2\ (17 plants, 3 tree snails) (14 with LPN = 2, 2 with LPN = 3, 3 with LPN = 8).	Proposed listing.
Umtanum buckwheat (LPN = 2) and white bluffs bladderpod (LPN = 9).\4\	Proposed listing.
Grotto sculpin (LPN = 2) \4\.....	Proposed listing.
2 Arkansas mussels (Neosho mucket (LPN = 2) & Rabbitsfoot (LPN = 9)).\4\	Proposed listing.
Diamond darter (LPN = 2) \4\.....	Proposed listing.
Gunnison sage-grouse (LPN = 2) \4\.	Proposed listing.

Coral Pink Sand Dunes Tiger Beetle (LPN = 2) \5\.	Proposed listing.
Lesser prairie chicken (LPN = 2).	Proposed listing.
4 Texas salamanders (Austin blind salamander (LPN = 2), Salado salamander (LPN = 2), Georgetown salamander (LPN = 8), Jollyville Plateau (LPN = 8)).\3\	Proposed listing.
West Texas aquatics (Gonzales Spring Snail (LPN = 2), Diamond Y springsnail (LPN = 2), Phantom springsnail (LPN = 2), Phantom Cave snail (LPN = 2), Diminutive amphipod (LPN = 2)).\3\	Proposed listing.
2 Texas plants (Texas golden gladecress (Leavenworthia texana) (LPN = 2), Neches River rose-mallow (Hibiscus dasycalyx) (LPN = 2)).\3\	Proposed listing.
4 AZ plants (Acuna cactus (Echinomastus erectocentrus var. acunensis) (LPN = 3), Fickeisen plains cactus (Pediocactus peeblesianus fickeiseniae) (LPN = 3), Lemmon fleabane (Erigeron lemmonii) (LPN = 8), Gierisch mallow (Sphaeralcea gierischii) (LPN = 2)).\5\	Proposed listing.
FL bonneted bat (LPN = 2).\3\	Proposed listing.
3 Southern FL plants (Florida semaphore cactus (Consolea corallicola) (LPN = 2), shellmound applecactus (Harrisia (= Cereus) aboriginum (=gracilis)) (LPN = 2), Cape Sable thoroughwort (Chromolaena frustrata) (LPN = 2)).\5\	Proposed listing.
21 Big Island (HI) species \5\ (includes 8 candidate species--6 plants & 2 animals; 4 with LPN = 2, 1 with LPN = 3, 1 with LPN = 4, 2 with LPN = 8)	Proposed listing.
12 Puget Sound prairie species (9 subspecies of pocket gopher (Thomomys mazama ssp.) (LPN = 3), streaked horned lark (LPN = 3), Taylor's checkerspot (LPN = 3), Mardon skipper (LPN = 8)).\3\	Proposed listing.
2 TN River mussels (fluted kidneyshell (LPN = 2), slabside pearlymussel (LPN = 2)).\5\	Proposed listing.
Jemez Mountain salamander (LPN = 2) \5\.	Proposed listing.

Actions with Statutory Deadlines	
5 Bird species from Colombia and Ecuador.	Final listing determination.
Queen Charlotte goshawk..........	Final listing determination.
6 Birds from Peru & Bolivia......	Final listing determination.
Loggerhead sea turtle (assist National Marine Fisheries Service) \5\.	Final listing determination.
Platte River caddisfly (from 206 species petition) \5\.	12-month petition finding.
Ashy storm-petrel \5\...........	12-month petition finding.
Honduran emerald................	12-month petition finding.
Eagle Lake trout \1\............	90-day petition finding.
Spring Mountains checkerspot butterfly.	90-day petition finding.
Aztec gilia \5\.................	90-day petition finding.
White-tailed ptarmigan \5\.......	90-day petition finding.
Bicknell's thrush \5\...........	90-day petition finding.
Sonoran talussnail \5\..........	90-day petition finding.
2 AZ Sky Island plants (Graptopetalum bartrami & Pectis imberbis) \5\.	90-day petition finding.
Desert massasauga...............	90-day petition finding.
Boreal toad (eastern or southern Rocky Mtn population) \5\.	90-day petition finding.
Alexander Archipelago wolf \5\...	90-day petition finding.
Eastern diamondback rattlesnake..	90-day petition finding.

\1\ Funds for listing actions for these species were provided in previous FYs.
\2\ Although funds for these high-priority listing actions were provided in FY 2008 or 2009, due to the complexity of these actions and competing priorities, these actions are still being developed.
\3\ Partially funded with FY 2010 funds and FY 2011 funds.
\4\ Funded with FY 2010 funds.
\5\ Funded with FY 2011 funds.

We have endeavored to make our listing actions as efficient and timely as possible, given the requirements of the relevant law and regulations, and constraints relating to workload and personnel. We are continually considering ways to streamline processes or achieve economies of scale, such as by batching related actions together. Given our limited budget for implementing section 4 of the Act, these actions described above collectively constitute expeditious progress.

The Bay-Delta DPS of longfin smelt will be added to the list of candidate species upon publication of this 12-month finding. We will continue to evaluate this DPS as new information becomes available. Continuing review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

We intend that any proposed listing determination for the Bay-Delta DPS of longfin smelt will be as accurate as possible. Therefore, we will continue to accept additional information and comments from all concerned governmental agencies, the scientific community, industry, or any other interested party concerning this finding.

References Cited

A complete list of references cited is available on the Internet at http://www.regulations.gov and upon request from the San Francisco Bay-Delta Fish and Wildlife Office (see ADDRESSES section).

Authors

The primary authors of this notice are the staff members of the San Francisco Bay-Delta Fish and Wildlife Office.

Authority

The authority for this section is section 4 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.).

Dated: March 13, 2012.

Gary D. Frazer,
Acting Director, Fish and Wildlife Service.

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