DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R8–ES–2014–0001; FXES11130900000C6–123–FF09E30000]

RIN 1018–AY03

Endangered and Threatened Wildlife and Plants; Reclassifying the Tidewater Goby From Endangered to Threatened

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule and 12-month finding.

SUMMARY: We, the U.S. Fish and Wildlife Service (Service), announce a 12-month finding on a petition to reclassify the tidewater goby (*Eucyclogobius newberryi*) as threatened under the Endangered Species Act of 1973, as amended (Act). The species is currently listed as endangered. After review of all available scientific and commercial information, we find that reclassifying the tidewater goby as threatened is warranted, and, therefore, we propose to reclassify tidewater goby as threatened under the Act. We are seeking information and comments from the public regarding this proposed rule.

DATES: We will accept comments received or postmarked on or before May 12, 2014. Please note that if you are using the Federal eRulemaking Portal (see **ADDRESSES**), the deadline for submitting an electronic comment is 11:59 p.m. Eastern time on this date. We must receive requests for public hearings, in writing, at the address shown in the **FOR FURTHER INFORMATION CONTACT** section by April 28, 2014.

ADDRESSES: *Written comments:* You may submit comments by one of the following methods:

- *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov.* In the Search box, enter Docket No. FWS–R8–ES–2014–0001, which is the docket number for this rulemaking. Then, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on ''Comment Now!''
- *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R8–ES–2014–0001; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see the Information Requested section below for more information).

Copies of documents: This proposed rule is available on *http://www.regulations.gov.* In addition, the supporting file for this proposed rule will be available for public inspection, by appointment, during normal business hours, at U.S. Fish and Wildlife Service (Service), Ventura Fish and Wildlife Office, 2493 Portola Road, Suite B, Ventura, CA 93003; telephone 805–644–1766. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Services (FIRS) at 800–877–8339.

FOR FURTHER INFORMATION CONTACT: Stephen P. Henry, Deputy Field Supervisor, telephone: 805–644–1766. Direct all questions or requests for additional information to: TIDEWATER GOBY QUESTIONS, U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, 2493 Portola Road, Suite B, Ventura, CA 93003. Individuals who are hearing-impaired or speech-impaired may call the Federal Relay Service at 1–800–877–8337 for TTY assistance.

SUPPLEMENTARY INFORMATION:

Executive Summary

Purpose of Regulatory Action

On May 18, 2010, we received a petition dated May 13, 2010, from The Pacific Legal Foundation, requesting that the tidewater goby be reclassified as threatened under the Act. We published a 90-day finding on January 19, 2011 (76 FR 3069), that stated our conclusion that the petition presented substantial scientific or commercial information indicating that the petitioned action may be warranted. This document serves as the 12-month finding for the petition, as well as a proposed rule to reclassify the tidewater goby as threatened.

Description of Proposed Action

On February 4, 1994, we listed the tidewater goby as endangered based on the threats described below in the *Previous Determinations Regarding the Tidewater Goby* section of this proposed rule.

According to the Act and our regulations at 50 CFR 424.11(c), a species may be reclassified if the best scientific and commercial data available substantiate that the species is no longer endangered because of the following 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. After review of all available scientific and commercial information, we find that reclassifying the tidewater goby as threatened is warranted for the following reasons:

(1) The number of localities known to be occupied has nearly tripled since listing (from 43 to 114; see 78 FR 8746).

(2) The increase in occupied localities indicates that the tidewater goby is more resilient in the face of severe drought events than believed at the time of listing.

(3) Threats identified at the time of listing have been reduced or are not as serious as previously thought. Threats appeared more pervasive due to the severe drought from 1987 to 1992.

(4) Sea level rise poses a substantial threat to the species that, while not an imminent threat, is likely to lead to the species becoming endangered in the foreseeable future.

We conclude that the endangered designation no longer correctly reflects the current status of the species and the tidewater goby is more appropriately classified as a threatened species.

Information Requested

We want any final rule resulting from this proposal to be as effective as possible. Therefore, we invite tribal and governmental agencies, the scientific community, industry, and other interested parties to submit information, comments or recommendations concerning any aspect of this proposed rule. Comments should be as specific as possible. We are specifically requesting information regarding:

(1) The potential effects of climate change on the tidewater goby's status, especially in regard to sea level rise;

(2) Progress toward completion of metapopulation viability analyses for the species;

(3) Any previously unknown threats not discussed in this proposed rule or threats that may be having an effect of the tidewater goby's status not fully analyzed in this proposed rule;

(4) The development of management plans within the tidewater goby's range since its listing in 1994 that may have positive effects on the species' conservation; and

(5) The appropriate taxonomic classification of the tidewater goby (particularly regarding the southern California populations), along with any

additional supporting genetic, morphological, or other information.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include. Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act (16 U.S.C. 1531 *et seq.*) directs that determinations as to whether any species is an endangered or threatened species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning the proposed rule by one of the methods listed in the **ADDRESSES** section. We request that you send comments only by the methods described in the **ADDRESSES** section. Comments must be submitted to *http://www.regulations.gov* before 11:59 p.m. (Eastern Time) on the date specified in the **DATES** section.

If you submit information via *http://www.regulations.gov,* your entire submission—including any personal identifying information—will be posted on the Web site. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov.*

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov,* or by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT**).

Public Hearings

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. We must receive your request within 45 days after the date of this **Federal Register** publication. Send your request to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Peer Review

In accordance with our joint policy, ''Notice of Interagency Cooperative Policy for Peer Review in Endangered Species Act Activities,'' which was published on July 1, 1994 (59 FR 34270), we will seek the expert opinion of at least three appropriate independent specialists regarding scientific data and interpretations contained in this proposed rule. We will send copies of this proposed rule to the peer reviewers immediately following publication in the **Federal Register**. The purpose of such review is to ensure that our decisions are based on scientifically sound data, assumptions, and analysis. Peer reviewers will conduct an assessment of the proposed rule, and the specific assumptions and conclusions regarding the proposed downlisting. This assessment will be completed during the public comment period.

We will consider all comments and information we receive during the comment period on this proposed rule as we prepare the final determination. Accordingly, the final decision may differ from this proposal.

Previous Federal Action

On October 24, 1990, we received a petition to add the tidewater goby to the Federal List of Endangered and Threatened Wildlife. We published a finding on March 22, 1991, that listing the tidewater goby as endangered may be warranted (56 FR 12146). A proposal to list the species as endangered was published on December 11, 1992 (57 FR 58770), and following a public comment period, we listed the tidewater goby as endangered throughout its entire range on February 4, 1994 (59 FR 5494).

On June 24, 1999, the Service published a proposed rule to remove the northern populations of tidewater goby from the List of Endangered and Threatened Wildlife (delist), concurrent with a proposal to keep listed as endangered a distinct population segment (DPS) of tidewater goby in Orange and San Diego Counties (64 FR 33816). On November 7, 2002, we withdrew the proposed delisting and DPS designation rule because we determined, based upon comments received, that our specific conclusions in the proposal were not corroborated by the information we received during three comment periods (67 FR 67803). Withdrawing the delisting proposal for the northern populations of the tidewater goby made the establishment of an endangered southern California DPS unnecessary.

On February 6, 2013, we published a final rule designating critical habitat in 65 units covering 12,156 acres in California (78 FR 8746). Details on the history of legal actions related to the critical habitat designation can be found in that final rule.

We finalized the recovery plan for the tidewater goby on December 7, 2005. A detailed discussion of the recovery plan and the downlisting and delisting criteria are provided below in the ''Recovery Plan'' section, following the analysis of the statutory factors.

We published a notice announcing the initiation of a 5-year status review for the tidewater goby under section 4(c)(2) of the Act on March 22, 2006 (71 FR 14538), and requested information from the public concerning the status of the tidewater goby (71 FR 14538). We notified the public of completion of the 5-year review on March 5, 2008 (73 FR 11945). In the 5-year review, completed on September 28, 2007, we recommended that the tidewater goby be reclassified as threatened because we concluded that the species was not in imminent danger of extinction. A copy of the 2007 5-year review for the tidewater goby is available on the Service's Environmental Conservation Online System (*http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E071*) and at *http://www.regulations.gov.*

On May 18, 2010, we received a petition dated May 13, 2010, from The Pacific Legal Foundation, requesting that the tidewater goby be reclassified as threatened under the Act. The petitioner cited the 5-year review of the tidewater goby's status completed by the Service in 2007 to support the petition. We published a 90-day finding on January 19, 2011 (76 FR 3069), concluding that the petition presented substantial scientific or commercial information indicating that the petitioned action (reclassification of the tidewater goby) may be warranted. This proposed rule constitutes the 12-month finding on the May 13, 2010, petition to reclassify the tidewater goby as threatened.

Background

Species Information

Species Description and Taxonomy

The tidewater goby is a small, elongate, gray-brown fish that rarely exceeds 5 centimeters (cm) (2 inches (in)) in length (Service 2005, p. 2). This species possesses large pectoral fins, and the pelvic or ventral fins are joined to each other below the chest and belly from below the gill cover back to just anterior of the anus. Male tidewater gobies are nearly transparent with a mottled brownish upper surface. Female tidewater gobies develop darker colors,

often black, on the body and dorsal and anal fins. Tidewater gobies have two dorsal fins set very close together or with a slightly confluent membrane. The first dorsal fin has five to seven slender spines, the second 11 to 13 soft, branched rays. The anal fin has 11 to 13 rays as well. The median fins are usually dusky, and the pectoral fins are transparent.

The tidewater goby is the only member of the genus *Eucyclogobius* in the Family Gobiidae. It was first described by Girard (1856), and Gill (1863) proposed it as a new species *Eucyclogobius newberryi* to distinguish the tidewater goby from other members of the family. *Eucyclogobius newberryi* is the currently published scientific name for the tidewater goby.

Distribution

The geographic range of the tidewater goby is limited to the coast of California (Eschmeyer *et al.* 1983, p. 262; Swift *et al.* 1989, p. 12). The species historically occurred from 5 kilometers (km) (3 miles (mi)) south of the California-Oregon border (Tillas Slough in Del Norte County) to 71 km (44 mi) north of the United States-Mexico border (Agua Hedionda Lagoon in San Diego County). The available documentation suggests the northernmost locality that forms one end of the historical and current geographic range of the tidewater goby has not changed over time (see for example, Eschmeyer *et al.* 1983, p. 262; Swift *et al.* 1989, p. 12). Tidewater gobies do not currently occur in Agua Hedionda Lagoon, and the species' southernmost known extant occurrence is the San Luis Rey River 8 km (5 mi) north of Agua Hedionda Lagoon. Although the northernmost and southernmost extent of the tidewater goby's range has not changed much over time, the species' distribution within the historical range has become patchy and fragmented.

Tidewater gobies are naturally absent from several large (80 to 217 km (50 to 135 mi)) stretches of coastline lacking lagoons or estuaries, and with steep topography or swift currents that may prevent the species from dispersing between adjacent localities (Earl *et al.* 2010, p. 104; Swift *et al.* 1989, p. 13). One such gap of approximately 160 km (100 mi) occurs from the Eel River in Humboldt County to Ten Mile River in Mendocino County. A second gap of approximately 97 km (60 mi) occurs between Lagoon Creek in Mendocino County to Salmon Creek in Sonoma County. Another large, natural gap of approximately 160 km (100 mi) occurs between the Salinas River in Monterey County and Arroyo del Oso in San Luis Obispo County. The southernmost gap, which is most likely the result of habitat loss and alteration, occurs between the Los Angeles Basin (city of Santa Monica, western Los Angeles County) and San Mateo Creek (Marine Corps Base (MCB) Camp Pendleton, San Diego County), a distance of approximately 130 km (80 mi).

Habitat loss and other anthropogenic (human—caused) factors have resulted in the tidewater goby now being absent from several localities where it historically occurred. These disappearances from specific localities have created smaller, artificial gaps in the species' geographic distribution (Capelli 1997, p. 7). Such localities include San Francisco Bay in San Francisco and Alameda Counties, and Redwood Creek and Freshwater Lagoon in Humboldt County. In central and northern California, Swift (*in litt.* 2007) believes it very unlikely that genetic interchange is possible between several groups of populations naturally separated by 32 km (20 mi) or more of rugged coastline. As anthropogenic gaps are created of equal or greater distance, recolonization and genetic exchange becomes less likely.

Swift *et al.* (1989, p. 13) reported that, as of 1984, tidewater gobies occurred, or had been known to occur, at 87 localities. This included localities at the extreme northern and southern end of the species' historical geographic range. An assessment of the species' distribution in 1993, using records that were limited to the area between the Monterey Peninsula in Monterey County and the United States-Mexico border, found tidewater gobies occurring at four additional sites since 1984 (Swift *et al.* 1993, p. 129). Other tidewater goby localities have been identified since 1993. Considering all of the known historical and currently occupied sites, tidewater gobies have been documented at 135 localities. Of these localities, gobies have been extirpated from 21 (16 percent), for a total of 114 localities that are known to be currently occupied (78 FR 8746) (see Figure 1); however, these localities are not regularly monitored, so the status of tidewater goby in many of these places may have changed since they were last surveyed.

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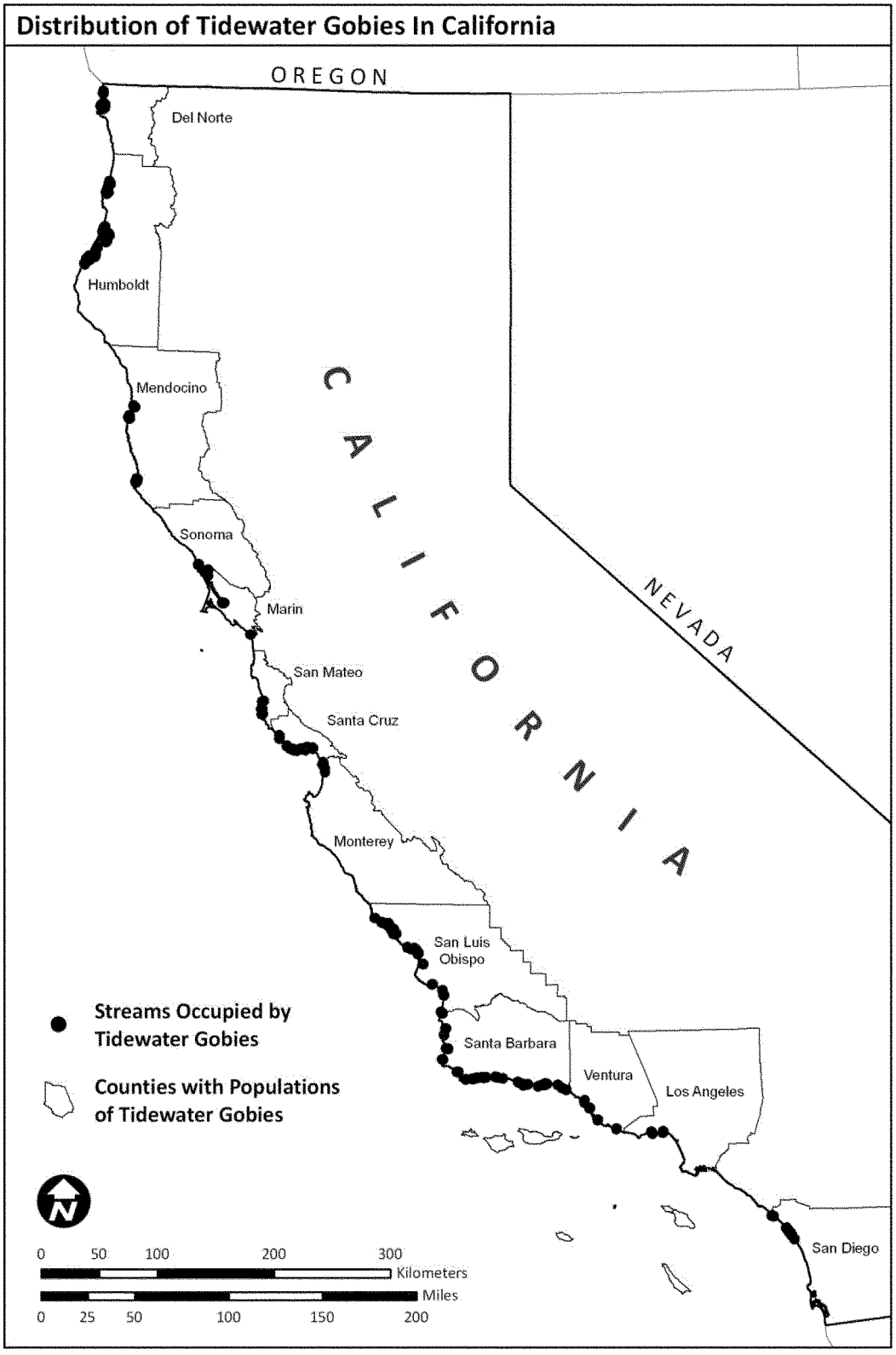
Figure 1



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Habitat

The tidewater goby inhabits lagoons, estuaries, backwater marshes, and freshwater tributaries to estuarine environments that closely correspond to major stream drainages. Sediments provided by major drainages produce sandy beaches with low-lying coastal areas conducive to formation of coastal lagoons (Habel and Armstrong 1977, p. 6; Swift *et al.* 1989, p. 13). Tidewater

gobies generally select habitat in the upper estuary, usually within the freshwater-saltwater interface. Although they may range upstream a short distance into freshwater, and downstream into water of up to about 75 percent saltwater (28 parts per thousand), the species is typically found in salinities of less than 12 parts per thousand (Swift *et al.* 1989, p. 7). These conditions occur in two relatively distinct situations: (1) The upper edge of large tidal bays, such as Tomales and Bolinas Bays near the entrance of freshwater tributaries; and (2) the coastal lagoons formed at the mouths of coastal rivers, streams, or seasonally wet canyons.

The areas that tidewater gobies occupy are dynamic environments that are subject to considerable fluctuation on a seasonal and annual basis. For example, the formation of a sandbar at the mouth of a lagoon occurs in the late spring as freshwater flows into the lagoon decline enough to allow the ocean to build up the sandbar through wave action on the beach. Winter rains and subsequently increased stream flows may bring in considerable sediment and dramatically affect the bottom profile and substrate composition of a lagoon or estuary. Fine mud and clay either move through the lagoon or estuary or settle out in the backwater marshes, while heavier sand is left in the lagoon or estuary. High flows associated with winter rains can scour out the lagoon bottom, with sand building up again after flows decline. These dynamic processes result in wetland habitats that, over time, change in location relative to stationary features that exist outside the flood zone (such as roads or buildings).

Tidewater gobies appear to be adapted to this broad range of environmental conditions (Worcester and Lea 1996, no pagination). Individuals held at the Granite Canyon Fish Culture Facility were subjected to a salinity tolerance test in hypersaline water (45 to 54 parts per thousand) for 6 months, with no mortality (Worcester and Lea 1996, no pagination). (The natural salinity of seawater ranges from 33 to 37 parts per thousand.) Holding temperatures (freshwater) varied from 4.0 to 21.5 degrees Celsius (C°) (39.2 to 70.7 degrees Fahrenheit (F°)). During the late 1980s and early 1990s, Karen Worcester (Morro Bay Estuary Program) conducted an investigation of habitat use in Pico Creek lagoon, and observed large numbers of tidewater gobies using the lower portion of the lagoon where highest salinities (up to 27 parts per thousand) were observed. In general, abundance did not appear to be associated with oxygen levels, which at times were quite low (Service 2007, p. 11).

While tidewater gobies tolerate a wide range of salinity and water quality conditions, Smith (*in litt.* 2007) reports that sandbar formation is important to produce the calm conditions that bring about the very abundant late summer populations. Periodic natural or artificial breaching of sandbars in summer reverses the freshening process, and sandbar re-formation produces stratified salinity conditions, with resultant warm and hypoxic (lacking oxygen) bottom conditions unsuitable for benthic invertebrates and for lagoon fish. As a result, artificial breaching or lack of sandbar formation may result in smaller populations that are restricted to areas upstream of tidal action (where salinity is lower and dissolved oxygen is higher). Open lagoons can sometimes provide some marginal habitat for fish near the tidally mixed mouth, but the substantially reduced remainder of the lagoon tends to be stratified, warm, and relatively unproductive. Partially closed lagoons tend to have warm, stratified conditions except every 2 weeks when very high tides cool and mix the lagoon.

Tidewater gobies also depend on calm backwaters as refuges against storm flows and/or draining of small lagoons when the sandbar is opened in winter. Populations are apparently periodically lost and then recolonize lagoon systems that provide poor winter refuges in flood years (such as Aptos, Soquel, and Moran lagoons in Santa Cruz County). At several localities, tidewater gobies have been apparently extirpated from lagoons that lack winter refugia (Waddell Lagoon in northern Santa Cruz County, for example).

Another feature of lagoons important to the tidewater goby is the availability of sediments for burrow construction and spawning. The sediments are usually spread quite evenly by declining flows; lagoons often end up only 1 to 2 meters (m) (3.3 to 6.6 feet (ft)) deep despite a width of 30 to 150 m (100 to 500 ft) or more (Habel and Armstrong 1977, pp. 4–7). This pattern holds true even in larger systems, such as the Santa Ynez River (Santa Barbara County) and Santa Margarita River (San Diego County). Half or more of the substrate of the lagoon will be soft sand, with mud in backwaters. Some rocks or gravel may be present, mostly at the upper (inlet) and lower (outlet) ends where constricted flow directly scours the channel. These rocks are exposed by high water flow. Declining flows continue to bring in sand that often covers the rocks by early spring.

Life History

Tidewater gobies generally live for only 1 year, with few individuals living longer than a year (Moyle 2002, p. 432). They may reproduce only once during their lifetime. Reproduction can occur at any time of the year, but it tends to peak from late April or May to July, and can continue into November, depending on seasonal temperatures and rainfall (Swenson 1999, p. 107). Fluctuations in rates of reproduction are probably due to death of breeding adults in early summer and colder temperatures or hydrological disruptions in winter (Swift *et al.* 1989, p. 107). Reproduction takes place in water between 9 to 25 C° (48 to 77 F°) at salinities of 2 to 27 parts per thousand (Swenson 1999, p. 103).

Male tidewater gobies begin digging vertical breeding burrows approximately 10 to 20 cm (4 to 8 in) deep in relatively unconsolidated, clean, coarse sand (averaging 0.5 millimeter (mm) (0.02 in) in diameter), after lagoons are closed off to the ocean by natural berms (Swift *et al.* 1989, p. 3; Swenson 1995). After the female lays eggs in the burrow, the male guards the eggs until they hatch. The larval gobies move to midwater vegetation until they mature enough to become benthic (free-swimming) and breed the next season.

Metapopulation Dynamics

Local populations of tidewater gobies are best characterized as metapopulations (Lafferty *et al.* 1999a, p. 1448). A metapopulation is a collection of populations separated by geographic distance, but connected by dispersing individuals. Local tidewater goby populations that occupy coastal lagoons and estuaries are usually separated from each other by the open ocean. Very few tidewater gobies have ever been captured in the marine environment (Swift *et al.* 1989, p. 7), which suggests this species rarely occurs in the open ocean. Studies suggest that some tidewater goby populations are persistent (Lafferty *et al.* 1999a, p. 1452), while other tidewater goby populations appear to experience intermittent extirpations. These extirpations may result from one or a series of factors, such as the drying up of some small streams during prolonged droughts (Lafferty *et al.* 1999a, p. 1451).

Some of the areas where tidewater gobies have been extirpated apparently have been recolonized when extant populations were present within a relatively short distance of the extirpated population. For example, Lafferty *et al.* (1999b, p. 621) concluded that tidewater gobies had recolonized Cañada Honda Creek in Santa Barbara

County from the Santa Ynez River approximately 9 km (5.5 mi) to the north. Recolonization may be occurring when high freshwater flows into lagoons and estuaries cause the entrance to the system to be breached and connect directly to the ocean. The high flows may flush tidewater gobies into the ocean and allow them to move up or down the coast with longshore currents and into adjacent lagoons where the species had been extirpated (Lafferty *et al.* 1999b, p. 621). These recolonization events suggest that tidewater goby populations exhibit a metapopulation dynamic where some populations survive or remain viable by continually exchanging individuals and recolonizations after occasional extirpations (Doak and Mills 1994, p. 619). They also suggest that flooding may sometimes have a positive effect by contributing to recolonization of localities where a tidewater goby population has become extirpated.

The largest wetland habitats where tidewater gobies have been known to occur are not necessarily the most secure, as evidenced by the fact that the Santa Margarita River in San Diego County and the San Francisco Bay have lost their populations of the tidewater goby. Water quality, habitat modification, and the introduction of numerous nonnative fish species (both competitors and predators) may have caused the tidewater goby to disappear from both areas (Service 2005, pp. 18–21, Appendix E). Today, the majority of the most stable and largest tidewater goby populations consist of lagoons and estuaries of intermediate sizes (2 to 50 hectares (ha) or 5 to 125 acres (ac)) that have remained relatively unaffected by human activities (Service 2005, p. 12). Many of the localities where tidewater gobies are persistent are likely to be ''source'' populations, and such localities probably provide the colonists for localities that intermittently lose their tidewater goby populations.

Historical records and survey results for several localities occupied by the tidewater goby are available (see Swift *et al.* 1989, pp. 18–19; Swift *et al.* 1994, pp. 8–16). These documents suggest the persistence of tidewater goby populations is related to habitat size, configuration, location, and proximity to human development. In general, the most stable and persistent tidewater goby populations occur in the lagoons and estuaries that are more than 1 ha (2.47 ac) in size and that have remained relatively unaffected by human activities (Lafferty *et al.* 1999a, pp. 1450–1453). We note, however, that some systems that are affected or altered by human activities also have relatively large and stable populations (for example, Humboldt Bay in Humboldt County, Pismo Creek in San Luis Obispo County, Santa Ynez River in Santa Barbara County, and the Santa Clara River in Ventura County). Also, some habitats less than 1 ha (2.47 ac) in size have tidewater goby populations that persist (Swift *et al.* 1997, p. 3). The best available information suggests that the lagoons and estuaries that have persistent populations are likely the source populations that provide individuals that colonize adjacent, smaller localities that have ephemeral tidewater goby populations (Lafferty *et al.* 1999a, p. 1452).

Genetics

Various genetic markers demonstrate that pronounced differences in the genetic structure of tidewater goby metapopulations exist, and that tidewater gobies in many localities are genetically distinct. Genetic variability across a species' distribution may be important to long-term species persistence because it represents the raw material for adaptation to differing local conditions and environmental change (Frankham 2005, p. 754). A study of mitochondrial control region and cytochrome b DNA sequences (molecular material used in genetic studies) from tidewater gobies that were collected at 31 localities throughout the species' geographic range has identified six major phylogeographic units (Dawson *et al.* 2001, p. 1171). These six regional units include the following areas: (1) North Coast (NC) Unit: Tillas Slough (Smith River) in Del Norte County to Lagoon Creek in Mendocino County; (2) Greater Bay (GB) Unit: Salmon Creek in Sonoma County to Bennett's Slough in Monterey County; (3) Central Coast (CC) Unit: Arroyo del Oso to Morro Bay in San Luis Obispo County; (4) Conception (CO) Unit: San Luis Obispo Creek in San Luis Obispo County to Rincon Creek in Santa Barbara County; (5) Los Angeles-Ventura (LV) Unit: Ventura River in Ventura County to Topanga Creek in Los Angeles County; and (6) South Coast (SC) Unit: San Pedro Harbor in Los Angeles County to Los Peñasquitos Lagoon in San Diego County. These units correspond to the recovery units identified in the recovery plan for the tidewater goby (Service 2005).

A more recent study to gather genetic distribution data for tidewater goby (Earl *et al.* 2010) used microsatellite DNA (versus the mitochondrial control region and cytochrome b DNA used by Dawson *et al.* 2001). Earl *et al.* concluded the following: (1) Populations of tidewater goby in northern San Diego County form a clade (a group of organisms that are more closely related to each other than any other group, implying a shared common ancestor) that has been reproductively isolated from all others for more than 2 million years (Earl *et al.* 2010, p. 112), and which appears to merit formal description as a species-level taxon; (2) populations along the mid-coast of California are sub-divided into regional groups, which are more similar to each other than different as believed from previous studies based on mitochondrial DNA (such as Dawson *et al.* 2001); and (3) the tidewater goby dispersed widely during a sea-level rise event approximately 7,000 years ago that connected separate watersheds, followed by increased isolation as the oceans receded again, resulting in geographic separation in the northernmost populations descended from a common ancestor (Earl *et al.* 2010, p. 111).

The conclusion that the North Coast populations of tidewater goby formed as a result of a single, evolutionarily recent episode of colonization of newly formed habitats is supported by McCraney and Kinziger (2009). They compared genetic variation of 13 naturally and artificially fragmented populations of tidewater goby in Northern California, including eight Humboldt Bay populations and five coastal lagoon populations, and made conclusions similar to Earl *et al.* (2010). McCraney and Kinziger (2009) also concluded that natural and artificial habitat fragmentation caused marked divergence among tidewater gobies in the North Coast populations. Their study showed that Humboldt Bay populations, due to isolation by manmade barriers, exhibited very high levels of genetic differentiation between populations, extremely low levels of genetic diversity within populations, and no migration among populations. They concluded that this pattern makes the Humboldt Bay populations of tidewater goby vulnerable to extirpation. In contrast, the study found that while coastal lagoon populations also exhibited very high levels of genetic differentiation between populations, the coastal lagoon populations displayed substantial levels of genetic diversity within populations, indicating occasional migration among lagoons (McCraney and Kinziger 2009, p. 32).

All coastal lagoons, with exception of Lake Earl in Del Norte County, appear to be stable and genetically healthy (McCraney and Kinziger 2009, p. 34). The Lake Earl population exhibited reduced levels of genetic diversity in comparison to similar coastal lagoon

populations (McCraney and Kinziger 2009. p. 34). They further concluded that reduced genetic diversity detected within Lake Earl is likely due to repeated population bottlenecking (previous reduction in population size that results in the population being descended from a small number of individuals, resulting in reduced genetic diversity within the population) that is a result of regular artificial breaching of the lagoon mouth.

Earl *et al.* (2010, p. 112) have suggested that the southern population of the tidewater goby to the south of the gap between Los Angeles and Orange Counties may merit formal description as a distinct species based on their different genetic makeup. However, a formal description has not yet been published. The Service is evaluating the genetic and taxonomic information to determine if it would be appropriate to consider listing the tidewater goby as separate species or other taxonomic units. For example, this could include considering listing a goby species or taxonomic unit to the south of Los Angeles County and another to the north. We are requesting information and comments on this distinction.

The conclusions from these genetic studies are: (1) Tidewater gobies exhibit considerable genetic diversity across their range; (2) the species can be divided into six phylogeographic units based on genetic similarities and differences; (3) the tidewater gobies to the south of the gap between Los Angeles and Orange Counties may be a distinct species based on their divergent genetic makeup compared to populations to the north; (4) the northernmost populations are also genetically distinct from other tidewater goby populations; (5) the populations at the north end of the species' distribution probably arose from a common ancestor at the end of sea level rises 7,000 years ago; and (6) natural and anthropogenic barriers have contributed to genetic differentiation among populations.

Previous Determinations Regarding the Tidewater Goby

Listing Rule

The 1990 petition to list the tidewater goby was submitted at the end of an extended drought in California that resulted in loss of habitat for the tidewater goby and severe declines in the number of occupied localities. In the 1994 listing rule (59 FR 5494), we made our determination that the tidewater goby was endangered based on the following: (1) The tidewater goby had been extirpated from nearly 50 percent of the lagoons and estuaries it had inhabited due to habitat alteration (channelization, water diversions, etc.) and drought; (2) only 43 populations remained, of which only 8 were considered large enough to be stable; (3) the tidewater goby was threatened by development, water quality issues, and other habitat alterations; and (4) the tidewater goby's downward trend was likely to continue regardless of the end of the drought due to the other threats acting on the species.

Proposed Delisting Rule

In the 1999 proposed rule to delist the northern populations of the tidewater goby (64 FR 33816), we identified three major reasons for our proposed action: (1) There were more populations in the north than were known at the time of listing (85 extant populations); (2) threats to those populations were less severe than previously believed; and (3) the tidewater goby has a greater ability than was known at the time of listing to recolonize sites from which it is temporarily absent. On November 7, 2002, we withdrew the proposed delisting and DPS designation rule because we determined, based upon comments received, that our specific conclusions in the proposal were not corroborated by the information we received during three comment periods (67 FR 67803). We determined that the information provided by the scientific community indicated that our 1999 assessment of the importance of new tidewater goby populations and the recolonization ability of the tidewater goby in the proposed delisting rule were premature, and agreed that it was prudent to wait and assess the persistence of these populations for a longer period of time. Withdrawing the delisting proposal for the northern populations of the tidewater goby made the establishment of an endangered southern California DPS unnecessary. We stated that we would focus on proceeding with the recovery planning process that would both guide conservation activities for the species and make explicit under what criteria the tidewater goby should be considered for delisting. Importantly, at the time of the withdrawal of the proposed delisting rule, we did not evaluate the appropriateness of downlisting the species instead of delisting, and we did not attempt to provide a more in-depth analysis of the magnitude and imminence of the various threats to the species.

5-Year Review

In conducting the 5-year status review (Service 2007), we performed an in-depth analysis of the magnitude and imminence of the various threats to the tidewater goby in light of the distribution of the species, and concluded that the tidewater goby should be reclassified as threatened because the species was not in imminent danger of extinction. The main reasons for this conclusion were: (1) The number of localities known to be occupied had increased since listing from 43 to 106; (2) the increase in occupied localities indicated the tidewater goby was more resilient in the face of severe drought events than believed at the time of listing; and (3) threats identified at the time of listing had been reduced or were not as serious as previously thought. We also concluded that there was a high likelihood that the results of ongoing genetic studies would indicate potential changes to the tidewater goby taxonomic classification, and that we should review those results prior to publication of a proposed downlisting rule.

Summary of Previous Determinations

At the time of its listing as endangered in 1994: (1) The tidewater goby had been extirpated from nearly 50 percent of the lagoons and estuaries it had inhabited due to an extended drought combined with habitat alteration (channelization, water diversions, etc.); (2) only 43 populations remained, of which only eight were considered large enough to be stable; and (3) the tidewater goby was threatened by development, water quality issues, and other habitat alterations. We concluded that these factors were severe enough that the tidewater goby was in a downward trend that would continue regardless of the end of the 1987–1992 drought. When we prepared a review of the species' status in 2007, the number of known occupied localities had increased to 106 at that time, and it was apparent that the predicted downward trend was in error. Although the other threats identified at the time of listing continued to impact the goby, we concluded that the main reason for the species' decline at the time of listing was the drought, and that the tidewater goby was more resilient than expected.

In the following sections, we analyze the current threats to the species to determine if their severity and magnitude have increased, decreased, or remain unchanged from the time of listing. We also evaluate whether any changes in these threats are sufficient to warrant reclassification of the tidewater goby.

Summary of Factors Affecting the Species

Section 4 of the Act and its implementing regulations (50 CFR part 424) set forth the procedures for listing species, reclassifying species, or removing species from listed status. ''Species'' is defined by the Act as including any species or subspecies of fish or wildlife or plants, and any distinct vertebrate population segment of fish or wildlife that interbreeds when mature (16 U.S.C. 1532(16)). A species may be determined to be an endangered or threatened species because of one or more of the five factors described in section 4(a)(1) of the Act: (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 human made factors affecting its continued existence. A species may be reclassified on the same basis.

Determining whether the status of a species has improved to the point that it can be downlisted requires consideration of whether the species is endangered or threatened because of the same five categories of threats specified in section 4(a)(1) of the Act. For species that are already listed as endangered or threatened, this analysis of threats is an evaluation of both the threats currently facing the species and the threats that are reasonably likely to affect the species in the foreseeable future following the delisting or downlisting and the removal or reduction of the Act's protections.

A species is an ''endangered species'' for purposes of the Act if it is in danger of extinction throughout all or a significant portion of its range and is a ''threatened species'' if it is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The word ''range'' in the significant portion of its range phrase refers to the range in which the species currently exists at the time of this status review. For the purposes of this analysis, we first evaluate the status of the species throughout all its range, then consider whether the species is in danger of extinction or likely to become so in any significant portion of its range.

The following analysis examines all five factors currently affecting, or that are likely to affect, the tidewater goby within the foreseeable future.

The tidewater goby was listed as endangered on February 4, 1994 (59 FR 5494). We made our determination based on the following: (1) The tidewater goby had been extirpated from nearly 50 percent of the lagoons and estuaries it had inhabited; (2) only 43 populations remained, and only eight of those were considered large enough to be stable; (3) the tidewater goby would continue to be at risk due to development, water quality issues, and other habitat alterations; and (4) the tidewater goby's downward trend was likely to continue regardless of the end of the drought due to the other threats acting on the species.

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

Capelli (1997, p. 7) estimated that 75 to 90 percent of the original estuarine acreage of California had been lost since 1850. Many of these wetlands were probably entirely lost to development (including development of harbors, channels, agriculture, industrial and business uses, residential development, and road construction) before surveys for tidewater gobies were being conducted. For example, over 95 percent of the wetlands that existed prior to 1850 in the San Francisco Bay have been lost (U.S. Geological Survey 2003), most of which were filled in entirely and are now covered by development.

By 1994, when the tidewater goby was listed, researchers believed that the species had been extirpated from nearly 50 percent of the lagoons within its historical range and that only 43 occupied localities remained (59 FR 5497). The final rule stated that the tidewater goby had experienced a substantial decline throughout its historical range and faced threats indicating the downward trend would continue because the species lives within specific habitat zones that have been, and would continue to be, targeted for development and degraded by human activities. In our 5-year review of the species (Service 2007), we recommended downlisting the tidewater goby to threatened because we concluded, in part, that threats such as habitat loss were not as severe as originally believed, as shown by the species' rebound from the drought (the number of occupied localities had increased from 43 to 106 at that time) despite continued effects of development and altered wetlands.

According to the recovery plan, approximately 55 to 70 of the localities recolonized since the listing in 1994 are naturally so small or have been so degraded over time that long-term persistence is uncertain (Service 2005, p. 6). By our calculation, approximately 60 percent of the recolonized localities are classified ''small habitat size'' (Service 2005, Appendix E). These small habitat areas are more likely to support ephemeral tidewater goby populations that may disappear when adverse conditions, such as drought or a rise in sea level (discussed below), affect the region (Lafferty *et al.* 1999a, p. 1452). Larger core or source populations may persist through conditions that would extirpate small populations. According to the recovery plan (Service 2005, Appendix E), 10 of these large core or source populations (described as large habitat size, abundant population density, regular presence) are known to exist.

Habitat Loss, Hydrology, and Sandbar Breaching

As described above, an estimated 75 to 90 percent of estuarine wetlands that possibly could have supported tidewater gobies have been lost in California (Capelli 1997, p. 7). Consequently, tidewater gobies likely occurred historically in more localities than at present. In many cases, these losses resulted in artificial gaps between localities or the widening of existing gaps. The habitat at many of these historical localities was lost to development (for example, harbors, channels, agriculture, industrial and business uses, residential development, road construction) before surveys for tidewater gobies were being conducted (see San Francisco Bay example, above). Most of these wetlands were filled in entirely and are now covered by development. Given that tidewater gobies may be able to disperse along sandy shores to some degree, it is likely that tidewater gobies in the southern portion of their range occupied estuaries and lagoons along the shores from Palos Verdes to the headlands at La Jolla when and where appropriate intermittently closed habitat occurred (Jacobs, *in litt.* 2007). Nearly all of this habitat has been opened for marinas and harbors (or closed to create freshwater impoundments). This has produced an anthropogenic (human-caused) gap between those occupied localities in Los Angeles and San Diego Counties of at least 130 km (80 mi).

Large areas of estuarine and coastal wetland habitat and many smaller estuaries and lagoons had been lost prior to the enactment of certain regulations that protect wetlands. Those losses that occurred in the past have largely been eliminated as a result of current laws and regulations protecting coastal habitats (see section below on Factor D). Although major habitat loss is

now unlikely, minor habitat disturbances (mostly less than one acre) will continue to occur throughout the tidewater goby's range, which in turn will result in impacts to the species. The amount of habitat disturbed varies widely from year-to-year, and we have no way of predicting how much will occur in any given year. However, Toline *et al.* (2006, no pagination) reported that since the tidewater goby was listed in 1994, over 100 biological opinions had been written by the Service to address adverse effects to the species (averaging approximately 8 projects per year, none of which posed jeopardy to the species). Projects covered by these biological opinions included: Flood control projects, removal of pipelines, bridge or crossing replacement and installations, water diversions, channel maintenance, sand and gravel extraction, and others. Many of these projects had a temporary effect on tidewater goby habitat, but some resulted in permanent changes, such as creation of permanent connections to seawater and channelization to encourage flushing of estuaries, that continue to have adverse effects on the tidewater goby throughout its range.

Some type of habitat degradation has occurred or is currently occurring throughout the current range of the species (Service 2005, Appendix E). Examples of ongoing activities that are occurring within tidewater goby habitat include annual dredging (such as that at Goleta Slough, Santa Barbara County), habitat restoration projects that are not compatible with tidewater goby needs (examples include Malibu Lagoon, Los Angeles County; Mission Creek, Santa Barbara County), and bridge widening projects (like Mission Creek). These projects are small in scale compared to large-scale habitat losses that occurred in the past; however, even small projects can have substantial effects on the species. One example of a small project that had a substantial effect on a tidewater goby population was repair work that began on February 24, 1998, on railroad trestles crossing San Mateo Creek Lagoon, San Diego County. This work included dredging portions of the creek and lagoon, and filling freshwater marshes that functioned as tidewater goby refugia. Previous surveys had found tidewater gobies to be abundant, but no tidewater gobies were found after the construction was completed (Swift and Holland 1998, pp. 5–7). The locality has since been recolonized or the numbers have rebounded after being driven to undetectable levels by the project (Toline *et al.* 2006, no pagination).

Based on the best available information, we conclude that these small projects generally have isolated, temporary effects and are not, by themselves, likely to significantly reduce the number of localities occupied by the tidewater goby in the future, compared to the extensive habitat losses that occurred prior to the species' listing in 1994. Our conclusion is based on the fact that the species continues to occupy those localities where these minor projects have occurred. Also, the current information indicates the tidewater goby has the capacity to recover from a severe drought that reduced its numbers dramatically, despite the ongoing effect of these smaller habitat disturbances.

Prior to the listing of the tidewater goby, modifications to the hydrology upstream of the lagoons and estuaries were common. These changes ranged from the installation and operation of tide gates (such as those at Humboldt Bay) to channelization for flood control. The functioning of these structures is intended to control water entering the lagoons from the watershed, and they are typically operated to minimize flooding of adjacent low-lying features like roads and buildings. McCraney *et al.* (2010, p. 3325) showed that artificial fragmentation of tidewater goby populations, such as those in Humboldt Bay caused by floodgates and levees, can lead to genetic isolation and possibly interfere with the long-term persistence of the tidewater goby in some localities. These current operations and potential future modifications for flood control do not mimic the natural conditions that tidewater gobies require for reproduction and may adversely influence salinities and the distribution of tidewater gobies in localities where they occur.

One method of controlling water levels in lagoons and estuaries is the breaching of sandbars. Such breaching occurs throughout the range of the tidewater goby. The main purpose of authorized breaching (pursuant to existing regulations) is to prevent inundation of nearby roads and private property (such as that at Lake Earl, Del Norte County and Goleta Slough, Santa Barbara County). Unauthorized breaching occurs periodically at the mouth of the Santa Clara River; the purpose is unknown but may be intended to expose mudflats for shorebirds, to enhance local surfing conditions, or to prevent inundation of the adjacent campgrounds at McGrath State Beach. In some instances, breaching is intended to move the stagnant water behind the sandbar out to the ocean due to the offensive odor or poor water conditions (Malibu Lagoon, Los Angeles County, for example). At the Bolsa Chica Reserve in Orange County, the lagoon has been permanently breached to encourage saltwater flow into the lagoon for the benefit of nesting birds such as plovers, terns, and gulls, and is no longer viable as tidewater goby habitat. Whatever the reason, breaching of sandbars drains lagoons and estuaries and results in habitat alterations that strand tidewater gobies and their eggs, leaving them vulnerable to predation by seabirds or desiccation, and may disrupt the normal breeding cycle (depending on when breaching occurs) (Capelli 1997, pp. 8–10). Where it happens, sandbar breaching has a substantial effect on the population at that locality.

Breaching is ongoing and likely to continue into the future to reduce upstream flooding when lagoons and estuaries are closed to the ocean. Other than permanent breaching, such as that at Bolsa Chica, these specific breaching activities and others do not happen every year, and the frequency at which they occur is dependent upon weather, tides, and other factors that we cannot predict very far into the future. Breaching occurs throughout the range of the species but is usually random, irregular, and sporadic. However, in response to climate change and sea level rise, we anticipate that sandbar breaching may occur more frequently in the future.

In terms of habitat loss and modification, our information indicates that despite advances in halting large-scale loss of wetland habitat that could support tidewater gobies, losses and alterations still occur and are expected to continue, but we cannot predict the number and locations of such projects in the future. Large projects have been replaced by multiple smaller projects, as demonstrated by the numerous biological opinions we have prepared for adverse effects to the tidewater goby since it was listed in 1994. Many of these projects are currently affecting tidewater goby habitat, and we expect more to occur in the future. We also know that hydrological changes to tidewater goby habitat have occurred and continue to occur, and that these changes are detrimental to tidewater goby persistence in some localities, and that sandbar breaching is a fairly widespread activity in the range of the tidewater goby. Some localities have experienced or are experiencing multiple threats; according to the recovery plan (Service 2005, Appendix E), more than 75 localities are likely subject to 2 or more kinds of habitat

degradation. Cumulatively, these activities are having a negative effect on tidewater goby habitat throughout its range, and other less common impacts, such as those resulting from agriculture, cattle grazing, and sewage treatment plant discharge, are also contributing to habitat loss and alteration.

While many sources of habitat loss or alteration are evident, compared to the large-scale habitat losses that occurred prior to the tidewater goby's listing, these are generally temporary and isolated or small in scale, so we do not anticipate severe impacts to the tidewater goby throughout its range in the short term. Where small and usually temporary effects occur, the tidewater goby has been able to persist (we do not have data on the size of populations following small projects, but the species reproduces profusely under proper conditions, and we expect it to rebound effectively). Over time, as these habitat alterations continue and other factors develop (such as climate change), we expect there may be a cumulative habitat loss that will result in loss of populations at some localities and that will reduce the range of the species. However, we conclude that the types of habitat alteration described above are not sufficient to currently cause rangewide declines in the tidewater goby's abundance or distribution.

Climate Change

In addition to the threats to tidewater goby habitat due to development, water quality, upstream flood control, and other alterations, the localities where tidewater gobies occur are threatened by global climate change. Sea level rise and hydrological changes associated with climate change are anticipated to have significant effects on tidewater goby habitat over the next several decades.

Sea level rise is a result of two phenomena: Thermal expansion (increased sea water temperatures) and global ice melt (Cayan *et al.* 2006, p. 5). Between 1897 and 2006, the observed sea level rise has been approximately 2 mm (0.08 in) per year, or a total of 20 cm (8 in) over that period (Heberger *et al.* 2009, p. 6). Older estimates projected that sea level rise along the California coast would follow a similar rate and reach 0.2–0.6 m (0.7–2 ft) by 2100 (IPCC 2007). More recent observations and models indicate that those projections were conservative and ignored some critical factors, such as melting of the Greenland and Antarctica ice sheets (Heberger *et al.* 2009, p. 6). Heberger *et al.* (2009, p. 8) have updated the sea level rise projections for California to 1.0–1.4 m (3.3–4.6 ft) by 2100, while Vermeer and Rahmstorf (2009, p. 21530) calculate the sea level rise globally at 0.57–1.9 m (2.4–6.2 ft); in both cases, recent estimates are more than twice earlier projections.

The effects of sea level rise could be compounded by and work synergistically with normal hydrological and meteorological phenomena along the California coast. The normal, but dramatic, tidal fluctuations that occur in California could be further increased with sea level rise. Storm severity is projected to increase with more frequent El Niño Southern Oscillations due to increasing surface water temperature (Cayan *et al.* 2006, p. 17). Storm severity is projected to increase to the north and decrease to the south, likely a consequence of the winter storm track shifting to the north (Cayan *et al.* 2009, p. 38). The combined effect of these phenomena could result in sea level rise reaching farther inland than previously anticipated in some models (Cayan *et al.* 2006, pp. 48–49; Cayan *et al.* 2009, p. 40).

Park *et al.* (1989, pp. 1–52) projected that of the saltmarshes along the coast of the contiguous United States, 30 percent would be lost with a 0.5-m (1.6-ft) sea level rise, 46 percent with a 1-m (3.3-ft) sea level rise, 52 percent with a 2-m (6.6-ft) sea level rise, and 65 percent with a 3-m (9.8-ft) sea level rise. While we cannot project directly to California from the estimates of Park *et al.* (1989, pp. 1–52), who focused on the east coast and Gulf coast of the United States, we can use it to make some estimates of what could happen along the West Coast. Assuming their estimates are accurate, we can anticipate that with a projected global sea level rise of up to almost 2 m (6.6 ft), approximately 52 percent of the remaining coastal saltmarshes in California could be inundated by 2100. Applying Heberger *et al.*'s (2009, p. 8) more conservative estimates for California to Park *et al.*'s calculations, with a projected sea level rise of 1.0–1.4 m (3.3–4.6 ft) by 2100, somewhere between 46 and 52 percent of the coastal saltmarshes in California would be inundated.

For the tidewater goby, these projections indicate that seal level rise has the potential to inundate coastal lagoons and transform them into primarily saltwater bodies (Cayan *et al.* 2006, pp. 34, 48–49). More severe storms that are likely to result from climate change (Cayan *et al.* 2006, p. 17), especially along the northern coast of California (Cayan *et al.* 2009, p. 38), combined with the higher than normal sea levels, will breach lagoon mouths more frequently from the ocean side. These breaches would increase the salinity within the tidewater goby's habitat. This would likely disrupt the tidewater goby's normal reproduction process, which requires closed lagoons and a specific range of salinities. The conversion of coastal lagoons and estuaries from brackish to primarily saltwater bodies, in addition to the inundation and breaching of sandbars, would eliminate habitat for tidewater gobies in many areas.

In addition to sea level rise, projections are that climate change will result in reduced freshwater flows into coastal lagoons and estuaries due to the following: (1) Decreased Sierra snowpack and more frequent droughts; (2) the need to extract more freshwater for human use (agriculture, growing populations) before it enters estuarine ecosystems; and (3) the likely intrusion of saltwater into California's single largest source of freshwater (the Sacramento-San Joaquin Delta) (Anderson *et al.* 2008, p. 4). Reduced freshwater supplies to coastal lagoons and estuaries, besides simulating the effects of drought on the tidewater goby, will exacerbate the intrusion of saltwater into coastal lagoons and estuaries that may result from sea level rise, thus converting lagoons and estuaries into primarily saltwater bodies that are not conducive to supporting tidewater gobies.

Although currently occupied localities may be inundated with saltwater due to sea level rise and declining freshwater input, currently freshwater habitats upstream of existing tidewater goby locations may become brackish as a result of sea level rise and develop habitat conditions suitable for the tidewater goby. In areas where this occurs, tidewater gobies may be able to move farther upstream as seawater moves farther inland. The ability of new habitat to develop and tidewater gobies to move upstream in response to saltwater intrusion is limited in many places by upstream modifications for flood control or other purposes (Service 2005, p. 17). In these locations, hard structures or development limit the extent of upstream habitat available that could potentially be converted to suitable brackish water areas suitable for gobies. These barriers are found throughout the range of the tidewater goby, and among regularly occupied tidewater goby localities, a few examples where upstream modifications may prevent migration include: Lagunitas Creek which has been subjected to channelization; the Santa Ynez River, which is channelized in portions and is diverted in some areas; Bennett Slough, which is channelized upstream, has been diverted, and for which flood control structures have

been installed; and the J Street Drain, which is concrete-lined and flows are controlled with a tide gate (Service 2005, Appendices C and E). As the sea level rises, the ability of tidewater gobies to move upstream to seek the habitat conditions they need may be impeded by these and other modifications. In addition, the lack of a natural interface between seawater and freshwater inflows may result in an abrupt change between saltwater and freshwater (instead of the mixing zone that exists under current conditions) and create unsuitable habitat for the tidewater goby.

The recovery plan (Service 2005, Appendix E) lists the localities currently and historically occupied by the tidewater goby and the threats to those localities. We assume that a shift upstream by tidewater gobies would be precluded at ''regularly'' and ''intermittently'' occupied localities where ''stream channelization'' is listed as a threat because the interface between saltwater and freshwater would not inundate areas where lagoons could form, but would be an abrupt interface where mixing of saltwater and freshwater occurs and does not allow tidewater goby habitat to establish. Similarly, those occupied localities for which ''salinity regime: dikes, levees, dams, etc.'' was listed as a threat could also form an abrupt fresh/saltwater interface where tidewater goby habitat could not form. Based on this assumption, we can calculate the number of localities where suitable tidewater goby habitat is not likely to form in response to sea level rise. Of the 124 localities considered ''regularly'' or ''intermittently'' occupied at the time the recovery plan was published (2005), 52 have ''stream channelization'' listed as a threat, 50 have ''salinity regime'' listed as a threat, and 26 localities have both listed as a threat. In total, 73 localities occupied by tidewater goby have either ''stream channelization'' or ''salinity regime'' or both listed as a threat. That would indicate that at least 59 percent (73 of 124) of the occupied localities that would be inundated by sea level rise may have little or no opportunity for suitable tidewater goby habitat to form upstream.

Another consideration is the human response to sea level rise. Existing development and infrastructure are at increasing risk, and those planning responses to sea level rise in California are exploring several options, including hard engineering, soft engineering, accommodation/adaptation, or retreat (California Coastal Commission 2001, pp. 18–25). While none of the responses have been ruled out, hard engineering (like sea walls or levees) and soft engineering (beach replenishment, sand bar protection) may be the most viable options (accommodation/adaptation could require costly structural fixes, and retreat requires the use of land that may not be available). Both of these engineering solutions are designed to work against sea level rise and will create an abrupt interface between saltwater and freshwater as opposed to allowing flooding of low-lying coastal areas. Consequently, areas where sea level rise is met by engineering solutions are less likely to accommodate a shift in tidewater goby habitat.

To summarize our analysis of the potential for upstream shifts in tidewater goby habitat in response to sea level rise, we estimate that up to 59 percent of the 124 localities considered regularly or intermittently occupied in the 2005 recovery plan (Service 2005, Appendix E) are not likely to accommodate higher sea levels such that ''new'' habitat for tidewater gobies would be created. Thus, we anticipate that by 2100, as much as 59 percent, and perhaps more, of the occupied localities could be extirpated by the combination of sea level rise with existing and future barriers to tidal inflow.

A less well-known aspect of climate change is ocean acidification. The increased amount of carbon dioxide in the atmosphere means rainfall captures more carbon dioxide and delivers it to the oceans. When carbon dioxide dissolves in seawater, the concentration of hydrogen ions increases, thereby increasing the acidity (Orr *et al.* 2005, p. 1). The lowering pH makes calcium carbonate less available for organisms that use it to form shells and exoskeletons. Projections are that ocean acidification, which began shortly after the Industrial Revolution and is accelerating in the 21st century, could disrupt the life cycles of many marine organisms that form the basis of complex ecosystems (Orr *et al.* 2005, p. 685). The tidewater goby forages on a variety of small organisms that may rely on the availability of calcium carbonate to form exoskeletons and shells. If ocean acidification decreases the availability of such prey, tidewater goby populations could be affected. While the effects of carbon dioxide dissolving in the oceans are apparent in some cases (coral reefs), the impacts to tidewater goby habitat and prey are speculative. Although acidification may have some effect on the species, at this time we cannot make meaningful projections on either the degree of acidification that is likely to occur within the range of the tidewater goby, or how the species may react to acidification.

Considering the number of historical localities listed as extirpated (24) in the recovery plan (Service 2005, p. 27), and those considered so small or degraded that long-term persistence is questionable (55 to 70; Service 2005, p. 6), the additional threat due to climate change and sea level rise increases the likelihood that the number of tidewater goby populations will decline and those that remain will be further fragmented.

Summary of Factor A

On the basis of this analysis, we find that the destruction, modification, or curtailment of tidewater goby habitat is currently a threat to the tidewater goby rangewide, and we expect the threat to continue in the future. While the large-scale impacts to tidewater goby habitat have slowed due to regulations that protect wetland areas, multiple small losses and alterations still occur and are expected to continue to degrade tidewater goby habitat throughout the species' range. Hydrological changes to tidewater goby habitat, such as flood control and bridge replacement, continue to occur, and these changes are detrimental to tidewater goby persistence in some localities. Sandbar breaching is a fairly pervasive activity throughout the range of the tidewater goby and has a significant negative impact on the populations where it occurs. Cumulatively, while these activities are having a negative effect on tidewater goby habitat throughout its range, and we predict that activities that remove or degrade tidewater goby habitat will continue, we conclude that impacts to the tidewater goby from these activities are not currently having a substantial effect on the species throughout its range, but may in the future as these effects accumulate.

A primary reason for the above conclusion is the tidewater goby's ability to rebound after prolonged periods of unsuitable habitat conditions (e.g., prolonged drought). At the time of listing in 1994, when the tidewater goby was known to occupy only 43 localities, we concluded that the species' ''downward trend was likely to continue'' due to threats posed by, among others, habitat loss. When the drought that had reduced the number of localities to 43 ended, the tidewater goby numbers rebounded to a now estimated 114 occupied localities (78 FR 8746). This indicates that the species is able to recover from a serious drought and that the threats we believed would cause a continuing downward trend are not as serious as previously determined.

In addition to the direct human-caused losses of tidewater goby habitat described above, climate change

(including ocean acidification), and sea level rise in particular, will have a significant negative impact on the species. Sea levels have been rising since the last century, and we can project how sea level rise will affect the tidewater goby; however, sea level rise is happening gradually and demonstrable effects to the tidewater goby will only be manifested after decades of global temperature increases. Thus, we conclude that sea level rise is a threat to the species in the foreseeable future, but is not an imminent threat.

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

Based on our review of the available information, we found no evidence of risks from overutilization for commercial, recreational, scientific, or educational purposes affecting the tidewater goby or potential risks in the future. While some scientific collecting has been done for genetic analysis, the number of individual gobies removed has been kept to levels that would not have a noticeable impact on discrete populations. We therefore conclude that overutilization for commercial, recreational, scientific, or educational purposes is not a threat to the tidewater goby now, and we do not anticipate overutilization becoming a threat in the future.

C. Disease or Predation

Disease/Parasites

Disease was not considered a threat to the tidewater goby in the final listing rule for the species; however, concern exists over the effects of certain parasites on the tidewater goby. *Cryptocotyle lingua* is one parasite that has been documented in the tidewater goby (Swift *et al.* 1989, p. 7; Swenson 1999). It is an introduced fluke (flatworm) native to the eastern Atlantic Ocean that infects marine fish as an intermediate host (Sindermann and Farrin 1962, pp. 69–75). The source of this parasite is not known, but it may have been introduced in ballast water from vessels from eastern Atlantic ports. As a trigenetic parasite, *Cryptocotyle lingua* has two intermediate hosts; the first is a snail, the second a fish like the tidewater goby. The second intermediate host passes along the parasite to the final host, such as a bird or mammal, when the fish is consumed. The intermediate host is weakened by the parasite but not killed. Although all localities may potentially support this parasite, it has only been documented to infect tidewater gobies at Gannon Slough, Humboldt County, Pescadero Creek, San Mateo County, and possibly Corcoran Lagoon, Santa Cruz County (Swenson 1999). While a typical trigenetic parasite has effects on its intermediate hosts described above, we have no information indicating that *Cryptocotyle lingua* infestations of the tidewater goby are substantial enough to cause the loss of populations or have caused a decline in the species' distribution or numbers. In the future, if *Cryptocotyle lingua* spreads, it may have a greater effect on the tidewater goby than currently observed.

McGourty *et al.* (2007, pp. 655–660) report that a newly recognized species of protozoan parasite, *Kabatana newberryi,* may be specific to the tidewater goby. Their data suggest that *Kabatana newberryi* occurs sympatrically (overlaps geographically) with the tidewater goby throughout northern California. During presence-absence surveys of tidewater gobies in 2003 and 2004, McGourty *et al.* (2007, p. 655) found individuals throughout the northern range of the species infected with *Kabatana newberryi,* as shown by the presence of opaque white muscle tissue. Voucher specimens of tidewater gobies taken from Rodeo Lagoon, Marin County, California in 2005 exhibited similar infections (D. Fong, pers. comm. as cited in McGourty *et al.* 2007, p. 659). No specific identification of the parasites could be made because the voucher specimens were preserved in formalin; however, the parasite from the Rodeo Lagoon specimens appears very similar to *Kabatana newberryi* in that it infects muscle cells. *Kabatana newberryi* has not been reported in the southern portion of the tidewater goby's range, and the dispersal mechanism of *Kabatana newberryi* is not well understood (McGourty *et al.* 2007, pp. 659–670). Surveys evaluating the presence and potential effects of *Kabatana newberryi* on tidewater gobies are needed to assess whether this parasite represents a significant threat to its host and could contribute to its decline. Because this parasite was discovered in tidewater goby specimens captured in Big Lagoon, Humboldt County, an otherwise large and reasonably secure population, this suggests that even populations at otherwise low risk from habitat loss or destruction may be at risk from disease or parasites (Service 2007, p. 24).

Although parasites have been found in tidewater gobies, diseases and parasites and how they affect tidewater goby populations are not well understood at this time. Only recently has research begun to analyze the relationship between tidewater gobies and parasites, and how the tidewater goby populations are affected. Native parasites, such as *Kabatana newberryi,* that target a specific host (in this case, the tidewater goby) are probably not a threat because a successful monospecific parasite does not decimate its host populations, although it can affect individual animals. Nonnative parasites, such as *Cryptocotyle lingua,* may be more of a threat because they did not evolve a host-parasite relationship with the tidewater goby, they can occupy more than one host species, and an infestation could possibly reduce tidewater goby numbers.

Although parasites can have effects on individual tidewater gobies, we have no information attributing any population declines or loss of localities to parasitic infestations. The best available information does not indicate that these parasites pose a significant threat to the tidewater goby now. We have no data with which to predict the future impacts of parasites on the tidewater goby, but the potential exists for parasites to reduce tidewater goby numbers if the parasites spread or increase in number.

Predation

Native fish species, such as some salmonids, may prey on tidewater gobies (Moyle 2002, p. 432). This is a natural phenomenon, and we expect gobies to be adapted to some level of predation by native species with which they have evolved, but when tidewater goby numbers and habitat are reduced through human-induced threats, these native predators may have a greater effect on a tidewater goby population. Introduced aquatic species that may have arrived in ballast water from foreign vessels or been deliberately released may be more damaging because they did not evolve in conjunction with native species, and they can be prolific in the absence of their own natural controls (that is, disease or predators). We know that introduced predatory fish have a negative impact on most of California's native coastal species and some prey on tidewater gobies (Service 2007, p. 21). According to the recovery plan, approximately 65 localities are known to have native and nonnative predators that feed on tidewater gobies (Service 2005, Appendix E). Introduced species may affect tidewater goby populations by preying on adults, larvae, or eggs. Predation by introduced or native species can be particularly damaging to species, such as tidewater goby, that are generally distributed across small, isolated populations and are prone to fluctuations in population

size (Pimm *et al.* 1988, p. 777; Lafferty *et al.* 1999a, p. 1448).

Specific examples of situations where predation by nonnative species may have negatively affected tidewater goby populations can be found in M. Capelli, *in litt.* 1999, p. 13; D. Holland, *in litt.* 1999, pp. 5–6; and C. Swift, *in litt.* 1999, no pagination. In the Santa Ynez River system, tidewater gobies accounted for 61 percent of the prey volume of 55 percent (10 of 18) of the juvenile largemouth bass sampled (Swift *et al.* 1997; M. Capelli, *in litt.* 1999, p. 13). The decline and subsequent recovery of the tidewater goby population in Las Pulgas Creek closely tracked the presence and absence of green sunfish in the lagoon of this system (Swift and Holland 1998, p. 10). The elimination of tidewater gobies from the Santa Margarita River, San Diego County, may have been due to the combined influence of nonnative species and decreasing habitat available for the tidewater goby (Swift and Holland 1998, pp. 14–17). Largemouth bass in Old Creek of San Luis Obispo County are likely responsible for the elimination and prevention of re-establishment of tidewater gobies there (D. Holland, *in litt.* 1999, p. 6). This evidence, though indirect, suggests that some nonnative predators can have significant negative impacts on tidewater gobies, up to and including extirpation from individual localities (K. Lafferty, *in litt.* 1999). In addition, predation by nonnatives may have negative effects short of extirpation, reducing tidewater goby population sizes and thereby rendering populations more vulnerable over the long term to extirpation as a result of natural perturbations of habitat conditions at the site (M. Capelli, *in litt.* 1999, p. 11).

Fish surveys along the California coast conducted by the California Department of Fish and Wildlife's (CDFW) Office of Spill Prevention and Response identified the presence of numerous introduced predatory species, including striped bass (*Morone saxatilis*), white catfish (*Amerius catus*), largemouth bass (*Micropterus salmoides*), common carp (*Cyprinus carpio*), threadfin shad (*Dorosoma petenense*), redear sunfish (*Lepomis microlophus*), black crappie (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), and inland silverside (*Menidia beryllina*). These fish have been introduced historically in California waters as sport fish or forage.

Currently, the impact of nonnative fish appears to be isolated and infrequent (see examples above); however, if introductions of nonnative fish continue in the future and more waters that support tidewater gobies are affected, we can expect nonnative predators to have a more widespread negative impact on tidewater goby populations.

Amphibians are also known predators of native fish species (Swift and Holland 1998, p. 26). Bullfrogs (*Rana catesbeiana*) have been introduced to California either accidentally through the aquarium trade and during trout stocking, or deliberately for pest control or sport. Bullfrogs are known predators on a wide variety of species, including many fish, and are suspected to have significant negative impacts on tidewater goby populations (Swift and Holland 1998, p. 26; Holland *et al.* 2001, pp. 35–36). Furthermore, bullfrogs have been implicated in the demise of the Old Creek, San Luis Obispo County, tidewater goby population (Rathbun 1991, p. 4).

In summary, numerous native and nonnative predators have been documented in tidewater goby habitat. While there is evidence that predators can affect individual tidewater goby localities, the impacts do not appear to be widespread and are more acute where predation is occurring in the presence of other factors that have depressed the species' numbers, such as drought. We conclude predation alone is not a severe threat to the species as a whole. As discussed under Factor D below, subsequent to the listing of the species, the State of California has enacted regulations to help control aquatic invasive species, including those that may arrive in ballast water, and this may reduce the threat from nonnative predators.

Summary of Factor C

The best available information indicates that at current population levels, parasitic infections and nonnative predators are not a major threat to the tidewater goby rangewide; however, under certain conditions (for example, poor water quality, drought), parasites and nonnative predators could have substantial negative impacts to populations of tidewater goby at specific localities in the future. At the time of listing in 1994, when the tidewater goby occupied only 43 localities and a severe drought was ending, parasites and predators posed a relatively greater threat to species. After the drought ended, the number of localities known to be occupied by tidewater gobies has increased to an estimated 114 (78 FR 8746), and currently available information does not indicate that parasites and predators are having a substantial effect on the tidewater goby's numbers or distribution at current levels.

D. The Inadequacy of Existing Regulatory Mechanisms

Reclassifying the tidewater goby from endangered to threatened would not change the protections afforded to this species under the Act or other regulations. The listing rule for the tidewater goby described several Federal and State regulations that provide protection for the tidewater goby and its habitat including the Rivers and Harbors Act (33 U.S.C. 401 *et seq.*), the Clean Water Act (33 U.S.C. 1251 *et seq.*), and the California Coastal Act (see the final listing rule for details on these and other regulations (59 FR 5494)). These regulations all remain in effect and continue to provide substantial protections for the tidewater goby and its habitat. However, while regulations have largely eliminated the large-scale destruction of habitat, these same regulations contain permitting processes that allow certain actions to continue, and small-scale habitat loss or degradation (meaning roughly a few acres per project) continues to occur (California Coastal Commission 1994, no pagination).

Subsequent to the listing of the tidewater goby as endangered, three new regulations have been enacted that provide additional protection for the species, the Federal Sikes Act Improvement Act, the California Ballast Management for Control of Nonindigenous Species Act, and the California Marine Invasive Species Act.

The Sikes Act Improvement Act of 1997 (16 U.S.C. 670 *et seq.*) authorizes the Secretary of Defense to develop cooperative plans with the Secretaries of Agriculture and the Interior for natural resources on public lands. The Sikes Act Improvement Act requires Department of Defense installations to prepare integrated natural resources management plans (INRMPs) that manage natural resources on military lands consistent with the use of military installations to ensure the readiness of the Armed Forces. INRMPs incorporate, to the maximum extent practicable, ecosystem management principles and provide the landscape necessary to sustain military land uses. INRMPs are developed in coordination with the State and the Service, and are generally updated every 5 years although they remain in effect during that process. Although implementation is subject to funding availability, INRMPs are important guiding documents that help to integrate natural resource conservation with military readiness

and training. Each INRMP includes the following:

(1) An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;

(2) A statement of goals and priorities;

(3) A detailed description of management actions to be implemented to provide for these ecological needs; and

(4) A monitoring and adaptive management plan.

Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

Vandenberg Air Force Base (VAFB) is located on the central California coast, approximately 225 km (140 mi) northwest of Los Angeles and is approximately 67 km (42 mi) in length. VAFB completed an INRMP in 2011 that protects in several ways the five localities on the base occupied by the tidewater goby. These measures include: (1) Avoiding the tidewater goby and its habitat, whenever possible, in project planning; (2) scheduling activities that may affect tidewater goby outside of the peak breeding period (March to July); (3) coordinating with VAFB water quality staff to prevent degradation and contamination of aquatic habitats; and (4) prohibiting the introduction of nonnative fishes into streams on-base (VAFB 2011, Tab D, p. 15). Furthermore, VAFB's environmental staff reviews projects and enforces existing regulations and orders that, through their implementation, avoid and minimize impacts to natural resources, including the tidewater goby and its habitat. In addition, VAFB's INRMP protects aquatic habitats for the tidewater goby by excluding cattle from wetlands and riparian areas through the installation and maintenance of fencing.

Seven of the eight occupied localities remaining in southern California are on MCB Camp Pendleton, which is located on the southern coast of California approximately 132 km (82 mi) south of Los Angeles and is approximately 21 km (13 mi) in length. MCB Camp Pendleton completed its INRMP in 2001, followed by a revised and updated version in 2007, which includes several measures that protect the tidewater goby and its habitat.

Management and protection measures that benefit the tidewater goby identified in Appendix B of the INRMP (MCB Camp Pendleton 2007, Appendix B, pp. B5–B7) include, but are not limited to, the following: (1) Maintaining connectivity of beach and estuarine ecosystems with riparian and upland ecosystems; (2) promoting natural hydrological processes to maintain estuarine water quality and quantity; and (3) maximizing the probability of tidewater goby metapopulation existence within the lagoon complex. Management and protection measures that benefit tidewater goby identified in Appendix C of the INRMP (MCB Camp Pendleton 2007, Appendix C, pp. C5–C8) include, but are not limited to, the following: (1) Eliminating nonnative, invasive species (such as *Arundo donax* (giant reed)) on the installation and off the installation in partnership with upstream landowners to enhance ecosystem value; (2) providing viable riparian corridors and promoting connectivity of native riparian habitats; (3) providing for unimpeded hydrologic and sedimentary floodplain dynamics to support the maintenance and enhancement of biota; (4) maintaining natural floodplain processes and extent of these areas by avoiding and minimizing further permanent loss of floodplain habitats; (5) maintaining to the maximum extent possible natural flood regimes; (6) maintaining to the extent practicable stream and river flows needed to support riparian habitat; (7) monitoring and maintaining groundwater levels and basin withdrawals to avoid loss and degradation of habitat quality; (8) restoring areas to their original condition after disturbance, such as following project construction or fire damage; and (9) promoting increased tidewater goby populations in watersheds through perpetuation of natural ecosystem processes and programmatic instruction application for avoidance and minimization of impacts.

MCB Camp Pendleton's INRMP also benefits tidewater goby through ongoing monitoring and research efforts. The installation conducts monitoring of tidewater goby populations at least once every 3 years (MCB Camp Pendleton 2007, Appendix B, p. B8). Additionally, MCB Camp Pendleton collaborated with the U.S. Geological Survey's Biological Resources Division to develop and implement a rigorous, science-based monitoring protocol for tidewater goby populations throughout the installation, including monitoring water quality variables at all historically occupied sites regardless of current occupation status.

The completion of the MCB Camp Pendleton INRMP and the protections it affords to the tidewater goby and its habitat on the base is of particular significance to the status of the species as seven of the eight occupied localities remaining in southern California (south of Los Angeles County) are on MCB Camp Pendleton. As recently as 1999, the Service considered southern California to be the most seriously threatened portion of the tidewater goby's range (64 FR 33816). However, the MCB Camp Pendleton INRMP has substantially reduced threats in the region.

The California Ballast Management for Control of Nonindigenous Species Act of 1999 was adopted by the State of California to establish a multi-agency program to prevent the introduction and spread of nonnative aquatic species from the ballast of ships into the State waters of California. The program was designed to determine the current level of species invasions while researching alternative control strategies. Under this program, the CDFW is required to study the extent of nonnative species introductions into the coastal waters of the State. To fulfill this requirement, the CDFW's Office of Spill Prevention and Response initiated several baseline field surveys of ports and bays along the California coast and a literature survey of records of nonindigenous species.

The California Marine Invasive Species Act was passed in 2003, widening the scope of the original ballast water program (CDFG 2008, p. 47). The 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 act, the legislation also requires State agencies to conduct a series of biological surveys to monitor new introductions to coastal and estuarine waters. Implementation of these measures should further reduce the frequency of new introductions of invasive species into California's coastal waters that could be a threat to the tidewater goby. The Coastal Ecosystems Protection Act of 2006 deleted a sunset provision of the Marine Invasive Species Act, making the program permanent.

Upon its listing as endangered, the tidewater goby benefited from the protections of Act, which include the prohibition against take and the requirement for interagency consultation for Federal actions that may affect the species. Section 9 of the

Act and Federal regulations prohibit the take of endangered and threatened species without special exemption. The Act defines ''take'' as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 U.S.C. 1532(19)). Our regulations define ''harm'' to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Our regulations also define ''harass'' as intentional or negligent actions that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering (50 CFR 17.3). Section 7(a)(1) of the Act requires all Federal agencies to utilize their authorities in furtherance of the purposes of the Act by carrying out programs for the conservation of endangered species and threatened species. Section 7(a)(2) of the Act requires Federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of listed species or destroy or adversely modify their critical habitat. Section 6 of the Act, which authorizes us to enter into cooperative conservation agreements with States, and to allocate funds for conservation programs to benefit threatened or endangered species, provides another potential benefit. Neither section 6 of the Act nor Service policy gives higher priority to endangered species over threatened species for conservation funding.

Thus, listing the tidewater goby provided a variety of protections, including the prohibition against take and the conservation mandates of section 7 for all Federal agencies. Because the Service has regulations that prohibit take of all threatened wildlife species (50 CFR 17.31(a)), unless modified by a special rule issued under section 4(d) of the Act (50 CFR 17.31(c)), the regulatory protections of the Act are largely the same for wildlife species listed as endangered and as threatened; thus, the protections provided by the Act will remain in place if the tidewater goby is reclassified as a threatened species.

Summary of Factor D

In summary, the tidewater goby is currently protected by a variety of regulatory mechanisms throughout its range, and we anticipate those protections will continue for the foreseeable future. Regulations in place when the tidewater goby was listed continue to provide substantial protection for the species and its habitat. The passing of the Sikes Act Improvement Act subsequent to the listing has been particularly beneficial to the tidewater goby in southern California where seven of the eight occupied locations in that region receive a substantial level of protection through the INRMP developed by MCB Camp Pendleton. Although the INRMP developed by VAFB provides substantial protections to the tidewater goby and its habitat, the VAFB INRMP only covers the five localities on the base. The other two regulations passed since the species was listed, the California Ballast Management for Control of Nonindigenous Species Act and the California Marine Invasive Species Act, help reduce the threat of the introduction of new invasive species from ballast water throughout the entire range of the species. Overall, regulations in effect at the time of listing and new regulations passed subsequent to listing have substantially reduced, but have not eliminated any of, the threats to the tidewater goby and its habitat. Therefore, we conclude that existing regulatory mechanisms are inadequate to protect the tidewater goby without the additional protections afforded under the Act.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Competition

One of the potential threats to the tidewater goby is competition from nonnative species. This competition is mainly for prey, but can also be competition for other resources. For example, Big Lagoon and Freshwater Lagoon in Humboldt County support populations of the nonnative New Zealand mudsnail (*Potamopyrgus antipodarum*) that was likely introduced by fisherman or boats, either on the outside of the vessels or in ballast water (Service 2008, no pagination). The New Zealand mudsnail blankets the bottom of these lagoons and may outcompete other native species, including the tidewater goby, for space and resources. The New Zealand mudsnail may have the overall effect of altering the ecosystem to the point it cannot support other native species.

Several small, potentially competitive, estuarine fishes have also been introduced into tidewater goby habitat. These include the rainwater killifish (*Lucania parva*), chameleon goby (*Tridentiger trigonocephalus*), yellowfin goby (*Acanthogobius flavimanus*), and shimofuri goby (*Tridentiger bifasciatus*). The first three species appeared in the 1960s in San Francisco Bay, coincident with the last collections of tidewater gobies there (Haaker 1979; Swift *et al.* 1989). Rainwater killifish have become widespread in San Francisco Bay, and have recently become established in Upper Newport Bay, Orange County, but have not become established elsewhere (Moyle 2002, p. 315). Yellowfin gobies have seldom been collected in the smaller, brackish, non-tidal systems where tidewater gobies are found (Swift *et al.* 1994, p. 21); however, in 1992 and 1993, yellowfin gobies were collected in the Santa Clara River (Ventura County) and Santa Margarita River (San Diego County) lagoons (Swift *et al.* 1994, p. 15). The recent appearance of yellowfin gobies in southern California and the coincident disappearance of the tidewater goby in the Santa Margarita River in late 1993 suggest that the species is slowly spreading to brackish habitats and may be eliminating tidewater gobies.

Chameleon gobies have been locally abundant on hard substrates in San Francisco and Los Angeles harbors since the 1960s and 1970s, respectively (Haaker 1979, p. 59). Initial experiments by Swenson and Matern (1995, p. 3) indicated that shimofuri gobies aggressively intimidate, outcompete, and prey on tidewater gobies in the laboratory. However, like the chameleon goby, the shimofuri goby prefers hard substrates. Thus, it might be expected to remain in such habitats in coastal lagoons, and perhaps not interact extensively with tidewater gobies. To date, the possible effects of interactions in the wild between these nonnative estuarine fish and tidewater gobies are largely conjectural.

These nonnative competitors may be having a negative effect on tidewater goby numbers, but the relationship is not demonstrated by the best available information. We can infer from the overall impact of introducing nonnative competitors in other situations that nonnative species like the New Zealand mussel will deplete resources used by the tidewater goby, but based on the best available information, we conclude that competition is not a substantial, uniform threat to the species throughout its range. As discussed under Factor D above, the State of California has enacted regulations to help control aquatic invasive species (CDFG 2008), including those introduced in ballast water, and while these regulations may not eliminate competition from nonnative species, they should help reduce the future threat.

Water Quality

Impaired water quality was cited as a potential threat to the tidewater goby in the recovery plan (Service 2005, p. 21, 28, Appendix C). Water quality issues still affect some of the localities occupied by tidewater gobies. For example, the Tillas Slough in Del Norte County is subject to runoff from pastures that carry nitrogenous waste, which in turn increases algae production and depletes oxygen levels in the water. In the Santa Clara River estuary, the natural flows are augmented by discharges from a wastewater treatment plant that have degraded water quality. These impacts on the tidewater goby habitat are not uncommon and appear ongoing and are likely to continue into the future in many parts of its range.

At the time the recovery plan was published (Service 2005), we determined that 54 localities that currently or historically supported, or could potentially support, tidewater gobies were ''Water Quality Limited'' as defined by the State Water Resources Control Board's 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments. The designation indicates that the listed water bodies do not meet current water quality standards set by the U.S. Environmental Protection Agency. Contaminants may include everything from sediment to coliform bacteria to polychlorinated biphenyls (PCBs).

Although the 2010 303(d) list includes an additional 30 localities listed in the recovery plan (Service 2005, Appendix C) that currently or historically supported, or could potentially support, tidewater gobies and are now considered ''Water Quality Limited'' (for a total of 84 localities), no link has been established between impaired water quality and negative impacts on tidewater goby populations (Service 2005, pp. 47, 50, 52). Therefore, based on the best available information, we conclude that impaired water quality is not a substantial threat to the tidewater goby. The recovery plan cites the need to explore water quality issues to ascertain the level of threat posed in these ''Water Quality Limited'' segments. This need may become more critical as more localities that support the species are added to the 303(d) list. (Note: Some additions to the list may be due to changes in the criteria for meeting the ''Water Quality Limited'' standards and not solely to declining water quality.)

Habitat Fragmentation

Metapopulation dynamics are an important aspect of tidewater goby biology and, in turn, the species' conservation. Maintaining metapopulation relationships ensures that processes of extirpation and recolonization, genetic exchange leading to enhanced fitness, and connectivity between populations are preserved. Studies such as Lafferty *et al.* (1999a, 1999b) and recovery planning efforts (Service 2005) emphasize the need to understand metapopulation dynamics for conserving the tidewater goby.

Tidewater goby metapopulation structures that may have existed in the past have been altered by the creation of additional gaps and increases in the number and size of gaps in the species' distribution (Smith, *in litt.* 2007) as a result of habitat alteration and other factors that have rendered some localities unsuitable for tidewater gobies. Connectivity of many populations has been reduced or eliminated by loss of localities, increased distance between localities, and lack of suitable, intermediate habitats (''stepping stones''). For example: (1) Waddell Creek in Santa Cruz County has been lost as a possible 24-km (15-mi) stepping stone between those localities to the north in San Mateo County and those to the south (for example, Scott Creek); (2) Schwans and Woods Lagoons have been lost as suitable stepping stones between the Baldwin/Wilder metapopulation north of the Santa Cruz and Corcoran/Moran metapopulation south of Santa Cruz; and (3) San Vicente and Liddell Creeks have been lost between Scott and Laguna Creeks (Santa Cruz County) (Smith, *in litt.* 2007).

In central and northern California, Swift (*in litt.* 2007) believes it very unlikely that genetic interchange (sharing of genes among populations that may allow for exchange of beneficial mutations that enhance survival under changing conditions, usually through dispersal of breeding individuals) is possible between several groups of populations naturally separated by 32 km (20 mi) or more of rugged coastline. For example, isolated populations in Mendocino County in the Ten Mile River-Virgin Creek-Pudding Creek group are unlikely to receive dispersing tidewater gobies and their genetic material from either the north or the south. These populations are too far away from other populations to be recolonized if lost and are unlikely to contribute genetic material in either direction as well. Farther south, a wide gap exists between Gaviota Creek and Winchester/Bell Canyon in Santa Barbara County (Swift, *in litt.* 2007). Similar long distances exist between Winchester/Bell Canyon and Arroyo Burro and Mission Creek-Laguna Channel (in Santa Barbara County) and between these latter two and the Ventura River and Santa Clara River pair (Ventura County). These large gaps seem to disrupt the metapopulations along most of the coast from Point Conception to Rincon Point (Swift, *in litt.* 2007), leaving individual populations vulnerable to loss of both the recolonization potential and the benefits of genetic interchange.

The substantial destruction of coastal wetlands, lagoons, and estuaries in the past has also contributed to many tidewater goby localities becoming more isolated, thus threatening the stability of some metapopulations through the potential loss of recolonization opportunities and the benefits of genetic interchange. An example of where this has occurred is the San Francisco Bay area. We have no means to determine how many tidewater goby localities existed in this area prior to development, but we do know that approximately 95 percent of the wetlands in this area have been filled (Josselyn 1983). Available records indicate at least seven tidewater goby localities have been extirpated, and there are now no occupied localities within the San Francisco Bay (see Figure 1, above). Lagunitas Creek is the only remaining occupied locality within Tomales Bay in Marin County, and is now separated from its nearest neighbor to the north, Estero de San Antonio, by a distance of about 25 km (15.5 mi), and from its nearest neighbor to the south, Rodeo Lagoon, by a distance of 38 km (23.6 mi). If tidewater gobies at Lagunitas Creek were extirpated during a drought, it is unlikely that the location would be recolonized naturally. The Rodeo Lagoon locality is also isolated. The closest known existing localities of tidewater goby to Rodeo Lagoon are Lagunitas Creek in Tomales Bay, 38 km (23.6 mi) to the north, and San Gregorio Creek, 58 km (36 mi) to the south. If the population at Rodeo Lagoon were extirpated, the tidewater goby would disappear from about a 70-km (60-mi) portion of the coast.

Another complicating factor that may be important to recolonization is the direction of long-shore currents. These currents flow predominantly from north to south. Because tidewater gobies are considered to be weak swimmers, recolonization may be limited to extirpated localities to the south of occupied ones.

While the metapopulation structure of tidewater gobies has been disrupted to some extent by an increase in the number and size of gaps between localities, we are aware that some areas where tidewater gobies have been extirpated apparently have been recolonized when extant populations were present within a relatively short distance of the extirpated population. For example, Lafferty *et al.* (1999b, p. 621) concluded that tidewater gobies had recolonized Cañada Honda Creek in Santa Barbara County from the Santa Ynez River approximately 9 km (5.5 mi) to the north. Recolonization may be occurring when high freshwater flows into lagoons and estuaries cause the entrance to the system to be breached and connect directly to the ocean. Additionally, as discussed above, the number of tidewater goby localities has increased from 43 at the time of listing to an estimated 114 localities occupied currently (78 FR 8746), indicating that the species has been able to recolonize many localities that had become extirpated during the extended drought that occurred immediately prior to the species' listing. Local extirpations and recolonizations are a natural part of tidewater goby metapopulation dynamics. We expect some local extirpations as part of this natural dynamic. However, because of increasing fragmentation, we expect that some populations will be extirpated over the long term and will not be recolonized. We cannot predict with certainty which populations may become permanently extirpated and which will eventually be recolonized, but we expect any permanent loss of populations to be gradual.

When metapopulations are fragmented and isolated from each other, genetic exchange within and between them is correspondingly limited, which may result in increased genetic drift (random changes in gene frequencies within populations resulting because each generation contains only a subset, or sample, of all the genes present in the previous generation) and inbreeding (mating between close relatives). Genetic drift can result in loss of alleles (gene variants), particularly those that occur in low frequencies within populations, and can contribute to loss of genetic diversity within and among populations. Loss of genetic diversity in small populations may decrease the potential for persistence in the face of long-term environmental change (Shaffer 1981, p. 133). Loss of genetic diversity can also result in decline in fitness from expression of deleterious recessive alleles (Meffe and Carroll 1994, pp. 150–152). Change in the distribution of diversity can destroy local adaptations or break up coadapted gene complexes (outbreeding depression). These problems can lead to a poorer ''match'' of the organism to its environment, reducing individual fitness and increasing the probability of population or species extinction (Meffe and Carroll 1994, p. 131). Genetic drift and inbreeding are reduced when there is genetic exchange among populations, which can restore genes lost through drift or bring in new genes, while also increasing the likelihood of matings between unrelated individuals.

As discussed above in the ''Genetics'' section, tidewater goby populations currently exhibit population genetic structuring (groups of populations are genetically more similar to each other than to other populations). This indicates that some degree of isolation/genetic differentiation is probably normal for tidewater gobies and is the result of the evolutionary history of the species. Under this situation, we expect greater gene flow within major phylogeographic groups (groups of closely related populations) than between the groups. However, habitat loss and anthropogenic factors have resulted in the creation of additional gaps in the species' distribution. This fragmentation may be resulting in isolation not only among major groups of related populations, but also between populations within groups, and thus reducing the levels of normally expected gene flow. For the tidewater goby, where metapopulation dynamics dictate gene flow and genetic diversity, the observed fragmentation of some parts of the species' distribution indicate that some subpopulations are likely genetically isolated from others. The effects of this genetic isolation are exhibited by the results of genetics studies cited earlier that conclude that natural and anthropogenic barriers have contributed to genetic differentiation among populations. The implications for the survival of the tidewater goby are not clear, but the loss of genetic interchange between populations may cause increased inbreeding and the loss of fitness afforded a species by having a diverse genetic makeup. While we expect that increased fragmentation and isolation may adversely affect gene flow and eventually lead to reduced fitness of populations, these processes generally occur over many generations.

Stochastic Events

Stochastic events in ecology are random, usually natural occurrences, which can affect a species or its ecosystem. Such events may include wildfire, earthquakes, landslides, and climatic phenomena such as floods or drought. These events can have a substantial impact on a species at any level, from individuals to rangewide. Of particular concern for the tidewater goby are the stochastic events related to climate, including drought and flood.

The most significant natural factor adversely affecting the tidewater goby is drought and the resultant alteration of coastal and riparian habitats. Periodic droughts are a historical feature of California, which has been repeatedly subject to prolonged droughts (U.S. Geological Survey 2004). When the tidewater goby was proposed for listing as endangered in 1992 (57 FR 58770; December 11, 1992), California had just experienced what is considered the most severe drought in the history of the State; the drought lasted for 5 years from 1987 to 1992 (Priest *et al.* 1993, p. 1). Although some localities may have actually been occupied but at such low numbers as to be undetectable, at the time of listing in 1994, we concluded that all but 43 tidewater goby localities had been extirpated. During such periods, when the number of localities is severely reduced or the size of populations declines drastically, the risk of extinction increases.

Drought conditions, when combined with human-induced water reductions (diversions of water from streams, excessive groundwater withdrawals), have degraded coastal and riparian ecosystems and have created extremely stressful conditions for most aquatic species, including the tidewater goby. Drought can have dramatic negative effects on tidewater gobies, at times decreasing their populations to very low levels (perhaps to the point where they are undetectable) and at the extreme, extirpating populations. For example, we state in the final listing rule for the tidewater goby (59 FR 5494; February 4, 1994) that formerly large populations of tidewater gobies had declined in numbers because of the reduced availability of suitable lagoon habitats (San Simeon Creek and Pico Creek in San Luis Obispo County), while others disappeared when the lagoons dried (as seen at Santa Rosa Creek, San Luis Obispo County).

Despite the tidewater goby's negative response to the extreme drought of 1987–1992, when normal rainfall patterns returned, the species either recolonized localities that had been dry or numbers increased in localities where drought conditions had reduced numbers to an undetectable level. When the species was listed in 1994, this level of resiliency was not well-documented.

By the time we conducted our 5-year review of the species' status (Service 2007), the overall tidewater goby population numbers had continued to rise, and we concluded that the tidewater goby was much more resilient than previously believed, thus leading us to conclude that the species may not be at risk of imminent extinction.

Flooding following severe storm events can wash tidewater gobies out of an estuary, which may play an important role in recolonizing localities where the species has been extirpated (Lafferty *et al.* 1999a, p. 1448). The mixing of freshwater from a flood and the saltwater offshore, and the resulting reduction in salinity, may allow tidewater gobies to make limited alongshore migrations to other suitable habitat. Evidence indicates that this is part of the mechanism that has allowed the species to recover its numbers following the 1987–1992 drought in California. Conversely, the potential positive effects of flooding may be negated when channelization has occurred upstream and alters the flood dynamics of the system. In these cases, channelization can increase the duration and intensity of flood events, not only contributing to loss of tidewater gobies from the estuary, but also reducing the likelihood of recolonization because the high volume flows of water may prevent tidewater gobies from entering an estuary they might otherwise be able to colonize.

Stochastic events may have both positive and negative effects on the tidewater goby. Drought has been shown to have substantial negative effects on the species by drying up estuaries and reducing the population size at individual localities. In a positive sense, periodic flooding may promote dispersal and colonization between estuaries that are otherwise separated by beaches or bluffs by allowing tidewater gobies to move along the coast when salinity would otherwise be too high under non-flood conditions. Under certain situations, flooding may also have a negative effect on the tidewater goby; when upstream modifications for flood control alter the intensity of outflow through an estuary, tidewater gobies may be flushed into the ocean and prevented from returning when flows are too strong for them to navigate. As discussed under the section on climate change, we expect the freshwater flows into coastal estuaries to decrease over time as droughts become more frequent or severe. This combination of factors could have a substantial negative impact on tidewater goby habitat in the foreseeable future.

Summary of Factor E

For Factor E, we conclude that some aspects of the threats due to other natural or manmade factors are currently having a negative effect on the tidewater goby, while others may be acting on the species but the effects do not appear to be significant. For example, competition for resources is always a concern for wildlife, and we know competition from nonnative species has operated negatively on some populations and may have resulted in the extirpation of one tidewater goby locality; however, the best available scientific and commercial information does not indicate that competition is significantly impacting the tidewater goby at current population levels, and we consider competition to be a minor threat to the species as a whole. We also note that water quality was poor in many localities occupied by the tidewater goby in 2005, and that even more of its localities may have experienced declining water quality since then; however, the best available information has not established a link between water quality and an impact on tidewater goby populations.

In contrast, habitat fragmentation has been shown to be a concern both for wildlife in general and especially for a species like the tidewater goby that exists as metapopulations for which connectivity may be critical for their persistence and for the maintenance of genetic diversity that imparts fitness in the face of environmental change. Stochastic events like periodic drought are of special concern because we have observed the number of occupied localities drop to as low as 43 at the height of a prolonged drought. This means that any time we enter a period of drought, tidewater goby numbers are likely to drop; however, we have also seen that the tidewater goby populations are resilient in the face of such events and population numbers can rebound when climatic conditions change. We conclude that the threat due to habitat fragmentation persists throughout the species' range, and that the effects of stochastic events may be severe, such as may occur during the next drought, similar to the drought of the late 1980s and early 1990s. The tidewater goby has shown its ability to recover from the effects of drought once rainfall returns, but the effects of the other natural or manmade factors (such as fragmentation) may persist.

Cumulative Impacts

As noted in the sections above, some of the threats to the tidewater goby may be exacerbated under certain conditions where the individual threats may not otherwise be severe. While any likely combination of threats will have an additive effect on the species in a particular location, any of the threats combined with drought would appear to pose the greatest risk to the tidewater goby. As observed when the tidewater goby was listed as endangered in 1994 after several years of drought in California, the species declined to the point where the Service believed it faced extinction. A drought of the magnitude that lead to the species' listing could have the same impact, but even short periods of drought may have a substantial effect on individual populations if other threats are in place.

For example, we recognize that predation by nonnative species is likely not a major factor in the tidewater goby's status overall, although it may be important in some localities (Service 2007, p. 22). However, because predation may depress population numbers in some areas, another factor, such as drought, may have a greater effect because the population is already reduced or stressed by the presence of predators. We can conclude that such a locality is more likely to lose its tidewater goby population during a drought than one where predation is not an additional stressor.

A more dramatic cumulative effect resulting from drought may be due to upstream diversion or withdrawal of water from drainages. Where water may already be limited due to upstream uses before it can reach tidewater goby habitat and create the brackish conditions the species requires, even a small period of drought is likely to cause the species' habitat to dry up; this is especially of concern at smaller watersheds. If the drought is extended, the return of tidewater gobies to that locality would be dependent on proper functioning of the metapopulation dynamics that allow recolonization from adjacent refugia, as we conclude happened at the end of the drought in the late 1980s and early 1990s in California.

This same principle applies to those localities where threats such as water pollution, upstream barriers, and disease or parasites may be a limiting factor in the tidewater goby's numbers. Because adequate water supply is critical to the species' life cycle, large declines in water in the tidewater goby's habitat are likely to exacerbate threats that alone are not limiting.

A cursory review of the known occupied localities and the threats identified for those localities (Service 2005, Appendix E) does not reveal a correlation between the number of

threats and the status of the tidewater goby at those localities. In other words, localities with a large number of threats do not appear to have lower or more variable population densities than locations with fewer threats. The most likely correlation is between the status and the size of the habitat, with larger habitats having abundant numbers and less vulnerable populations (Service 2005, Appendix E). A more vigorous statistical analysis may reveal some pattern of correlation, but we conclude that combinations of threats and the cumulative impact on tidewater goby populations in those localities with smaller habitats are likely to be greater than they are for larger habitat localities. The reasons for this include the following: (1) There are more refugia in larger habitats; (2) threats are more dispersed; and (3) larger habitats are less vulnerable to short-term impacts.

Summary of Factors

The primary factors that led to the listing of the tidewater goby as endangered in 1994 were: (1) The tidewater goby had been extirpated from nearly 50 percent of the lagoons and estuaries it had inhabited due to habitat alteration (channelization, water diversions, etc.) and drought; (2) only 43 populations remained, of which only 8 were considered large enough to be stable; and (3) the tidewater goby was threatened by development, water quality issues, and other habitat alterations. We concluded in the 1994 listing rule that the downward trend in the tidewater goby's populations was likely to continue; however, when the prolonged drought in California ended and normal rainfall patterns resumed, the number of occupied localities grew through recolonization (or apparent recolonization as greater numbers increased the species' detectability) from 43 up to 114 as of the publication of the final revised critical habitat designation (78 FR 8746), showing the species' resiliency in the face of changing conditions. The other factors that led to the tidewater goby's listing are still acting on the species, but it appears that they are not severe enough at current population levels to place the species currently in danger of extinction.

As an example, our analysis of Factor A concludes that the destruction, modification, or curtailment of tidewater goby habitat is currently a threat, and we expect the threat to continue in the future. While the elements that constitute the Factor A threats (habitat disturbance, sandbar breaching, etc.) that destroy, modify, or curtail habitat are having a negative effect on tidewater goby habitat throughout its range, we conclude that impacts to the tidewater goby from these relatively small projects and activities are not having a substantial effect on the species throughout its range. This is based on the fact that these threats were in place prior to and after the species was listed in 1994 and have continued, yet the tidewater goby rebounded from a severe drought in the face of the Factor A elements (other than climate change). This indicates that the Factor A threats alone are not severe enough to cause the species' decline.

We further conclude that predation or disease alone are not a significant threat to the tidewater goby, although we do have evidence that predation by nonnative fishes may have contributed to the extirpation of some populations. Throughout the species' range, the loss of tidewater goby populations has not been attributed solely to disease, parasites, predation, or competition from other species, and the best available information indicates that such threats are currently only moderately important in the species' survival, although such threats may exacerbate or combine with other threats to increase the species' vulnerability. While we conclude these are only moderately important threats, we cannot reasonably predict whether new nonnative species will be introduced, to what extent they will become established in tidewater goby habitat, and what their effects will be on tidewater goby populations. We may draw different conclusions regarding future introductions of nonnative species, depending on the specific circumstances.

The listing of the tidewater goby under the Act benefits the species in several ways. For example, listing under the Act often requires coordination with the Service if the tidewater goby is present in a project area so that conservation of that species can be considered in the planning and implementation, and requires interagency consultation if a federal action may affect a listed species to ensure that such action is not likely to jeopardize the listed species or destroy or adversely modify its critical habitat. Another potential benefit of the Act is under section 6, which authorizes us to enter into cooperative conservation agreements with States, and to allocate funds for conservation programs to benefit endangered or threatened species. Reclassifying tidewater goby from endangered to threatened would not change any the protections afforded to this species under the Act or other regulations.

With the addition of three new regulations enacted subsequent to the listing of the tidewater goby, existing regulations have slowed the loss, especially on a large scale, of the tidewater goby's habitat. One of the new regulations in particular, the Sikes Act Improvement Act, has resulted in substantial new protections to the tidewater goby and its habitat in southern California.

Although regulations are in place that provide substantial protections to the tidewater goby and its habitat, small-scale loss of habitat continues to occur throughout the range of the species as many regulations allow impacts to habitat to occur under certain conditions, and we therefore conclude that existing regulatory mechanisms are inadequate to protect the tidewater goby without the additional protections afforded under the Act.

From our review of the most recent data and analyses, we conclude that sea levels are rising and may eventually eliminate much of the tidewater goby habitat due to seawater intrusion and changes in hydrology. Combined with past habitat losses and current threats, sea level rise due to climate change poses a severe threat to the species' survival. While sea level rise is occurring and has been since the last century, and we can project what effect rising sea levels will have on the tidewater goby, sea level rise is happening gradually, and demonstrable effects to the tidewater goby will only be manifested after decades of global temperature increases. Habitat at some localities that are small in size and constrained by natural or manmade features will be lost. Some larger localities are less constrained and new habitat may form in upstream areas, but the number of sites where this is likely to occur is limited. While gobies may persist at a limited number of larger sites, by that time, the numbers and sizes of tidewater goby populations will be reduced and populations will be more vulnerable to remaining threats. Thus, sea level rise is a threat to the species in the foreseeable future, but is not an imminent threat.

The tidewater goby is facing numerous threats, including habitat loss from multiple sources, habitat fragmentation due to the loss of stepping stone localities between populations, disruption of metapopulation dynamics and loss of genetic exchange among populations, predation and nonnative competitors, alterations to hydrology (for example, sandbar breaching and channelization), changes in water quality, stochastic events such as drought, and the growing

and inevitable impact of sea level rise. While some of these threats can singly have a substantial impact on individual tidewater goby localities, in most cases it is the combined impact of those threats with prolonged drought and eventually sea level rise that will have the greatest effect on the species.

Recovery Plan

Section 4(f) of the Act directs us to develop and implement recovery plans for the conservation and survival of endangered and threatened species unless we determine that such a plan will not promote the conservation of the species. Under section 4(f)(1)(B)(ii), recovery plans must, to the maximum extent practicable, include: ''Objective, measurable criteria which, when met, would result in a determination, in accordance with the provisions of [section 4 of the Act], that the species be removed from the list.'' However, revisions to the list (adding, removing, or reclassifying a species) must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is endangered or threatened (or not) because of one or more of five threat factors. Section 4(b) of the Act requires that the determination be made ''solely on the basis of the best scientific and commercial data available.'' Therefore, recovery criteria should help indicate when we would anticipate an analysis of the five threat factors under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species because of any of the five statutory factors.

Thus, while recovery plans provide important guidance to the Service, States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are not regulatory documents and cannot substitute for the determinations and promulgation of regulations required under section 4(a)(1) of the Act. A decision to revise the status of or remove a species from the Federal List of Endangered and Threatened Wildlife (50 CFR 17.11) is ultimately based on an analysis of the best scientific and commercial data then available to determine whether a species is no longer an endangered species or a threatened species, regardless of whether that information differs from the recovery plan.

The Recovery Plan for the Tidewater Goby was approved by the Service on December 7, 2005 (Service 2005). The recovery plan has as its overall recovery objective to downlist the species to threatened status, then delist. The primary objective of the recovery plan is to manage the threats to and improve the population status of the tidewater goby sufficiently to warrant reclassification (from endangered to threatened status) or delisting.

The recovery plan established the following criteria for downlisting the tidewater goby from endangered to threatened (Service 2005, pp. 40–41):

(1)(a) Specific threats to each metapopulation, such as habitat destruction and alteration (including coastal development, upstream diversion, channelization of rivers and streams, discharge of agriculture and sewage effluents), introduced predators (such as centrarchid fishes), and competition with introduced species (yellowfin and chameleon gobies, for example), have been addressed through the development and implementation of individual management plans that cumulatively cover the full range of the species.

(1)(b) A metapopulation viability analysis based on scientifically credible monitoring over a 10-year period indicates that each Recovery Unit is viable, with at least 5 subunits in the North Coast Unit, 8 subunits in the Greater Bay Unit, 3 subunits in the Central Coast Unit, 3 subunits in the Conception Unit, 1 subunit in the Los Angeles/Ventura Unit, and 2 subunits in the South Coast Unit to individually having a 75 percent chance of persisting for 100 years.

The first criterion was intended to identify the point at which specific threats to each metapopulation were being adequately managed and addressed. Under criterion (1)(a), some of the past habitat alteration has been addressed through implementation of existing regulations (such as the Clean Water Act), although it has not been eliminated. Only limited, rangewide efforts to eliminate introduced predators have been implemented for the benefit of the tidewater goby. The only management plans of which we are aware that address conservation of the tidewater goby are the INRMPs for MCB Camp Pendleton and VAFB, and plans under development for Mission Creek in Santa Barbara County, the Santa Clara River estuary in Ventura County, and Malibu Lagoon in Los Angeles County. In any case, plans to manage specific threats to the tidewater goby do not cumulatively cover the full range of the species; therefore, recovery criterion 1(a) has not been fully met. However, as discussed above, we have determined that the threats this criterion was intended to address are not as severe as previously thought. We conclude that none of these threats is likely to cause the imminent extinction of the tidewater goby, and therefore, the threats are sufficiently reduced that the requirement to have plans specifically addressing them is no longer an appropriate criterion for downlisting the species to threatened.

The second criterion was intended to indicate whether the species has responded as expected to measures to reduce threats and to ensure that the tidewater goby remains well-distributed and resilient in the face of stochastic events throughout its range. None of the metapopulation viability analyses described in the recovery plan (criterion 1(b)) have been completed, as far as we know. While metapopulation viability analyses have not been conducted, the tidewater goby currently occurs at localities in all six recovery units. The species now occupies nearly three times as many localities as it did at the time of listing, indicating the species is more resilient than previously thought. While we do not have detailed analyses of viability for individual metapopulations, the species' ability to respond positively to the end of drought conditions over approximately a 20-year period and for populations to be recolonized or recover, indicates the species likely has generally exhibited positive demographic characteristics such as reproductive rate and survival. So, while criterion (1)(b) has not been met, we conclude we have sufficient evidence that the species has responded positively to the end of the drought and that previously identified threats have not had as severe an effect on the species as expected.

Despite the fact that none of the downlisting criteria from the recovery plan have been fully achieved, we have concluded that other factors presented in this proposed rule provide sufficient support for our determination. When the tidewater goby was listed in 1994, the number of occupied localities had dropped to 43 in the face of an extended drought, and we were not certain that the unoccupied localities would be recolonized after the drought ended. We had concluded that the species' downward trend would continue due to the other threats, so even when the drought ended we believed the tidewater goby would continue to decline. Upon the resumption of ''normal'' rainfall patterns, the number of localities found to be occupied rebounded to almost three times the number known in 1992, when listing was first proposed, despite the continuing effects of the remaining threats. This indicated to us that species

was more resilient than we had known and that the low numbers seen in response to drought did not mean the species was in imminent danger of extinction. Also, the number of occupied localities had increased so much that even in the face of the ongoing threats and the likelihood that these would continue to affect the tidewater goby in the future, the species is no longer currently at risk of extinction.

Proposed Determination

We have carefully assessed the best scientific and commercial information available regarding the past, present, and future threats to the tidewater goby (*Eucyclogobius newberryi*). In our analysis of the 5 factors relating to the species' status we have reached the following conclusions:

Factor A (The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range): We have found that the tidewater goby is currently experiencing some habitat loss and will continue to experience small losses in the foreseeable future. We do not anticipate any repeat of the large losses that occurred prior to regulations that protected coastal wetlands. At the time of listing in 1994, when the tidewater goby occupied only 43 localities and a severe drought was ending, habitat loss posed a relatively greater threat to species. After the drought ended, the number of localities known to be occupied by tidewater gobies has increased to at least 114, and currently available information does not indicate that habitat loss alone is having a substantial effect on the tidewater goby's numbers or distribution. We do anticipate that global sea level rise will have a profound effect on the species' habitat in the foreseeable future; however, we do not believe that the threat from sea level rise is imminent. While sea level rise is occurring and has been since the last century, the change has been and will be gradual, perhaps over decades instead of months or years. The threats discussed under Factor A are not likely to cause the tidewater goby's extinction in the near future; however, sea level rise by itself poses a substantial threat to the species that, while not an imminent threat, is reasonably foreseeable and could lead to the species' extinction.

Factor B (Overutilization for Commercial, Recreational, Scientific, or Educational Purposes): We found no evidence of risk to the tidewater goby from overutilization, nor do we anticipate any such impacts to the species in the foreseeable future.

Factor C (Disease or Predation): Parasites and nonnative predators are likely to be having some negative effects on the tidewater goby. Our review of the available information does not indicate that these negative effects are reducing the tidewater goby's numbers rangewide, but may act in concert with other stressors to have a greater impact at a local level. Disease or predation alone are not sufficient to cause the species' extinction in the foreseeable future.

Factor D (Inadequacy of Existing Regulatory Mechanisms): Existing regulations have been effective at protecting the tidewater goby from large-scale habitat loss, and the enactment of the Sikes Act Improvement Act subsequent to listing has been a major benefit to the species in southern California. However, small-scale, localized habitat loss and alteration continue to occur, and existing regulatory mechanisms are inadequate to protect the tidewater goby without the additional protections afforded under the Act.

Factor E (Other Natural or Manmade Factors Affecting Its Continued Existence): We conclude that some natural or human-caused factors are having a negative effect on the tidewater goby, but we cannot reasonably determine whether the effects of some other factors are negatively impacting the tidewater goby. Habitat fragmentation (natural or anthropogenic) and stochastic events (like drought) have clearly had a negative impact on the tidewater goby since the species has been monitored. However, the best available information does not indicate that competition with other species (native or nonnative) and poor water quality are having an influence on the species' overall status. Our conclusion is that drought and additional fragmentation are foreseeable threats to the tidewater goby and could contribute to the species' extinction in the future, while the rangewide influence of other factors cannot be demonstrated.

Based on the analysis above, we conclude that the tidewater goby is not in danger of extinction throughout all of its range, but instead is threatened; that is, the species is likely to become endangered in the foreseeable future throughout all of its range.

Significant Portion of the Range Analysis

Having examined the status of the tidewater goby throughout all its range and determined that the species is threatened throughout all its range, we next examine whether the species is in danger of extinction in a significant portion of its range. The range of a species can theoretically be divided into portions in an infinite number of ways; however, there is no purpose in analyzing portions of the range that have no reasonable potential to be significant or in 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.

The geographic range of the tidewater goby is limited to the coast of California (Eschmeyer *et al.* 1983, p. 262; Swift *et al.* 1989, p. 12). The species historically occurred from 5 km (3 mi) south of the California-Oregon border (Tillas Slough in Del Norte County) to 71 km (44 mi) north of the United States-Mexico border (Agua Hedionda Lagoon in San Diego County). The available documentation suggests the northernmost locality that forms one end of the historical and current geographic range of the tidewater goby has not changed over time (see for example, Eschmeyer *et al.* 1983, p. 262; Swift *et al.* 1989, p. 12). Tidewater gobies do not currently occur in Agua Hedionda Lagoon, and the species' southernmost known extant occurrence is the San Luis Rey River 8 km (5 mi) north of Agua Hedionda Lagoon.

Although the northernmost and southernmost extent of the tidewater goby's range has not changed much over time, the species' distribution within the historical range has become patchy and fragmented.

Tidewater gobies are naturally absent from several large (80 to 217 km (50 to 135 mi)) stretches of coastline lacking lagoons or estuaries, and with steep topography or swift currents that may prevent the species from dispersing between adjacent localities (Earl *et al.* 2010, p. 104; Swift *et al.* 1989, p. 13). One such gap of approximately 160 km (100 mi) occurs from the Eel River in Humboldt County to Ten Mile River in Mendocino County. A second gap of approximately 97 km (60 mi) occurs between Lagoon Creek in Mendocino County to Salmon Creek in Sonoma County. Another large, natural gap of approximately 160 km (100 mi) occurs between the Salinas River in Monterey County and Arroyo del Oso in San Luis Obispo County. The southernmost gap, which is most likely the result of habitat loss and alteration, occurs between the Los Angeles Basin (city of Santa Monica, western Los Angeles County) and San Mateo Creek (MCB Camp Pendleton, San Diego County), a distance of approximately 130 km (80 mi).

Habitat loss and other anthropogenic (human-caused) factors have resulted in the tidewater goby now being absent from several localities where it historically occurred. These disappearances from specific localities have created smaller, artificial gaps in the species' geographic distribution (Capelli 1997, p. 7). Such localities include San Francisco Bay in San Francisco and Alameda Counties, and Redwood Creek and Freshwater Lagoon in Humboldt County. In central and northern California, Swift (*in litt.* 2007) believes it very unlikely that genetic interchange is possible between several groups of populations naturally separated by 32 km (20 mi) or more of rugged coastline. As anthropogenic gaps are created of equal or greater distance, recolonization and genetic exchange becomes less likely.

Swift *et al.* (1989, p. 13) reported that, as of 1984, tidewater gobies occurred, or had been known to occur, at 87 localities. This included localities at the extreme northern and southern end of the species' historical geographic range. An assessment of the species' distribution in 1993, using records that were limited to the area between the Monterey Peninsula in Monterey County and the United States-Mexico border, found tidewater gobies occurring at four additional sites since 1984 (Swift *et al.* 1993, p. 129). Other tidewater goby localities have been identified since 1993. Considering all of the known historical and currently occupied sites, tidewater gobies have been documented at 135 localities, and of these 135 localities, 21 (16 percent) are no longer known to be occupied by tidewater gobies (78 FR 8746). Therefore, we conclude that 114 localities are currently occupied (see Figure 1, above). These localities are not regularly monitored so the current status of tidewater goby in many of these places may have changed.

Given their patchy distribution and metapopulation dynamics of extirpation and recolonization, no individual area is likely to be of greater biological or conservation importance than any other area. Additionally, all recovery units, which span the entire extent of the species' range, are currently occupied, so no major portion of the species' range has been lost. Therefore, we conclude that the lost historical range is not a significant portion of the tidewater goby's range.

To further identify potentially significant portions of the range that might warrant further analysis, we considered whether the threats facing the tidewater goby are geographically concentrated or different in some fashion, which could indicate a portion or portions of the range where the species is likely to be endangered and could warrant further consideration of whether it is a significant portion of the species' range.

In the recovery plan (Service 2005, pp. 30–35), we divided the range of the tidewater goby into six recovery units based on observed genetic and morphological differences. Each of the recovery units provides important increments of redundancy, resiliency, and representation that contribute to the species' long-term viability. In our five-factor analysis in this proposed rule, based on the best available information we have identified several threats to the species including small-scale habitat loss, nonnative predators, habitat fragmentation, and competition with other species (see Summary of Factors Affecting the Species section). All these threats occur in each of the recovery units, and the threats are not concentrated more in one unit than another. Additionally, as described above, a cursory review of the known occupied localities and the threats identified for those localities (Service 2005, Appendix E) does not reveal a correlation between the number of threats and the status of the tidewater goby at those localities. In other words, localities with a large number of threats do not appear to have lower or more variable population densities than locations with fewer threats. While threats may vary from locality to locality, differences in number and type of threats don't appear to be causing a greater risk of extirpation in some localities as opposed to others. More importantly, the most serious threats to the tidewater goby are drought and sea level rise, which would have relatively the same effect on each recovery unit. Therefore, we find that none of the six recovery units is likely to be at greater risk of extinction than any other, and therefore none warrants further consideration as potentially endangered significant portions of the range.

Southern California, in particular, could potentially be considered a significant portion of the range for two reasons: (1) In 1999, the Service proposed that threats to the tidewater goby were more concentrated and therefore more severe in the southern California portion of the species' range than they were elsewhere in the range to the north because only six occupied localities remained in southern California (64 FR 33816), and (2) tidewater gobies in the southern California portion of the range have been found to be genetically distinct from those in the rest of the range (see *Species Information* section). Since the Service's 1999 proposal, tidewater gobies now occur at two additional localities bringing the total occupied localities in southern California to eight. More importantly, as discussed under factor D, MCB Camp Pendleton's INRMP, which was put into effect subsequent to the 1999 proposal, provides substantial protections for seven of the eight populations that occur in southern California that were not in place at the time of the proposed rule. Therefore, we no longer consider threats in southern California to be more severe or different from other areas, and therefore conclude the tidewater goby is not likely to be danger of extinction (as opposed to the rangewide status of threatened) in the southern California portion of its range.

In summary, we did not find that any portion of the species' range has a greater concentration of threats than others and, therefore, conclude that no portion warrants further consideration.

Conclusion

Based on the analysis above, we conclude that the tidewater goby is no longer in danger of extinction throughout all or a significant portion of its range, but instead is likely to become endangered in the foreseeable future throughout all or a significant portion of

its range. The species more appropriately meets the definition of a threatened species. Therefore, we propose to reclassify the tidewater goby from an endangered species to a threatened species.

Effects of This Rule

This proposal, if made final, would revise 50 CFR 17.11(h) to reclassify the tidewater goby from endangered to threatened. This rule formally recognizes that this species is no longer in imminent danger of extinction throughout all or a significant portion of its range. However, this reclassification does not significantly change the protection afforded this species under the Act. The regulatory protections of section 9 and section 7 of the Act remain in place. Anyone taking, attempting to take, or otherwise possessing a tidewater goby or parts thereof, in violation of section 9 of the Act, is still subject to a penalty under section 11 of the Act, unless their action is covered under a special rule under section 4(d) of the Act. At this time, we are not proposing a special rule under section 4(d) of the Act for the tidewater goby. Under section 7 of the Act, Federal agencies must ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of the tidewater goby.

Recovery actions directed at the tidewater goby will continue to be implemented as outlined in the recovery plan for the tidewater goby (Service 2005), including development of management plans such as those at MCB Camp Pendleton and VAFB.

Required Determinations

Clarity of This Proposed Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(a) Be logically organized;

(b) Use the active voice to address readers directly;

(c) Use clear language rather than jargon;

(d) Be divided into short sections and sentences; and

(e) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

National Environmental Policy Act

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*), need not be prepared in connection with regulations pursuant to section 4(a) of the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

References Cited

A complete list of all references cited in this final rule is available at *http://www.regulations.gov* at Docket No. FWS–R8–ES–2014–0001 or upon request from the Ventura Fish and Wildlife Office (see **ADDRESSES**).

Authors

The primary authors of this proposed rule are staff members of the Service's Ventura Fish and Wildlife Office (see **ADDRESSES**).

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

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

PART 17—[AMENDED]

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

Authority: 16 U.S.C. 1361–1407; 1531–1544; 4201–4245, unless otherwise noted.

■ 2. Amend § 17.11 by revising the entry for ''Goby, tidewater'' in the List of Endangered and Threatened Wildlife to read as follows:

§ 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							
*	*	*	*	*	*	*	
Goby, tidewater	*Eucyclogobius newberryi.*	U.S.A. (CA)	Entire	T	527	17.95(e)	NA
*	*	*	*	*	*	*	

* * * * *

Dated: March 5, 2014.

Stephen Guertin,

Acting Director, U.S. Fish and Wildlife Service.

[FR Doc. 2014–05335 Filed 3–12–14; 8:45 am]

BILLING CODE 4310–55–P