**DEPARTMENT OF THE INTERIOR**

**Fish and Wildlife Service**

**50 CFR Part 17**

**RIN 1018-AB66**

## Endangered and Threatened Wildlife and Plants; Proposed Threatened Status for the Delta Smelt

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Proposed rule.

**SUMMARY:** The Fish and Wildlife Service (Service) proposes to determine the delta smelt (*Hypomesus transpacificus*) to be a threatened species, pursuant to the Endangered Species Act of 1973, as amended (Act). This osmerid fish species occurs only in Suisun Bay and the Sacramento-San Joaquin estuary (the Delta) near San Francisco Bay, California. The delta smelt has declined nearly 90 percent over the last 20 years, and is primarily threatened by large freshwater exports of Sacramento River and San Joaquin River outflows for agriculture and urban use. The prolonged drought, introduced nonindigenous aquatic species, and agricultural and industrial chemicals also threaten this species.

This proposal, if made final, would implement the protection and recovery provisions afforded by the Act for the delta smelt. The Service seeks all available data and comments from the public regarding this proposal.

**DATES:** Comments from all interested parties must be received by January 31, 1992. Public hearing requests must be received by November 18, 1991.

**ADDRESSES:** Comments and materials concerning this proposal should be submitted to the Field Supervisor, Sacramento Field Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, E-1803, Sacramento, California 95825-1846. Comments and materials received will be available for public inspection, by appointment, during normal business hours at the above address.

**FOR FURTHER INFORMATION CONTACT:** A. Keith Taniguchi (see **ADDRESSES** section) at 916/978-4866 or FTS 460-4866).

**SUPPLEMENTARY INFORMATION:**

### Background

The delta smelt was originally classified as the same species as the pond smelt (*Hypomesus olidus*), but Hamada recognized the delta smelt as a distinct species in 1961 (cited in Moyle 1976, 1980). Hamada retained the name *H. olidus* for the delta smelt and renamed the pond smelt *H. sakhalinus*. In 1963 McAllister renamed the delta smelt from *H. olidus* to *H. transpacificus*, with a Japanese subspecies (*H. t. nipponensis*) and a California subspecies (*H. t. transpacificus*). More recent taxonomic work has shown that these subspecies should be recognized as species, the delta smelt being *H. transpacificus* and the Japanese smelt being *H. nipponensis* (Moyle 1980).

The delta smelt was described as follows by Moyle *et al.* (1989): A slender-bodied fish typically 60-70 mm (2.36-2.76 in) in standard length (SL), although a few may attain 120 mm (4.73 in) SL. Live fish are nearly translucent and have a steely-blue sheen to their sides. Occasionally there may be one chromatophore between the mandibles, but usually none is present. Its mouth is small, with a maxilla that does not extend past the mid-point of the eye. The eyes are relatively large; the orbit width is contained about 3.5-4 times in the head length. Small, pointed teeth are present on the upper and lower jaws. The first gill arch has 27-33 gill rakers and there are 7 branchiostegal rays. There are 9-10 dorsal fin rays, 8 pelvic fin rays, 10-12 pectoral fin rays, and 15-17 anal fin rays. The lateral line is incomplete and has 53-60 scales along it. There are 4-5 pyloric caeca.

Length-frequency data validate that the delta smelt is primarily a species with a 1-year (annual) life span (Moyle *et al.* In Press). Juvenile delta smelt are 40-50 mm (1.58-1.97 in) fork length (FL) by early August. They become sexually mature adults when 55-70 mm (2.17-2.76 in) FL. They rarely grow larger than 80 mm (3.15 in) FL (the largest smelt on record is 126 mm (4.96 in) FL). Delta smelt longer than 50 mm (1.97 in) FL are rare throughout their range by the following June because adult delta smelt die after spawning.

Historically, the delta smelt occurred from Suisun Bay and upstream to the town of Isleton on the Sacramento River and Mossdale on the San Joaquin River. It is the only smelt endemic to California and the only true native estuarine species found in the Delta (Moyle *et al* 1989, Stevens *et al.* 1990, Moyle *et al.* In Press, Wang 1986). The delta smelt is a euryhaline species (species adapted to living in fresh and brackish water) that occupies estuarine areas with salinities below 2 grams per liter (parts per thousand, ppt), rarely occurring in estuarine waters with more than 10-12 ppt salinity, about one-third sea water (Ganssle 1966 in Moyle 1976).

In proposing to designate critical habitat (see "Critical Habitat" section), the Service identified those areas within the Sacramento-San Joaquin River Delta that contain the constituent elements required by the delta smelt for successful survival and reproduction. Constituent elements for the delta smelt include space for population growth, cover or shelter, feeding areas, littoral zone habitat for reproduction and rearing of juveniles, and appropriate salinity levels for survival and reproduction. A review of the available information indicates that these constituent elements are found in the

Delta estuary in an area which extends past Isleton on the Sacramento River, (to the Delta cross channel, near Walnut Grove), to the north, and south along the San Joaquin and Middle River to the south end of Bacon Island to the south (see map). The area being proposed for critical habitat, although not identical to the documented historic range of the delta smelt, includes those areas that currently contain the constituent elements essential for the conservation of this species. Preliminary data indicate that delta smelt occur in areas outside the documented historic range of the species (P. Moyle, pers. comm.). These areas are therefore included in the proposed critical habitat designation.

Delta smelt historically congregated in upper Suisun Bay and Montezuma Slough (mainly during March to mid-June) when the Sacramento and San Joaquin River flows were high. During very high river outflows some smelt may be washed into San Pablo Bay, but the rapidly restored higher salinities do not allow permanent populations of delta smelt to become established there. Because of substantial human-caused changes in the relative ratios of seasonal freshwater outflows, the center of delta smelt abundance, since 1982, has shifted to the Sacramento River channel in the Delta. Delta smelt are now rare in Suisun Bay, and virtually absent from Suisun Marsh where they once were seasonally common (Moyle *et al.* 1989). Even though suitable spawning and nursery habitat now occur less frequently in Suisun Bay than previously, suitable conditions, when they are present, provide for increased levels of delta smelt recruitment that augment overall population levels.

Delta smelt have a low fecundity, about 1,400–2,800 eggs per female, relative to two other species of Osmeridae occurring in California that exhibit fecundities from 5,000–25,000 eggs per female (Moyle 1976). Delta smelt spawn in freshwater at temperatures from about 7–15 °C between February and June. Most spawning occurs in the dead-end sloughs and shallow edge-waters of channels in the Delta; spawning also has been recorded in Montezuma Slough near Suisun Bay and far upstream in the Sacramento River near Rio Vista (Radtke 1966, Wang 1986). The adhesive demersal eggs attach to hard substrates such as rocks, gravel, tree roots, and submerged branches. Based on data for closely related species, delta smelt eggs probably hatch in 12–14 days. The planktonic larvae either are transported downstream to the mixing zone, or hatch there. Within the mixing zone, the pelagic larvae are zooplanktivores and feed on copepods, cladocerans, and amphipods. The primary food for all life stages of the delta smelt are the nauplius, copepodite, copepodid, and adult stages of the euryhaline copepod *Eurytemora affinis*. Adult smelt consume *E. affinis* during all times of the year. The opossum shrimp (*Neomysis mercedis*) is secondarily important as food for adult smelt, and cladocerans (*Daphnia* sp., *Bosmina* sp.) are consumed seasonally by adult smelt.

Available data indicate the decline in the delta smelt population has been concurrent with increased human changes to seasonal Delta hydrology, freshwater exports, and the accompanying changes in the temporal, spatial, and relative ratios of water diversions. These altered hydrological effects, coupled with severe drought years and introduced nonindigenous aquatic species, appear to have reduced the species' capacity to recover from natural seasonal fluctuations in hydrology for which it was adapted.

Many introduced species may adversely affect all life stages of the delta smelt. These introduced species compete for the zooplankton for food, or alter the species composition of the zooplankton community, thereby further decreasing the ability of the delta smelt population to recover.

In 1987 the Service funded an analysis of survey data (Moyle and Herbold 1989). These survey data were collected from Suisun Marsh and the Delta by the University of California, Davis, and the California Department of Fish and Game. The report concluded that: (1) Freshwater flows set an upper limit to delta smelt stock recruitment within the year, (2) other environmental factors (physical and/or biological) may further depress the smelt population, however, the proportion of time when water flows are reversed (upstream flow) in the lower San Joaquin River during the egg and larval stages probably is the major source of density-independent mortality to the delta smelt, and (3) a larger adult smelt population was associated with higher freshwater outflows because these flows produced higher plant and animal biomasses at all aquatic trophic levels.

**Previous Service Action**

In a letter dated May 7, 1990, the California-Nevada Chapter of the American Fisheries Society expressed its concern to the Service that increased water exports and diversions from the Delta Region, coupled with California's drought conditions, have critically endangered the delta smelt. Although not a formal petition, they recommended expeditious Federal listing of this species as an endangered species pursuant to the Act.

The Service included the delta smelt as a category 1 candidate species in the January 6, 1989, Animal Notice of Review (50 FR 554). Category 1 species are species for which data in the Service's possession are sufficient to support proposals for listing. On June 29, 1990, the Service received a petition dated June 26, 1990, from Dr. Don C. Erman, President-Elect of the California-Nevada Chapter of the American Fisheries Society, to list the delta smelt as an endangered species with critical habitat. The Service made a 90-day finding that substantial information had been presented indicating that the petitioned action may be warranted, and announced this decision in the **Federal Register** on December 24, 1990 (55 FR 52852). The Service initiated a status review at that time. During the status review, the Service examined the available data on the early life history and ecology of this species. Available data on physiological tolerances and estuarine factors were also examined in relation to actual or potential threats to the delta smelt. Primary sources of information describing the many human factors and projects that may affect the Delta smelt are the expert testimonies presented to the California State Water Resources Control Board's 1987 Water Quality/Water Rights Proceeding on the San Francisco Bay and Sacramento-San Joaquin River Delta. This proceeding is also known as the Bay-Delta Proceeding, Evidentiary Hearing Record, July 7–December 29, 1987. The exhibits and transcripts spanned 54 days of hearings. Comments received by the Service on the petitioned action were also considered during the status review. This proposed rule constitutes the final affirmative finding for the petitioned action, in accordance with section 4(b)(3)(B)(ii) of the Act.

**Summary of Factors Affecting the Species**

Section 4 of the Endangered Species Act (16 U.S.C. 1533) and regulations (50 CFR part 424) promulgated to implement the listing provisions of the Act set forth the procedures for adding species to the Federal Lists. A species may be determined to be endangered or threatened because of one or more of the five factors described in section 4(a)(1). These factors and their application to the delta smelt (*Hypomesus transpacificus*) are as follows:

*A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range*

The delta smelt was one of the most common and abundant pelagic fish caught by California Department of Fish and Game trawl surveys in the Delta during the early 1970s (Stevens and Miller 1983, Moyle *et al.* 1989, Stevens *et al.* 1990). Its distribution once ranged from Suisun Bay upstream to Isleton on the Sacramento River and to Mossdale on the San Joaquin River (Radtke 1966, Moyle 1976, Moyle *et al.* 1989). Smelt populations did fluctuate a great deal in the past, but by 1982 the population had declined precipitously. Over the last 20 years, the population has experienced a ten-fold decline—from 2,600,000 to 280,000 individuals. Since 1982 the delta smelt population has remained relatively stable, but at low levels. The 1989 and 1990 populations have not shown any significant signs of recovery (Moyle and Herbold 1989, Moyle *et al.* 1989, Moyle *et al.* In Press, Stevens *et al.* 1990).

Much of the available data on the population dynamics of the delta smelt were obtained from studies focused on other fish species, such as striped bass (*Morone saxatilis*) and chinook salmon (*Oncorhynchus tshawytscha*). Consequently, the collection methods used in these studies were not designed to estimate the delta smelt population. The Service acknowledges this in the available database for the delta smelt. However, the data do indicate that this species has experienced a significant population decline over the past 10 years, that no apparent recovery is occurring, and the factors that have degraded the delta smelt's habitat continue to occur.

This species' pelagic life history, dependence on pelagic microzooplankton, 1-year life span, and low fecundity are characteristics of a fish species that will be affected greatly by perturbations to its reproductive habitat or larval nursery areas. It is especially affected during critical protracted drought periods, which will be exacerbated if there are additional alterations in hydrology caused by reductions of freshwater inflows to the Delta or by altered timing and/or duration of water exports. A weak stock-recruitment relationship, i.e., little evidence of the effect of parent population size on the offspring population size, strongly suggests that environmental or habitat factors may severely limit delta smelt abundance, even during those years when adults may be extremely abundant (Moyle *et al.* In Press).

Moyle *et al.* (1989) reported multiple and synergistic causes of the delta smelt decline in the following order of importance: (1) Reduced river outflows, primarily in the Sacramento and San Joaquin Rivers and their tributaries, (2) too high of a river outflow in years with unusually high rainfalls, (3) entrainment mortality caused by water diversion projects, (4) human and natural perturbations to the smelt's food web, (5) presence of toxic substances in the aquatic habitat (e.g., agricultural and industrial chemicals, heavy metals, etc.), and (6) loss of genetic integrity because of a sharply curtailed delta smelt population and because this curtailed population may become displaced by the wagasaki, or Japanese smelt (*Hypomesus nipponensis*), which was inadvertently introduced into reservoirs of the Sacramento River drainage by the California Department of Fish and Game (Moyle 1976).

Delta water diversions and exports presently total up to about 8 to 9 million acre-feet per year, excluding the upstream diversions. State and Federal projects export about 6 million acre-feet per year, and private local projects divert about 2 to 3 million additional acre-feet per year. Since 1983, the proportion of water exported from the Delta during October through March has been higher than in earlier years (Moyle *et al.* In Press). These proportionally higher exports have been conducted during the delta smelt's spawning season. Federal and State water diversion projects in the southern Delta export, by absolute volume, mostly Sacramento River water and some San Joaquin River water. At low to moderate river outflows, however, essentially all of the San Joaquin River water goes to the southern Delta where the large pumping plants are located. The State's Banks Pumping Plant presently exports freshwater at rates up to 6,400 cfs. The U.S. Bureau of Reclamation's Tracy Pumping Plant can export water at rates up to 4,600 cfs. In addition, local private diverters export up to 5,000 cfs from about 1,800 diversions scattered throughout the Delta.

When total diversion rates are high relative to Delta inflows, the lower San Joaquin River and other channels have a net upstream or reverse flow (Moyle *et al.* In Press, Moyle and Herbold 1989, Stevens *et al.* 1990). Reverse flows disorient out-migrating larval and juvenile fish of many species and result in large mortalities because of entrainment at the various pumping plants and other water diversion sites. Riverine and estuarine outflow are required for larvae and juvenile fish to migrate through the estuarine and bay ecosystems.

In recent years, the number of days of reversed San Joaquin River flow have increased, particularly during the February-June spawning months for delta smelt (Moyle *et al.* In Press). All size classes of delta smelt suffer mortalities when they are entrained by the pumping plants and diversions in the south Delta. This species' embryonic, larval, and postlarval mortality rates become higher as western Delta reversed river flows increase the salinity level and act to relocate the mixing zone.

The delta smelt is adapted for life in the mixing zone (brackish water/freshwater entrapment zone) of the Sacramento-San Joaquin estuary. The estuary is an ecosystem where the mixing zone and salinity levels are determined by the interaction of river inflow and tidal action. Moyle *et al.* (In Press) reported that delta smelt were most abundant in shallow, low salinity water associated with the mixing zone, except when they spawned. Their analysis showed that smelt were collected from water with a mean salinity of 2 ppt with a mean temperature of 15 degrees Celsius (°C), but found in salinities ranging from 0–14 ppt at temperatures ranging from 6–23 °C. The larvae require the high microzooplankton densities produced by the mixing zone environment. The best survival and growth of smelt larvae occur when optimum conditions in the mixing zone occupy a large area that includes extensive shoal regions containing suitable spawning substrates within the euphotic zone (depths less than 4 m). Sixty-two percent of delta smelt collected in Suisun Bay occurred at 3 sampling stations with depths less than 4 m; the remaining 38 percent were caught at 6 deeper stations.

During periods of drought and increased water diversions, the mixing zone and associated smelt populations are translocated farther upstream in the Delta. During years prior to 1984, the mixing zone was located in Suisun Bay during October through March (except in months with exceptionally high outflows or during years of extreme drought). From April through September, the mixing zone usually was found upstream in the channels of the rivers. Since 1984, the mixing zone has been located primarily in the river channels during the entire year, with the exception of the record flood outflows of 1986, because of increased water exports and diversions. Upstream, the mixing zone becomes confined to the deep river channels, becomes smaller in

total surface area, contains very few shoal areas of suitable spawning substrates, may have swifter, more turbulent water currents, and lacks the high zooplankton productivity. Delta smelt reproduction likely is adversely affected by the mixing zone now being situated in the main channels of the Delta (Moyle *et al.* In Press). In 1982 the delta smelt population declined in response to the shifted location of the mixing zone. In all respects, the upstream river channels are much less favorable for the spawning and survival of the smelt. The decline of the delta smelt population since 1982 has been concurrent with the increasing number of water project diversions that have confined the mixing zone to the deep, less productive channels in the lower rivers.

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

The delta smelt may be harvested as a non-target by-catch in commercial bait fisheries for other baitfish species. Some scientific collecting is conducted for the delta smelt; however, these activities do not appear to be adversely affecting this species. Native Americans historically harvested delta smelt for food, but modern Native Americans are not known to be harvesting this fish. There are no recreational or educational uses of this animal that may affect the delta smelt population.

*C. Disease or Predation*

Disease and predation are not known to be factors that threaten the delta smelt. However, a growing striped bass population may cause an increase in striped bass predation on all size classes of the delta smelt. An effort by the California Department of Fish and Game is underway to compensate for striped bass population mortalities caused by water export projects. The 1991 striped bass stock was very low relative to the population in the 1960s. The striped bass compensation program annually releases 1–2 million juvenile hatchery-reared striped bass in the estuary in an effort to rebuild the population.

*D. The Inadequacy of Existing Regulatory Mechanisms*

Regulatory mechanisms currently in effect do not provide adequate protection for the delta smelt or its habitat. This species is not listed by the State of California, and the Federal Government offers no protection on Federal lands beyond that which applies to wildlife in general on such lands. The California Fish and Game Commission ruled a petition to State list the species as unwarranted on August 30, 1990. It did not accept the California Department of Fish and Game's recommendation to State list the delta smelt as a threatened species (Stevens *et al.* 1990). State listing would have provided some measure of protection to the species because State agencies would have been required to consult with the California Department of Fish and Game if any project they funded or carried out would adversely affect the delta smelt. However, even if California had listed the delta smelt, the species would not have been protected from the adverse effects of Federal actions.

Suisun Bay is the best known nursery habitat for this fish's reproduction and larval survival, but the habitat has been altered because of higher than normal salinities in spring. These higher salinities are caused by the large number of freshwater diversions which allow brackish seawater to intrude farther upstream. At present, there are relatively few periods when freshwater outflow volumes through the Delta and Suisun Bay of any significance are mandated for wildlife or fisheries. Federal and State agencies had planned to increase 1991, and probably 1992, water supplies for out-of-stream uses at the expense of environmental protection of estuarine fish and wildlife resources in the fifth, and potentially sixth years, of drought (Morat 1991). Because of significantly higher than normal precipitation and subsequent higher instream flows during March, 1991, a State agency request for relaxation of Delta water quality standards was withdrawn. It is likely, should the severe California drought continue, that this water quality relaxation action would be requested again in the near future to favor out-of-stream water use over the need to protect aquatic habitats for fish and wildlife. At present, there are no regulatory mechanisms that require consistent low salinities in important delta smelt estuarine habitats.

Present regulatory processes do not ensure that water inflows to Suisun Bay and the western Sacramento-San Joaquin estuary will be adequate to maintain the mixing zone near or in Suisun Bay for the sustenance of wildlife and their habitats. The California State Water Resources Control Board (Board) has the authority to condition or require changes in the amount of water inflow and the amount of water exported or diverted from the Delta. However, the Board has not taken action to improve the water flow and/or water quality of the Delta to protect aquatic and other wildlife, including candidate species for listing under the Act. Any action by the Board may occur too late to prevent the further endangerment and potential extinction of the delta smelt in the Sacramento-San Joaquin estuary ecosystem. December 1992 is the estimated completion date for the Board's water quality plan. The Service testified at the Board's Water Quality/Water Rights Hearings in 1987 and recommended that the delta smelt be added to the Animal Notice of Review as a category 1 candidate species (Lorentzen 1987). The Board has not taken regulatory or legal action to protect this animal or its habitat during the 4 years since the Service expressed its concern for several species of the Sacramento-San Joaquin estuary. Therefore, the Service considers the existing regulatory mechanisms inadequate for assuring the long-term existence of delta smelt in Suisun Bay and the Delta.

*E. Other Natural or Manmade Factors Affecting its Continued Existence*

The delta smelt is vulnerable because of its short (1-year) life span and its present small population size. The limited gene pool may result in depressed reproductive vigor and loss of genetic variation.

Poor water quality also may be a threat. All major rivers in this species' historic range are exposed to large volumes of agricultural and industrial chemicals that are applied in the California Central Valley watersheds (Nichols *et al.* 1986). Agricultural chemicals and their residues find their way into the rivers and estuary. Toxicology studies of rice field irrigation drain water of the Colusa Basin Drainage Canal documented significant toxicity of drain water to striped bass embryos and larvae, medaka larvae, and the major food organism of the striped bass larvae and juveniles, the opossum shrimp (*Neomysis mercedis*). This drainage canal flows into the Sacramento River just north of the City of Sacramento. The majority of drain water samples collected during April and May 1990 were acutely toxic to striped bass larvae (96 h exposures), the third consecutive year that the Colusa Basin rice irrigation drain water has been acutely toxic (Bailey *et al.* 1991). While water toxicity has been documented as negatively impacting striped bass larvae, studies have not been conducted to determine the effects of water toxicity on delta smelt. However, delta smelt may be similarly affected by agricultural and industrial chemical run-off.

Some heavy metal contaminants have been released into the Delta from industrial and mining enterprises. While the effects of these contaminating compounds on delta smelt larvae and their microzooplankton food resources are not well known, the compounds could potentially adversely affect delta smelt survival.

In recent years, untreated discharges of ship ballast water introduced nonindigenous aquatic species to the Sacramento-San Joaquin estuary ecosystem (Carlton *et al.* 1990). Several introduced species may adversely affect the delta smelt. An Asian clam (*Potamocorbula amurensis*), introduced as veliger larvae at the beginning of the present drought, was first discovered in Suisun Bay during October 1986. By June 1987, the Asian clam was nearly everywhere in Suisun, San Pablo, and San Francisco Bays irrespective of salinity, water depth, and sediment type at densities greater than 10,000 individuals per square meter. Asian clam densities declined to 4,000 individuals per square meter as the population aged during the year (Carlton *et al.* 1990). Persistently low river outflow and concomitant elevated salinity levels may have contributed to this species population explosion (Carlton *et al.* 1990). The Asian clam could potentially play an important role in affecting the phytoplankton dynamics in the estuary. It may have an effect on higher trophic levels by decreasing phytoplankton biomass and by directly consuming *Eurytemora affinis* copepod nauplii, the primary food of delta smelt.

Three non-native species of euryhaline copepods (*Sinocalanus doerrii, Pseudodiaptomus forbesi,* and *Pseudodiaptomus marinus*) established themselves in the Delta between 1978–1987 (Carlton *et al.* 1990) while *Eurytemora affinis* populations, the native euryhaline copepod, have declined since 1980. It is not known if the introduced species have displaced *E. affinis* or whether changes in the estuarine ecosystem now favor *S. doerrii* and the two *Pseudodiaptomus* species (Moyle *et al.* 1989). These introduced copepod species are more efficient at avoiding the predation of larval delta smelt. The introduced copepods also exhibit a different swimming behavior that makes them less attractive to a feeding delta smelt larvae. Because of reduced food availability or feeding efficiency causing decreased food ingestion rates, the weakened delta smelt larvae is more vulnerable to starvation or predation.

The significantly altered microzooplankton food web now present in the Suisun Bay-Delta estuary may have decreased the gross growth efficiency of delta smelt larvae. Gross growth efficiency is the proportion of weight-specific food ingestion rate that goes to larval fish body growth. When food ingestion rates are low, gross growth efficiency is low. At low gross growth efficiencies, larval fish take much longer to metamorphose to juveniles. Long larval stage durations increase the likelihood that density-dependent mechanisms (e.g., predators, over-grazing of food resources, etc.) and density-independent mechanisms (e.g., adverse salinities, temperature, absence of zooplankton, water diversion entrainment and impingement mortality, etc.) would develop to adversely affect survival and recruitment. In temperate latitudes, where spawning is temporally and spatially confined, as it is for the delta smelt, both mortality and growth rates tend to be low. Ingestion in temperate species is relatively low compared to tropical species, and larval stage duration is long and potentially highly variable. Under these circumstances small changes in either mortality rates or growth rates can have significant adverse effects on recruitment potential (Shepherd and Cushing 1980, Houde 1989). Under these conditions the timing of spawning and the availability of favorable spawning sites for adults are critical to the recruitment success of the spawned cohort.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species in determining to propose this rule. The Service acknowledges that the available data on the population dynamics of the delta smelt were collected incidental to other investigations and were not intended to provide a population estimate. The Service believes however, that these data represent the best available information and support a finding that listing is warranted. The available data do indicate a significant population decline over the last 20 years. Though the current population has remained relatively stable over the last 5 years, it has done so at low levels. No apparent recovery is occurring. The delta smelt faces threats from a more frequent upstream shift of its aquatic estuarine habitat, and a reduction of available habitat due to drought, water exports and diversions. The shift in location of the mixing zone, as well as the reduced area available to the smelt, is expected to continue in the future. These factors will continue to adversely affect all life stages of the delta smelt. Because the smelt population is at such low levels, this species' 1-year lifespan is also a factor which threatens the species. The failure of a single reproductive season could significantly affect the ability of this species to survive and recover. Based on the evaluation of all available information on population dynamics and threats to this species, the preferred action is to propose the listing of the delta smelt as a threatened species.

**Critical Habitat**

Critical habitat for a threatened or endangered species is defined by section 3 of the Act as: (i) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the provisions of section 4 of the Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and, (ii) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Section 4(a)(3) of the Act requires that, to the maximum extent prudent and determinable, the Secretary designate critical habitat concurrently with determining a species to be endangered or threatened. Because delta smelt populations since 1983 have been less than 13 percent of population levels during 1958–1983, and the population is restricted to Suisun Bay and the Delta, critical habitat is being proposed for the delta smelt to include all submerged lands below ordinary high water and the entire water column contained in Suisun Bay, the length of Montezuma Slough, portions of the Sacramento River, portions of the Delta, portions of the San Joaquin River, and the contiguous water bodies in between (a complex of bays, dead-end sloughs, channels typically less than 4 m deep, marshlands, etc.) in their entirety; specifically, the Suisun Bay through the Delta estuary at and beneath the water surface to the present benthic bathymetry in Contra Costa County, Sacramento County, San Joaquin County, and Solano County, California. Constituent elements in these areas include space for population growth, cover or shelter, maintenance of appropriate littoral zone reproduction habitat to sustain embryos and to rear larvae and juveniles, and 0–2 ppt salinities during the January to June delta smelt reproductive season. The areas being proposed for critical habitat are representative of the historic

geographical and ecological distribution of the species. They would contain the mixing zone in shallower areas less than 4 m deep where the productivity of phytoplankton and microzooplankton would be optimal, and the survival and recruitment of delta smelt larvae would be maximized. The "Proposed Regulations Promulgation" section below provides a precise metes and bounds description of the proposed critical habitat.

The Suisun Bay through Delta estuary defined by ordinary high water is known to be habitat for delta smelt and satisfies all known criteria for the physiological, behavioral, and ecological requirements of the conservation of this species. The aquatic habitat which is encompassed by this rule provides a freshwater to low salinity aquatic environment for unaffected delta smelt reproduction and rearing. This habitat also provides the hydrology and hydrodynamics necessary to provide a delta smelt nursery area and microzooplankton food for delta smelt larvae.

A weak stock-recruitment relationship strongly suggests that environmental or habitat factors may severely limit delta smelt abundance. Habitat requirements at crucial stages of the life cycle such as spawning and development of newly-hatched smelt larvae may be much more narrow than previously thought.

Section 4(b)(8) of the Act requires, for any proposed or final regulation that designates critical habitat, a brief description and evaluation of those activities (public or private) that may adversely modify such habitat or may be affected by such designation. Actions that could adversely affect critical habitat for this species are high diversion and export rates of surface water inflows, in combination with upstream water storage management practices and operations, that would allow the near-bottom seawater water mass to intrude upstream of Suisun Bay during late winter through early summer. Specific activities that could cause the foregoing include:

(1) Water export or substantially increased water usage for domestic, industrial, irrigation, municipal, or other purposes that would cause salinities in Suisun Bay to rise above 2 ppt between February and June; or

(2) Contaminated or untreated surface and ground water runoff, or seeps, entering the Suisun Bay and upper Delta from agricultural, industrial, mining, municipal, or similar operations.

Water exports from the Delta permitted by the California State Water Resources Control Board and implemented by the California Department of Water Resources and the U.S. Bureau of Reclamation may be affected by the designation of critical habitat. State and Federal agencies export about 6 million acre-feet per year of freshwater from the Delta Region, and private Delta water diverters remove an additional 2–3 million acre-feet per year of Delta inflow through about 1,800 unscreened diversion structures. Water exports permitted or funded by the Bureau of Reclamation which may adversely affect critical habitat, if designated as proposed, would be subject to section 7 consultation. Permits issued by the Corps of Engineers to construct or modify water diversion structures may also be subject to consultation with the Service.

Section 4(b)(2) of the Act requires the Service to consider economic and other impacts of designating a particular area as critical habitat. The Service will consider the critical habitat designation in light of all economic and other relevant impacts before making a decision on whether to issue a final rule.

### Available Conservation Measures

Conservation measures provided to species listed as endangered or threatened under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Recognition through listing encourages and results in conservation actions by Federal, State, and private agencies, groups, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the States and requires that recovery actions be carried out for all listed species. Such actions are initiated by the Service following listing. The protection required of Federal agencies and the prohibitions against taking and harm are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer informally with the Service on any action that is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat. If a species is subsequently listed and its critical habitat is designated, section 7(a)(2) requires Federal agencies to insure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of such a species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service. Federal actions which may affect the delta smelt include U.S. Army Corps of Engineers funding or issuance of permits for water pumping facilities or structures, levee construction or repairs, and channel dredging and dredge spoil disposal projects. Other examples include U.S. Bureau of Reclamation water export or water management operations or projects, and U.S. Environmental Protection Agency actions pertaining to the water quality standards of Suisun Bay, Suisun Marsh, and the Delta. Measures to protect the listed winter-run chinook salmon, for which the National Marine Fisheries Service has jurisdiction under the Act, also may affect the delta smelt and may require consultation with the Service.

The Act and its implementing regulations found at 50 CFR 17.21 and 17.31 set forth a series of general prohibitions and exceptions that apply to all threatened wildlife not covered by a special rule. These prohibitions, in part, would make it illegal for any person subject to the jurisdiction of the United States to take (including harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt any such conduct), import or export, transport in interstate or foreign commerce in the course of commercial activity, or sell or offer for sale in interstate or foreign commerce any threatened fish or wildlife species not covered by a special rule. It also is illegal to possess, sell, deliver, carry, transport, or ship any such wildlife that has been taken illegally. Certain exceptions apply to agents of the Service and State conservation agencies.

Permits may be issued to carry out otherwise prohibited activities involving threatened wildlife species under certain circumstances. Regulations governing threatened species permits are at 50 CFR 17.32. Unless otherwise provided by special rule, such permits are available for scientific purposes, to enhance the propagation or survival of the species, for economic hardship, zoological exhibition, educational purposes, special purposes consistent with the Act, and/or for incidental take in connection with otherwise lawful activities.

**Public Comments Solicited**

The Service intends that any final action resulting from this proposal will be as accurate and as effective as possible. Therefore, comments or suggestions from the public, other concerned governmental agencies, the scientific community, industry, or any other interested party concerning this proposed rule are hereby solicited. Comments particularly are sought concerning:

(1) Biological, commercial trade, or other relevant data concerning any threat (or lack thereof) to this species;

(2) The location of any additional populations of this species;

(3) The reasons why any habitat should or should not be determined to be critical habitat as provided by section 4 of the Act;

(4) Constituent habitat elements critical for the conservation of the delta smelt;

(5) Additional information concerning the range and distribution of this species;

(6) Further statistical data on population size and stability of this species;

(7) Current or planned activities in the subject area and their possible impacts on this species; and

(8) Any foreseeable economic and other impacts resulting from the proposed designation of critical habitat.

Any final decision on this proposal will take into consideration all the comments and additional information received by the Service, and such communications may lead to a final decision that differs from this proposal.

The Endangered Species Act provides for a public hearing on this proposal, if requested. Requests must be received within 45 days of the date of publication of the proposal. Such requests must be made in writing and addressed to the Field Supervisor, Sacramento Field Office, U.S. Fish and Wildlife Service, 2800 Cottage Way, E-1803, Sacramento, California 95825-1846.

**National Environmental Policy Act**

The Service has determined that an Environmental Assessment, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

**References Cited**

A complete list of all references cited herein is available on request from the Field Supervisor, Sacramento Field Office (See **ADDRESSES** section).

**Authors**

The primary authors of this proposed rule are A. Keith Taniguchi, Sacramento Field Office (see **ADDRESSES** section) (telephone 916/978-4866 or FTS 460-4866); and Robert Ruesink, U.S. Fish and Wildlife Service, Fish and Wildlife Enhancement, 911 N.E. 11th Avenue, Portland, Oregon 97232 (503/231-6131 or FTS 429-6131).

**List of Subjects in 50 CFR Part 17**

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, and Transportation.

**Proposed Regulations Promulgation**

**PART 17— [AMENDED]**

Accordingly, it is hereby proposed to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

1. The authority citation for part 17 continues to read as follows:

**Authority:** 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500, unless otherwise noted.

2. It is proposed to amend § 17.11(h) by adding the following, in alphabetical order under FISHES, to the List of Endangered and Threatened Wildlife:

**§ 17.11 Endangered and threatened wildlife.**

* * * * *

(h) * * *

| Species | | Historic range | Vertebrate population where endangered or threatened | Status | When listed | Critical habitat | Special rules |
|---|---|---|---|---|---|---|---|
| Common name | Scientific name | | | | | | |
| * | * | * | * | * | * | | |
| FISHES: | | | | | | | |
| * | * | * | * | * | * | | |
| Smelt, delta | *Hypomesus transpacificus* | U.S.A. (CA) | Entire | T | | 17.95(e) | NA |
| * | * | * | * | * | * | | |

3. It is further proposed to amend § 17.95(e) by adding critical habitat of the delta smelt in the same alphabetical sequence as the species occurs in § 17.11(h).

**§ 17.95 Critical habitat—fish and wildlife.**

(e) * * *

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DELTA SMELT (*Hypomesus transpacificus*)

California: Areas of all water and all submerged lands below ordinary high water and the entire water column bound by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays), the length of Montezuma Slough, portions of the Sacramento River, portions of the Delta, portions of the San Joaquin River, and the contiguous water bodies in between (a complex of bays, dead-end sloughs, channels typically less than 4 m deep, marshlands, etc.) as more particularly described below:

Beginning at the Carquinez bridge which crosses the Carquinez Strait, thence northwesterly along the north shore of Suisun Bay to Montezuma Slough; thence upstream to its confluence with the Sacramento River; thence up the Sacramento River to Walnut Grove; thence along the Delta Cross Channel to the North Fork Mokelumne River; thence downstream to its confluence with the San Joaquin River; thence upstream to the confluence of Middle River; thence southerly to the South Bacon Island Canal; thence due west to Old River; thence northwesterly to Rock Slough; thence westerly to Sand Mound Slough; thence northerly to Dutch Slough; thence westerly to Big Break and its confluence with the San Joaquin River; thence downstream to its confluence with Suisun Bay; thence westerly along the south shore of Suisun Bay to the Carquinez Bridge.

Constituent elements of the area proposed as critical habitat include space for population growth, cover or

shelter, estuarine water with a salinity of 0–2 ppt in Suisun Bay during January to June for reproduction, and a salinity of 0–10 ppt for maintenance of the required zooplankton for food, and maintenance of a littoral zone for sustaining embryos, larvae and juveniles. The seasonal water quality is affected by natural phenomena such as floods, droughts and tidal currents (or other events) and human actions. The interaction of these variable influences continually or seasonally shift the geographic location of the mixing zone throughout the area of critical habitat designated above. The critical habitat would contain the mixing zone in shallow water areas typically less than 4 m deep where the productivity of phytoplankton and zooplankton would be optimal and delta smelt survival maximized.

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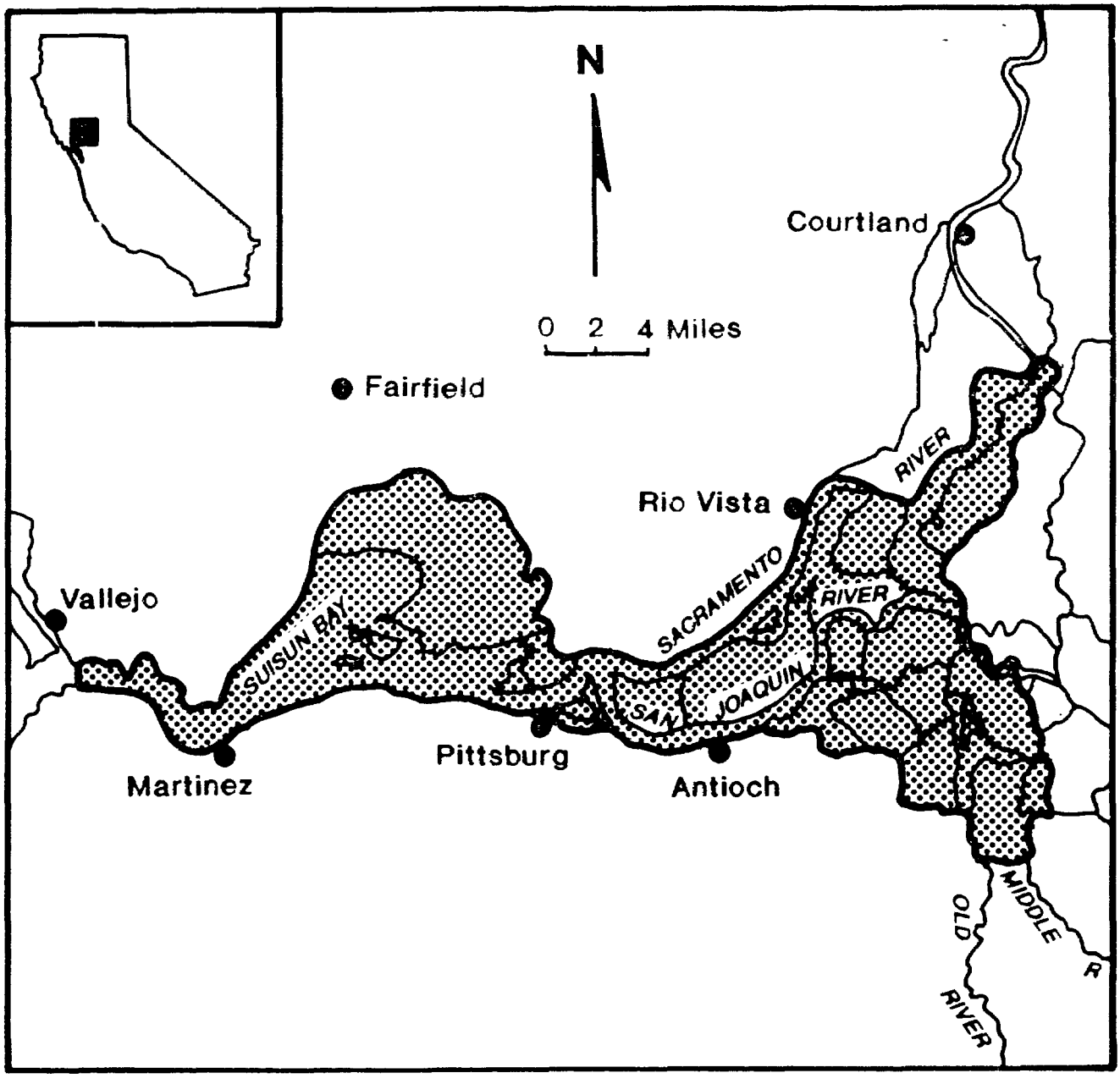


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Dated: September 27, 1991.

**Richard N. Smith,**

*Director, Fish and Wildlife Service.*

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