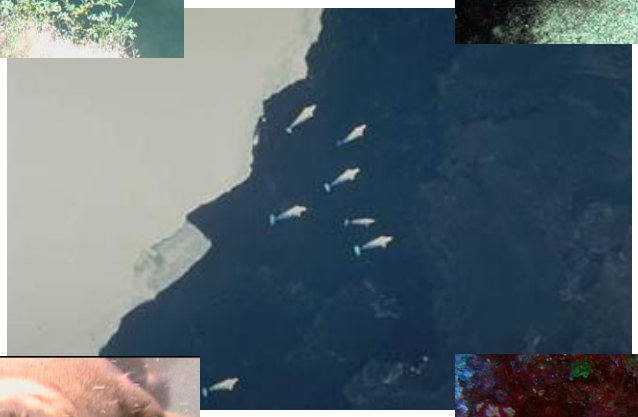
Biennial Report to Congress on the Recovery Program for Threatened and Endangered Species

October 1, 2006 – September 30, 2008



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Cover photo credits: Central Valley spring-run Chinook salmon in Butte Creek. July 2007 (NOAA); white abalone (NOAA); beluga whale (NOAA), Steller sea lion (NMML photo gallery 2002), and green turtle (David Burdick)

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ACRONYM LIST

AFRP	Anadromous Fish Restoration Program
ASC	Atlantic Salmon Commission
BRT	Biological Review Team
BSRFH	Bureau of Sea Run Fisheries and Habitat
CALFED	CALFED Bay-Delta Program
CC	California Coastal
CCC	Central California Coast
CDFG	California Department of Fish and Game
CV	Central Valley
CMP	Conservation and Management Plan
CVPIA	Central Valley Project Improvement Act
DPS	Distinct Population Segments
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FERC	Federal Energy Regulatory Commission
FRH	Feather River Hatchery
FWS	U.S. Fish and Wildlife Service
FY	Fiscal Year
GIS	Geographic Information System
GOM	Gulf of Maine
HCP	Habitat Conservation Plan
IOSEA	Indian Ocean and Southeast Asia
MHI	Main Hawaiian Islands
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
NASCO	North Atlantic Salmon Conservation Organization
NC	Northern California
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
PCBs	polychlorinated biphenyls
PCSRF	Pacific Coastal Salmon Recovery Fund
SONCC	Southern Oregon/Northern California Coast
TED	Turtle Excluder Device
TRT	Technical Recovery Teams
WCPFC	Western and Central Pacific Fishery Commission

OVERVIEW

The primary purpose of the Endangered Species Act (ESA) of 1973, as amended, is the conservation of endangered and threatened species and the ecosystems on which they depend. Conservation is defined as "…the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary." As one means of achieving recovery, the ESA requires the development of recovery plans for listed endangered or threatened species (except those species for which it is determined that such a plan will not promote the conservation of the species). These plans organize and guide the recovery process. The ESA amendments of 1988 added a requirement that the Secretaries of Commerce and the Interior report to Congress every 2 years on the status of efforts to develop and implement recovery plans, and on the status of all species for which recovery plans have been developed (section 4(f)(3)). The Secretary of Commerce has delegated responsibility for endangered and threatened species recovery to the National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA). This is the tenth Report to Congress on the status of the recovery program for these species.

This report summarizes efforts to recover all domestic species under NMFS' jurisdiction from October 1, 2006, through September 30, 2008. It includes accounts of each species, its status, current threats, conservation actions undertaken during this timeframe, and priority actions needed in the next biennium. During the two years covered in this report, NMFS had jurisdiction over 59 domestic species[1,2] of salmon, sturgeon, sawfish, sea grass, mollusks, sea turtles, and marine mammals, and eight foreign species, for a total of 67 species. The 59 species addressed in this report include three newly listed or relisted species:

- Cook Inlet Beluga whale (*Delphinapterus leucas*), listed as endangered on October 22, 2008 (73 FR 62919)
- Oregon coast coho, relisted as threatened on February 11, 2008 (73 FR 7816)
- Puget Sound Steelhead trout (*Oncorhynchus mykiss*), listed as threatened on May 7, 2007 (72 FR 26722)

Also, the Northern right whale was split into two distinct population segments (DPS), North Atlantic right whale (*Eubalaena glacialis*) and North Pacific right whale (*Eubalaena japonica*), on March 6, 2008 (73 FR 12024).

Of our 59 domestic listed species, 25 currently have recovery plans and 32 plans are being developed:

- Revised plans have been completed for the Hawaiian monk seal, Steller sea lion, and Atlantic population of Loggerhead sea turtle.
- Recovery plans were developed for Southern Resident Killer Whale and four Pacific salmon evolutionarily significant units (ESUs)/DPSs (Upper Columbia River steelhead

[1] Species is defined in the ESA as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife that interbreeds when mature.
[2] Black abalone, not included in this report, was listed January 14, 2009.

DPS, Upper Columbia River Spring Run Chinook ESU, Hood Canal Summer-run chum ESU, and Puget Sound Chinook ESU).

- Recovery plans are being revised for Kemp's ridley sea turtle, sperm whale, and fin whale and a draft recovery plan is being developed for sei whale.
- Recovery plans are currently under development for 24 ESUs and DPSs of Pacific salmon and steelhead, respectively.
- Two listed species currently have no recovery plan in development—Guadalupe fur seal and bowhead whale.

In addition to the numerous Pacific salmon technical recovery teams and sub-basin recovery teams (see Pacific Salmon Overview), there are active recovery teams for the Kemp's ridley sea turtle, smalltooth sawfish, Johnson's seagrass, white abalone, elkhorn and staghorn coral, Hawaiian monk seal, and right whale. Also, two active take reduction teams, formed in accordance with Marine Mammal Protection Act (MMPA), assist in the recovery of listed species: the Atlantic Large Whale Take Reduction Team and Pacific Offshore Cetacean Take Reduction Team.

Recovery of threatened and endangered species is a tremendous, long-term challenge. One means NMFS is using to meet this challenge is through meaningful stakeholder involvement in recovery planning and implementation. All NMFS' active recovery teams either have stakeholder representation (federal, state, and local government agencies; affected industries; conservation or other non-governmental organizations; or affected individuals) on their teams, or hold stakeholder fora to keep the public informed of their progress and to obtain feedback. In some cases (e.g., Pacific salmon recovery efforts in Washington State), recovery boards were appointed by the Governor and the plans written by local sub-basin recovery teams. NMFS helps support and is active on these teams, and is adopting their plans as draft recovery plans to be published for public comment. Experience has shown that true stakeholder involvement in the planning process results in "buy-in" to the recovery plan and greater recovery activity both during and after the planning process. Stakeholder involvement is emphasized in the Interim Recovery Planning Guidance completed in October 2004 and updated in July 2006, which is being field-tested in regional and field offices (see http://www.nmfs.noaa.gov/pr/laws/esa/policies.htm).

Between October 1, 2006, and September 30, 2008, of the 59 domestic endangered or threatened species listed under the ESA, 22 (37%) were stabilized or improving; 17 (29%) were known to be declining; and 20 (34%) were unknown or mixed in their status. These percentages reflect a minor variation from the previous 2004–2006 Biennial Report, and reflect three of the newly listed species with declining population trends. A list of species for which NMFS is responsible is provided in the following section.

Recovery plans are available online at
http://www.nmfs.noaa.gov/pr/PR3/recovery.html

Recovery plans may also be requested by writing to the following address:
Endangered Species Division – Recovery Plans
Office of Protected Resources – F/PR3
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3226

This report is available online via the NMFS-Office of Protected Resources website at
http://www.nmfs.noaa.gov/pr/PR3/biennial.html

ESA-LISTED SPECIES UNDER NMFS JURISDICTION OCCURING IN U.S. WATERS

Table 1. ESA-listed species under NMFS jurisdiction including listing status, trends, priority numbers, and recovery plan status.

Species/ESU/DPS[1]	Date Listed / Reclassified	ESA Status	Population/ESU Trend	Recovery Priority Number[2]	Status of Recovery Plan
SEA TURTLES					
Green sea turtle					
-Breeding colony populations in Florida, Pacific coast Mexico	7/28/1978	Endangered	Increasing (*FL*); Declining (*Mexico*)	5	Completed 01/1998
-Rangewide	7/28/1978	Threatened	Declining	5	Completed 01/1998 *(Pacific);* 10/1991 (*Atlantic*)
Hawksbill sea turtle	6/2/1970	Endangered	Declining	1	Completed 01/1998 *(Pacific);* 11/1993 (*Atlantic*)
Kemp's Ridley sea turtle	12/2/1970	Endangered	Increasing	5	Completed 08/1992 – Under Revision
Leatherback sea turtle	6/2/1970	Endangered	Declining (*Pacific*); Mixed (*Atlantic*)	1	Completed 01/1998 *(Pacific);* 05/1992 (*Atlantic*)
Loggerhead sea turtle	7/28/1978	Threatened	Mixed (*Pacific*); Declining (*Atlantic*)	5	Completed 01/1998 *(Pacific);* 12/1991; Revision Completed 12/2008 (*Atlantic*)
Olive Ridley sea turtle					
-Breeding colony populations of Pacific coast Mexico	7/28/1978	Endangered	Mixed	5	Completed 01/1998
-Rangewide	7/28/1978	Threatened	Mixed	5	Completed 01/1998
PACIFIC SALMON					
Northwest Region					
-Lower Columbia River Coho ESU	3/24/1999; 6/28/2005[3]	Threatened	Unknown	1	Under Development
-Oregon Coast coho ESU	8/10/1998[3]; 2/11/2008	Threatened[3]	Increasing	1	Under Development
-Lower Columbia River Chinook ESU	3/24/1999; 6/28/2005[3]	Threatened	Stable or Increasing	1	Partial Draft Completed 02/2006 (*Washington)*; Under Development (*Oregon)*
-Puget Sound Chinook ESU	3/24/1999; 6/28/2005[3]	Threatened	Increasing	1	Completed 01/2007
-Snake River Fall-run Chinook ESU	4/22/1992; 6/28/2005[3]	Threatened	Stable or Increasing	1	Draft Completed 03/1995 (not adopted); Under Development
-Snake River Spring/Summer-run Chinook ESU	4/22/1992; 6/28/2005[3]	Threatened	Unstable or Declining	1	Draft Completed 03/1995 (not adopted); Under Development

Species/ESU/DPS[1]	Date Listed / Reclassified	ESA Status	Population/ESU Trend	Recovery Priority Number[2]	Status of Recovery Plan
-*Upper Columbia River, Spring Run Chinook ESU*	3/24/1999; 6/28/2005[3]	Endangered	Stable or Increasing	1	Completed 09/2007
-*Upper Willamette River Chinook ESU*	3/24/1999; 6/28/2005[3]	Threatened	Stable or Increasing	1	Draft Completed 09/2007
-*Columbia River chum ESU*	3/25/1999; 6/28/2005[3]	Threatened	Stable or Increasing	1	Partial Draft Completed 02/2006 (*Washington*); Under Development (*Oregon*)
-*Hood Canal Summer-run chum ESU*	3/25/1999; 6/28/2005[3]	Threatened	Increasing	1	Completed 05/2007
-*Ozette Lake sockeye ESU*	3/25/1999; 6/28/2005[3]	Threatened	Stable or Increasing	1	Draft Completed 04/2008
-*Snake River sockeye ESU*	11/20/1991; 6/28/2005[3]	Endangered	Unstable or Declining	3	Draft Completed 03/1995 (not adopted); Under Development
-*Lower Columbia River steelhead DPS*	3/19/1998; 1/5/2006[3]	Threatened	Stable or Increasing	1	Partial Draft Completed 02/2006 (*Washington*); Under Development (*Oregon*)
-*Middle Columbia River steelhead DPS*	3/25/1999; 1/5/2006[3]	Threatened	Stable or Increasing	1	Draft Completed 05/2006
-*Snake River Basin steelhead DPS*	8/18/1997; 1/5/2006[3]	Threatened	Stable or Increasing	1	Draft Completed 03/1995 (not adopted); Under Development
-*Upper Columbia River steelhead DPS*	8/18/1997; 1/5/2006[3]	Threatened	Stable or Increasing	1	Completed 09/2007
-*Upper Willamette River steelhead DPS*	3/25/1999; 1/5/2006[3]	Threatened	Stable or Increasing	1	Draft Completed 09/2007
-*Puget Sound steelhead DPS*	5/11/2007	Threatened	Unknown	1	Under Development
Northwest and Southwest Regions					
-*Southern Oregon/Northern California Coast coho ESU*	5/6/1997; 6/28/2005[3]	Threatened	Mixed	1	Under Development
Southwest Region					
-*Northern California steelhead DPS*	6/7/2000; 1/5/2006[3]	Threatened	Declining	5	Under Development
-*California Central Valley steelhead DPS*	3/19/1998; 1/5/2006[3]	Threatened	Declining	7	Under Development
-*Central California Coast steelhead DPS*	8/18/1997; 1/5/2006[3]	Threatened	Declining	3	Under Development
-*South-Central California Coast steelhead DPS*	8/18/1997; 1/5/2006[3]	Threatened	Unknown	3	Under Development

Species/ESU/DPS[1]	Date Listed / Reclassified	ESA Status	Population/ESU Trend	Recovery Priority Number[2]	Status of Recovery Plan
-*Southern California steelhead DPS*	8/18/1997; 05/01/2002[4]; 1/5/2006[3]	Endangered	Unknown; likely declining	3	Under Development
-*Central California Coast coho ESU*	10/31/1996; 6/28/2005[3]	Endangered	Declining	1	Under Development
-*California Coastal Chinook ESU*	9/16/1999 6/28/2005[3]	Threatened	Mixed	3	Under Development
-*Sacramento River Winter-run Chinook ESU*	11/5/1990; 1/4/1994[5;] 6/28/2005[3]	Endangered	Declining	3	Draft Completed 08/1997; Under Development
-*Central Valley Spring-run Chinook ESU*	9/16/1999; 6/28/2005[3]	Threatened	Declining	7	Under Development
ATLANTIC SALMON					
Gulf of Maine DPS	11/17/2000	Endangered	Declining	1	Completed 11/2005
NON-SALMONID FISH					
Smalltooth sawfish – *U.S. DPS*	4/1/2003	Endangered	Unknown	7	Completed 01/2009
Gulf sturgeon	9/30/1991	Threatened	Stable	8	Completed 09/1995
Shortnose sturgeon	3/11/1967	Endangered	Mixed	5	Completed 12/1998
Green sturgeon – *southern DPS*	4/7/2006	Threatened	Unknown; likely Declining	5	Under Development
PLANTS					
Johnson's seagrass	9/14/1998	Threatened	Stable	7	Completed 09/2002
INVERTEBRATES					
White abalone	5/29/2001	Endangered	Declining	2	Completed 10/2008
Elkhorn coral	5/9/2006	Threatened	Declining	7	Under Development
Staghorn coral	5/9/2006	Threatened	Declining	7	Under Development
SEALS AND SEA LIONS					
Caribbean monk seal	3/11/1967; 10/28/2008[7]	Extinct	Extinct	NA	None
Guadalupe fur seal	12/16/1985	Threatened	Increasing	10	None

Species/ESU/DPS[1]	Date Listed / Reclassified	ESA Status	Population/ESU Trend	Recovery Priority Number[2]	Status of Recovery Plan
Hawaiian monk seal	11/23/1976	Endangered	Declining	1	Completed 03/1983; Revision Completed 08/2007
Steller sea lion – *eastern DPS*	4/10/1990; 11/26/1990; 5/5/97[6]	Threatened	Increasing	10	Completed 12/1992; Revision Completed 03/2008
Steller sea lion – *western DPS*	4/10/1990; 11/26/1990; 5/5/97[6]	Endangered	Mixed	7	Completed 12/1992; Revision Completed 03/2008
WHALES					
Beluga Whale – *Cook Inlet DPS*	10/22/2008	Endangered	Declining	3	Under Development
Blue whale	6/2/1970	Endangered	Unknown	7	Completed 07/1998
Bowhead whale	6/2/1970	Endangered	Increasing	7	None
Fin whale	6/2/1970	Endangered	Unknown	7	Draft Completed 06/2006
Humpback whale	6/2/1970	Endangered	Increasing	3	Completed 11/1991
North Atlantic right whale	6/2/1970; 03/06/2008	Endangered	Increasing	1	Completed 05/2005
North Pacific right whale	6/2/1970; 03/06/2008	Endangered	Unknown	1	Under Development
Sei whale	6/2/1970	Endangered	Unknown	3	Draft Completed 07/1998 – Under Revision
Sperm whale	6/2/1970	Endangered	Unknown	7	Draft Completed 06/2006
Killer whale	11/18/2005	Endangered	Declining	3	Completed 01/2008

[1] ESU = Evolutionarily Significant Unit; DPS = Distinct Population Segment.

[2] Recovery Priority Numbers are designated according to guidelines published by NMFS on June 15, 1990 (55 FR 24296). Priorities are designated from 1 (high) to 12 (low) based on the following factors: degree of threat, recovery potential, and conflict with development projects or other economic activity. See Appendix A for further information on NMFS Recovery Priority Numbers, including criteria used to designate numbers.

[3] In *Alsea Valley Alliance* v. *Evans*, 161 F. Supp. 2d 1154 (D. Or. 2001) (*Alsea*), the U.S. District Court in Eugene, Oregon, ruled that NMFS could not exclude hatchery fish within the ESU when listing. Although the *Alsea* ruling affected only one ESU, subsequent to the ruling, NMFS initiated new status reviews for 27 ESUs and, in 2005, re-listed 15 ESUs of salmon with revised definitions of the populations to be included in the ESU, delisted one ESU (OR Coast coho) and listed one ESU (Lower Columbia River coho); and in 2006, re-listed 10 ESUs of steelhead (and called them DPSs).

[4] This ESU was first listed on 8/18/1997; the southern range extension to the U.S.-Mexico border was added to the listing for this ESU via a final rule on 5/1/2002.

[5] This ESU was first emergency-listed as threatened on 8/4/1989, then officially listed as threatened on 11/5/1990, then reclassified as endangered on 1/4/1994.

[6] This species was first listed as threatened via a 240-day emergency rule on 4/10/1990, then officially listed as threatened in a final rule on 11/26/1990. NMFS separated the species into western and eastern DPSs via a final rule on 5/5/1997, which maintained the eastern DPS as threatened and reclassified the western DPS as endangered.

[7] This species was delisted due to extinction.

SEA TURTLE RECOVERY

Overview

NMFS and the U.S. Fish and Wildlife Service (FWS) share responsibility for the conservation, management, and recovery of sea turtle species found in waters and lands under U.S. jurisdiction. Although both agencies work closely together on recovery activities, NMFS is primarily responsible for recovery actions in the marine environment and FWS is primarily responsible for recovery actions in the terrestrial environment (i.e., nesting beaches). Six species of sea turtles are listed under the ESA and targeted by NMFS recovery activities: green, leatherback, loggerhead, hawksbill, olive ridley, and Kemp's ridley. Two regionally important DPSs are listed separately: (1) the green turtle breeding populations in Florida and on the Pacific Coast of Mexico and (2) the olive ridley turtle breeding populations on the Pacific Coast of Mexico.

Threats

Major threats to sea turtles in the United States include, but are not limited to: destruction and alteration of nesting and foraging habitats; incidental capture in commercial fisheries; and vessel strikes. To reduce the incidental capture of sea turtles in commercial fisheries, NMFS has enacted regulations to restrict certain segments of U.S. commercial fisheries using gears that have documented sea turtle bycatch (e.g., trawls, longlines, gillnets, and pound nets). To effectively address all threats to marine turtles, NMFS and the FWS have developed recovery plans to direct research and management efforts for each sea turtle species.

Marine Turtle Bycatch in the United States

Incidental take in fishing operations, or bycatch, is one of the most serious threats to the recovery and conservation of marine turtle populations. To evaluate this threat, NMFS has instituted fishery observer programs in some fisheries to document sea turtle bycatch and has promulgated regulations to reduce sea turtle bycatch in certain Pacific, Atlantic, and Gulf of Mexico fisheries.

In the Pacific, NMFS requires measures (e.g., gear modifications, changes to fishing practices, and time/area closures) to reduce sea turtle bycatch in the Hawaii longline fishery and the California/Oregon drift gillnet fishery.

In the Atlantic, NMFS has issued measures (e.g., gear modifications, changes to fishing practices, and time/area closures) to reduce sea turtle bycatch in pelagic longline, mid-Atlantic gillnet, Chesapeake Bay pound net, and Southeast shrimp and flounder trawl fisheries. In the southeast U.S. Atlantic and Gulf of Mexico, NMFS has worked closely with the trawl fishing industry to develop turtle excluder devices (TEDs) to reduce the mortality of sea turtles incidentally captured in shrimp trawl gear. Large-opening TEDs are required in all shrimp trawl nets.

In 2003, NMFS launched the Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic and Gulf of Mexico Fisheries to evaluate and address sea turtle bycatch comprehensively across jurisdictional (i.e., state and federal) and fishing sector (i.e., commercial and recreational) boundaries on a per-gear basis in fisheries of the Atlantic and Gulf of Mexico.

Initial efforts are focused on non-shrimp trawl fisheries and a proposed rule to expand TED regulations into certain of these fisheries is under development.

International Sea Turtle Conservation

The conservation and recovery of sea turtles requires multi-lateral cooperation and agreements to ensure the survival of these highly migratory animals. NMFS has a broad national and international program for the conservation and recovery of marine turtles—the goals of the international component of the sea turtle program are to facilitate the global conservation and recovery of sea turtles by working closely with other nations through diplomatic channels, capacity building, and scientific exchange. To do this, NMFS participates in two globally significant international instruments designed to facilitate international sea turtle conservation, the Inter-American Convention for the Protection and Conservation of Sea Turtles and the Indian Ocean Southeast Asia Marine Turtle Memorandum of Understanding. In addition NMFS works through other bi-lateral and multi-lateral channels and organizations to advance global sea turtle conservation.

Green Sea Turtle (*Chelonia mydas*)

Date Listed: July 28, 1978 (43 FR 32800)

Photo credit: David Burdick

Legal Status:
Endangered (*breeding colony populations in Florida and Pacific coast of Mexico*)
Threatened (*rangewide except where listed as endangered*)

Recovery Plan Status:
Pacific: Two final recovery plans were approved on January 12, 1998; one for the East Pacific green turtle population and one for all other Pacific populations.
Atlantic: A final recovery plan was approved on October 29, 1991.

Species Status: An assessment of the annual number of nesting females from major nesting areas (and other beaches in the Pacific Ocean, Asian Seas, Indian Ocean, Mediterranean Sea, and Atlantic Ocean where quantitative data are available) indicates a decline by 48 to 67 percent over the past three generations. In the United States, the nesting populations in Hawaii (Figure 1) and Florida (Figure 2) have been documented as increasing over the past 10–20 years. Age at sexual maturity is estimated as between 30 and 50 years. Thus, caution is warranted when interpreting short-term nesting trend data.

Threats and Impacts: Threats and impacts in the marine environment affecting both the threatened rangewide populations and the endangered breeding populations of green turtles include the following:

- Harvest of immature turtles and adults: Direct harvest of East Pacific green turtles has been documented in Mexico and Peru. In the West and Central Pacific, direct harvest of immature turtles and adults occurs throughout the green turtle's range, and potentially including (although unauthorized) the U.S. flagged areas of Guam, Commonwealth of the Northern Mariana Islands, and American Samoa. A legal fishery for green turtles also occurs in the Caribbean; Nicaragua's commercial turtle fishery is estimated to kill thousands of large juvenile and adult green turtles each year.

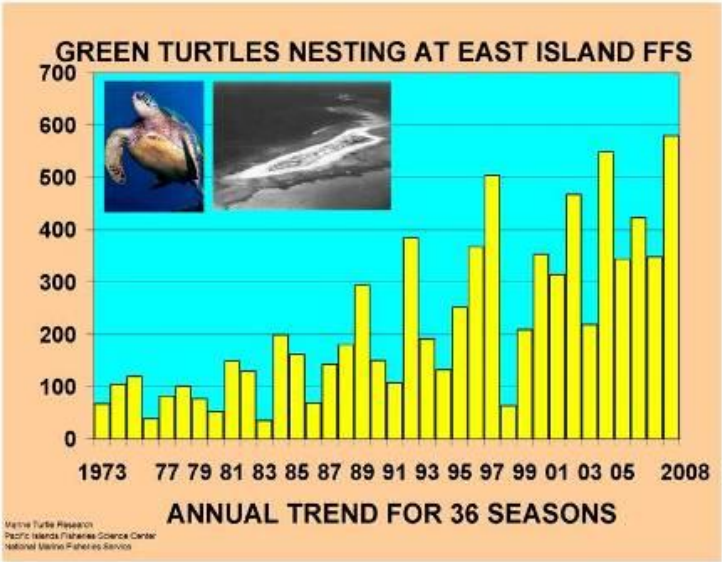


Figure 1. Estimated number of female green turtles nesting at East Island, French Frigate Shoals, Hawaiian Archipelago, 1973–2008

- Incidental capture in commercial and artisanal fisheries: Fisheries known to interact with green turtles include gillnet, longline, hook and line, purse seine, pound net, trap/pot gear, dredge, and trawl fisheries.
- Incidental capture in recreational fisheries: Fisheries known to interact with green turtles include shore-based and nearshore hook and line fisheries for coastal sport fish.

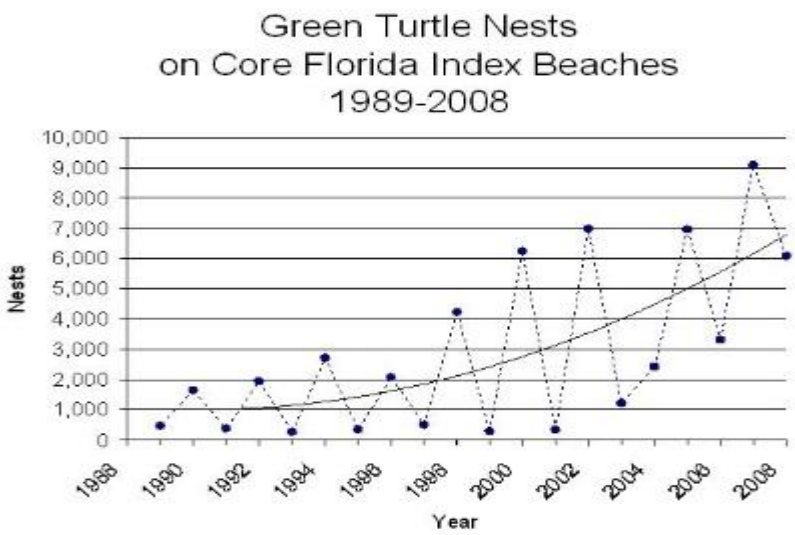


Figure 2. Number of green turtle nests documented on Florida core index beaches, 1989–2008.

- Marine debris and entanglement: Green turtles can ingest a wide variety of marine debris, and effects include interference with metabolism as well as absorption of toxic by-products. They can also become entangled in marine debris, such as "ghost" fishing gear.
- Pollution: Point and non-point source pollution (e.g., pesticides, heavy metals, and polychlorinated biphenyls (PCBs)) in the marine environment have been detected in turtles and their eggs.
- Vessel strikes: Especially in areas where recreational and/or commercial vessel traffic (small, medium, and/or large vessels) is intense, propeller and collision injuries are common. Vessel activities may also destroy or degrade habitat through anchoring, propeller scarring, and groundings.
- Power plant entrainment and entrapment, along both the U.S. Atlantic and Pacific coasts.
- Dredging and beach nourishment activities: These activities can result in marine habitat destruction via both direct and indirect effects and hopper dredges can entrain and kill turtles.
- Oil and gas exploration, development, and transportation: Underwater explosions (e.g., gas and oil structure removal and use of explosives during exploration activities) can kill or injure turtles, and destroy or damage habitat.
- Military activities: Military exercises in the marine environment may impact the migratory and foraging behavior of turtles and their habitats.
- Global climate change and sea level rise resulting in changes in nesting beach habitat (e.g., shoreline erosion and beach temperature changes).

Conservation Actions: Major conservation actions conducted in 2006–2008 to advance recovery of the green turtle include the following:

Pacific/Indian Ocean:

- Continued to conduct population identification of bycaught, nesting, foraging, and stranded turtles through genetic analysis, flipper tagging, and satellite telemetry.
- Identified habitat requirements using stable isotope analysis.

- Continued U.S. fishery observer programs within the Exclusive Economic Zone as well as on the high seas to monitor, report, and estimate bycatch.
- Continued vital population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes.
- Supported research to determine satellite transmitter drag on turtles.
- Continued to collaborate with foreign partners to export longline fishery technologies through education and outreach, a circle hook exchange program, and fishing gear experiments in Ecuador, Mexico, Guatemala, Costa Rica, Peru, Brazil, Columbia, Chile, Korea, Thailand, Japan, Philippines, Spain, Vietnam, Indonesia, and the Mediterranean.
- Conducted experiments to reduce bycatch and mortality in longline fisheries, including testing "stealth gear," blue-dyed bait, deep day-time fishing, and new circle hook designs in domestic and international fisheries.
- Continued TED outreach and training efforts with various foreign governments.
- Supported the development and completion of a Turtle Research Database System in collaboration with six international agencies.
- Participated in the Indian Ocean Memorandum of Understanding (MOU) on the Conservation and Management of Marine Turtles of the Indian Ocean and Southeast Asia (IOSEA), and its associated Conservation and Management Plan (CMP), to provide a framework for the conservation of sea turtles and their habitats in the Indo-Pacific region. Led the development and negotiations to obtain agreement and passage of a resolution dedicated to reducing bycatch of sea turtles.
- Convened a workshop to review and assess the results of all U.S. longline bycatch reduction efforts to date, including the available information on the effects of circle hooks on bycatch species and target catch, and to use this information to (1) identify best gear and fishing practices and (2) develop an action plan to direct NMFS' domestic and international marine turtle longline bycatch reduction efforts.

<u>Western and Central Pacific</u>

- Assisted national observer programs and supported capacity building through in-country fishery observer training to improve sea turtle species identification, reporting, handling, and education in Papua New Guinea, Marshall Islands, Indonesia, Vietnam, New Caledonia, Fiji, and Cook Islands.
- Continued long-term monitoring and research of the Hawaiian green turtle to identify potential causes of and threats posed by fibropapillomatosis.
- Continued to conduct long-term nesting beach monitoring in the Northwest Hawaiian Islands, evaluated population trends, and designed and evaluated conservation strategies via stochastic simulation models.
- Conducted long-term, spatially extensive, capture-mark-recapture programs at six sites throughout Hawaiian archipelago.
- Supported the State of Hawaii in preliminary stages of assessing the impact of nearshore recreational fisheries on sea turtle populations.
- Educated Hawaii-based longline fishery participants about sea turtle mitigation requirements including safe handling, gear removal, and release of turtles caught incidental to the fishery.

- Supported capacity building in American Samoa, Guam, and Commonwealth of Northern Mariana Islands for nesting beach and in-water monitoring and to assess threats to marine turtles and their nesting habitat.
- Supported turtle monitoring programs and capacity building in the Federated States of Micronesia and the Republic of Palau.
- Supported sea turtle bycatch mortality mitigation in the Palau tuna longline fishery through observer training in partnership with Palau Marine Law Enforcement Division and Bureau of Marine Resources.
- Supported in-water population assessment, genetic stock identification and threat assessment of sea turtles at Palmyra and conservation and management capacity and data collection efforts in the Marshall Islands.
- Supported surveys of trawl and longline fishing crews at Indonesian ports to estimate capture rates of marine turtles.
- Tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries in collaboration with Japan.

Eastern Pacific

- Identified trophic ecology of green turtles in the eastern Pacific.
- Conducted satellite telemetry to determine migratory corridors and susceptibility to fisheries impacts in the southeastern Pacific Ocean.
- Monitored and tracked resident green turtles in south San Diego Bay, California; Chile; Peru; and the Pacific coast of Mexico.
- Supported population assessment efforts in Ecuador and field studies in Peru to determine habitat use and characterize human impacts in neritic habitats.
- Supported a longline fishery observer program and sea turtle handling and resuscitation workshops in Peru.
- Supported an observer program in the Chilean swordfish-directed longline fishery and provided circle hooks and technical support for experimental testing of modified gear.
- Supported education and collaborative work with Mexican halibut gillnet and bottomset longline fisheries in Baja California to reduce turtle bycatch.

Atlantic Ocean:

- Identified population structure of nesting turtles using DNA analysis, flipper tagging, and satellite telemetry and habitat requirements using stable isotope analysis.
- Conducted population identification of bycaught, foraging, and stranded turtles using DNA analysis, flipper tagging, and satellite telemetry.
- Supported in-water population studies in the Atlantic and Caribbean to provide indices of turtle abundance and to gather life history data.
- Continued coordination and support of the Sea Turtle Stranding and Salvage Network in the Atlantic and Gulf of Mexico.
- Continued U.S. longline fishery observer program to monitor, report, and estimate green turtle bycatch.
- Implemented and provided training for a Sea Turtle Disentanglement Network in the Atlantic Northeast Region to address sea turtle entanglement in pot and other fishing gear.

- Convened a workshop to improve understanding of sea turtle bycatch in vertical lines associated with pot/trap and gillnet fisheries.
- Developed and tested gear technologies to reduce sea turtle bycatch, including modifications to scallop dredges.
- Established an inspection program for modified pound net leaders in the Chesapeake Bay to ensure gear is consistent with sea turtle requirements.
- Developed a regulation to give NMFS the authority to observe federal, state, or recreational fisheries for sea turtle bycatch where no authority currently exists.
- Continued and expanded fishery observer programs to monitor, report, and estimate green turtle bycatch.
- Conducted gear research to develop TEDs suitable for use in non-shrimp trawl fisheries such as the whelk, scallop, and sciaenid bottom trawl fisheries.
- Continued TED outreach and training efforts with various foreign governments.

Priority Recovery Actions Needed: Priority recovery actions needed for the green sea turtle include the following:

- Support education and outreach to reduce the direct take of eggs and turtles, and support the prohibition of direct take of juvenile and adult green turtles in their foraging habitats.
- Develop and implement solutions to reduce and eliminate sea turtle interactions with fisheries.
- Support the use of large circle hooks in global longline fisheries and continue to identify other gear modifications and fishing practices to reduce turtle bycatch in longline fisheries.
- Support nations in monitoring and implementing management measures to reduce sea turtle interactions in pelagic and coastal fisheries.
- Implement regulations in the United States requiring the use of TEDs, or measures that provide comparable or greater protection, in trawl fisheries known to incidentally capture sea turtles.
- Support nations in monitoring and implementing management measures to reduce sea turtle interactions in pelagic and coastal fisheries.
- Build capacity in foreign nations to establish and maintain conservation, research, and monitoring programs.
- Further identify population structure of green turtle nesting populations in the South Pacific region.

Recovery Priority Number: 5 (*Breeding Colony Populations in Florida and Pacific coast of Mexico*); 5 (*Rangewide*)

The recovery priority number for the green sea turtle is 5. This represents a moderate magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

Hawksbill Sea Turtle *(Eretmochelys imbricata)*

Photo credit: Becky A. Dayhuff, Environmental Educator

Date Listed: June 2, 1970 (35 FR 8491)

Legal Status: Endangered

Recovery Plan Status:
Pacific: A final recovery plan was approved on January 12, 1998.
Atlantic: A final recovery plan was approved on December 15, 1993.

Species Status: The hawksbill sea turtle is severely depleted throughout its range as a result of decades of intensive harvest. Today, most nesting populations continue to decline, a few appear stable (Buck Island Reef National Monument, U.S. Virgin Islands), and a few appear to be increasing (Mona Island, Puerto Rico) as a result of years of intensive conservation efforts. Major causes of the continued decline include commercial exploitation driven by the continuing demand for hawksbill shell (bekko), directed harvest of eggs, poaching of adult and immature turtles for meat, and destruction and degradation of nesting habitat and coral reef habitats that provide critically important foraging and resting areas. Baseline nesting demography, population status, trends, and genetic information is lacking throughout the species' range in the Western and South Pacific.

Threats and Impacts: Threats and impacts in the marine environment affecting hawksbill turtles include the following:

- Direct take of all life stages.
- Destruction and degradation of habitat: Hawksbills depend heavily on coral reefs for shelter and food.
- Global climate change and sea level rise resulting in changes to nesting and foraging beach habitat (e.g., shoreline erosion, beach temperature changes, coral reef degradation and destruction).
- Dredging: Dredging can result in marine habitat destruction via both direct and indirect effects.
- Marine debris and entanglement: Hawksbill turtles ingest a wide variety of marine debris, and effects include interference with metabolism as well as absorption of toxic by-products. Turtles can also become entangled in marine debris, such as "ghost" fishing gear.
- Incidental capture in commercial and recreational fishing gear including driftnets, seines, trawls, longlines, and gillnets.
- Vessel strikes: Especially in areas where recreational and/or commercial vessel traffic (small, medium, and/or large vessels) is intense, propeller and collision injuries are not uncommon.

- Vessel activities may also destroy or degrade habitat through anchoring, propeller scarring, and groundings.
- Oil and gas exploration, development, and transportation: Underwater explosions (e.g., gas and oil structure removal and use of explosives during exploration activities) can kill or injure turtles, and may destroy or damage habitat.
- Pollution: Point and non-point source pollution (e.g., pesticides, heavy metals, and PCBs) in the marine environment have been detected in turtles and their eggs.

Conservation Actions: Conservation actions conducted in 2006–2008 for recovery of the hawksbill turtle include the following:

Pacific/Indian Ocean:

- Supported the development of a Turtle Research Database System in collaboration with six international agencies.
- Continued TED outreach and training efforts with various foreign governments.

Central and Western Pacific

- Participated in the Indian Ocean MOU on the Conservation and Management of Marine Turtles of the IOSEA, and its associated CMP, to provide a similar comprehensive framework for the conservation and protection of sea turtles and their habitats in the Indo-Pacific region. Led the development and negotiations to obtain agreement and passage of a resolution dedicated to reducing bycatch of sea turtles.
- Assisted national observer programs and supported capacity building through in-country fishery observer training to improve sea turtle species identification, reporting, handling, and education in Papua New Guinea, Indonesia, Vietnam, Marshall Islands, New Caledonia, Fiji, and Cook Islands.
- Convened an Annual Hawaii Hawksbill Turtle Recovery Implementation meeting.
- Supported nesting beach monitoring and mitigation activities to remove non-native predators of eggs and hatchlings, and satellite and radio telemetry studies of post-nesting females in the main Hawaiian Islands.
- Supported capacity building in American Samoa, Guam, and the Commonwealth of the Northern Marianas Islands for nesting beach and in-water monitoring and to assess threats to marine turtles and their nesting habitat.
- Supported turtle monitoring programs and capacity building in the Federated States of Micronesia and the Republic of Palau.
- Supported in-water population assessment, genetic stock identification, and threat assessment of sea turtles at Palmyra and conservation and management capacity and data collection efforts in the Marshall Islands.
- Supported a survey of trawl and longline fishing crews at Indonesian ports to estimate capture rates of marine turtles.
- Supported a trial observer program in Indonesian longline and trawl fisheries.

Eastern Pacific

- Convened the first workshop with sea turtle specialists from Mexico, Guatemala, El Salvador, Nicaragua, Costa Rica, Ecuador, Colombia, and the United States to compile current scientific knowledge on eastern Pacific hawksbills, identify priority sites and

principal threats, consolidate multinational alliances and projects for conservation, and establish conservation goals.
- Conducted educational outreach efforts in Mexico, Costa Rica, El Salvador, and Ecuador to promote local and regional marine turtle conservation.
- Liaised with Minister of the Environment in Ecuador and the Vice Minister of the Environment in El Salvador (the two most important countries for hawksbill nesting in the Eastern Pacific) to promote national conservation legislation and enforcement of existing laws and regulations regarding the protection of marine turtles.
- Supported and collaborated with Ecuador and El Salvador to deploy the first-ever satellite transmitters on adult female hawksbills in the eastern Pacific to determine habitat use, migratory movements, and stock boundaries.

Atlantic Ocean:
- Supported satellite telemetry studies to investigate migration patterns and habitat use of hawksbills in the Caribbean Sea and Gulf of Mexico.
- Supported standardized index in-water surveys to monitor hawksbill populations in the wider Caribbean (e.g., Pearl Cays, Nicaragua).
- Re-examined population structure of nesting turtles in the U.S. Virgin Islands, Costa Rica, Mexico, Barbados, Antigua, Nicaragua, and Guadeloupe using improved DNA analysis techniques.
- Conducted population identification of foraging turtles from the U.S. Virgin Islands and Nicaragua along with stranded turtles off the coast of Texas using DNA analysis.
- Continued coordination and support of the Sea Turtle Stranding and Salvage Network in the Atlantic and Gulf of Mexico.
- Continued and expanded fishery observer programs to monitor, report, and estimate hawksbill turtle bycatch.

Priority Recovery Actions Needed: Priority recovery actions needed for the hawksbill sea turtle include the following:
- Stop the direct harvest of hawksbill turtles and eggs through foreign nation capacity building, education, and law enforcement support.
- Support conservation and biologically viable management of hawksbill populations in countries that share U.S. hawksbill stocks.
- Determine population size, status, and trends through long-term regular nesting beach and in-water censuses.
- Identify stock home ranges and foraging/stranding population contributions using DNA analysis.
- Identify and protect primary nesting and foraging areas.
- Eliminate adverse effects of development on hawksbill nesting and foraging habitats.
- Control non-native predators of eggs and hatchlings (e.g., mongoose, feral cats, and pigs) in the Hawaiian population.
- Reduce incidental mortalities of hawksbill turtles by commercial and artisanal fisheries.

Recovery Priority Number: 1

The recovery priority number for the hawksbill sea turtle is 1. This represents a high magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*

Date Listed: December 2, 1970 (35 FR 18319)

Legal Status: Endangered

Recovery Plan Status: A final recovery plan for the Kemp's ridley turtle was approved on August 21, 1992. A revised plan is currently under development.

Species Status: The only major nesting sites for Kemp's ridley are in Mexico in the state of Tamaulipas, with the majority of nesting occurring along the coast at Rancho Nuevo. Although still significantly decreased in number from the mid-20th century, the trend in the number of nests documented at the Mexican nesting beaches has been increasing over the past decade, with 17,882 nests documented in 2008 (Figure 3). A small nesting assemblage is also found in the United States, primarily in Texas, 6 nests were documented in 1996 and a record 195 nests were documented in 2008. As a result of intensive bi-lateral conservation efforts, including full protection of nesting females and their eggs in Mexico, and implementation of turtle excluder device requirements in the U.S. shrimp trawl fishery, there is cautious optimism that the Kemp's ridley population is in the early stages of recovery.

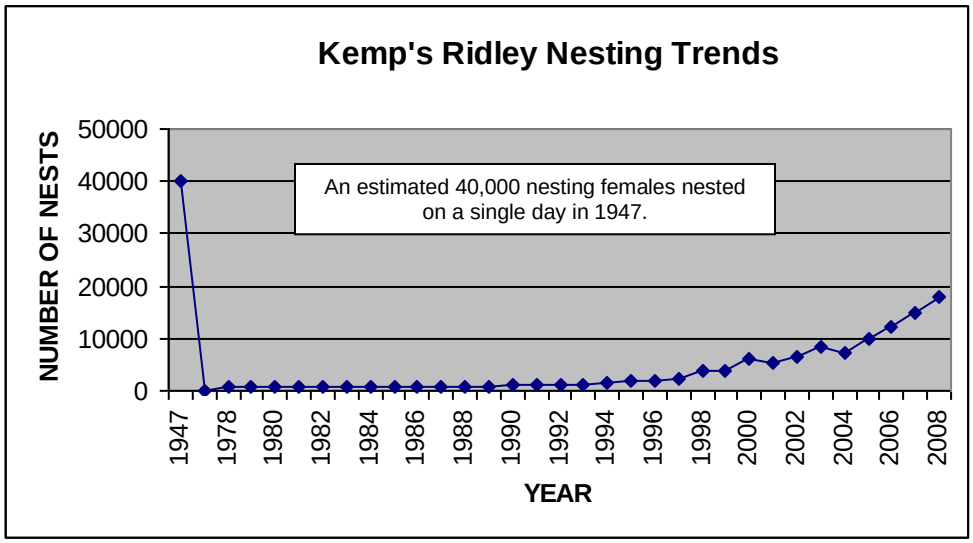


Figure 3. Kemp's ridley nesting trends in Mexico, 1978– 2008. The 1947 point is a single reference point representing nesting females on a single day, the total nests over the entire 1947 nesting season is believed to be much higher.

Threats and Impacts in the Marine Environment: Threats and impacts found in the marine environment affecting Kemp's ridley turtles include the following:

- Interactions with commercial and recreational fishing gear, including trawls, purse seines, pound nets, traps and pots, hook and line, dredges, and gillnets.
- Marine debris and entanglement: Kemp's ridley turtles can ingest a wide variety of marine debris, and effects include interference with metabolism as well as absorption of toxic by-products. They can also become entangled in marine debris, such as "ghost" fishing gear.

- Vessel strikes: Especially in areas where recreational and/or commercial vessel traffic (small, medium, and/or large vessels) is intense, propeller and collision injuries are not uncommon.
- Power plant entrainment and entrapment: Kemp's ridleys can become entrained and entrapped primarily along the U.S. Atlantic coast.
- Prey limitation: Overfishing may lead to a reduction of key prey species preferred by Kemp's ridleys.
- Dredging: Dredging can result in marine habitat destruction via both direct and indirect effects and hopper dredges can entrain and kill turtles.
- Oil production: Marine turtles are at risk when encountering an oil spill, as respiration, skin, blood chemistry, and salt gland functions are affected.
- Pesticides, heavy metals, and PCBs: These materials and substances have been detected in turtles and eggs, but their effect is unknown.
- Oil and gas exploration, development, and transportation: Underwater explosions (e.g., gas and oil structure removal and use of explosives during exploration activities) can kill or injure turtles, and may destroy or damage habitat.
- Marina and dock development: Marina and dock development can destroy or degrade foraging habitat as well as lead to increased boat traffic, thus increasing the risk of collisions.
- Climate change and resulting changes in nesting beach habitat (e.g., shoreline erosion and beach temperature changes).

Conservation Actions: Conservation actions conducted in 2006–2008 for recovery of the Kemp's ridley turtle include the following:

- Identified population structure of nesting turtles at Padre Island, Texas and Rancho Nuevo, Mexico using DNA analysis.
- Supported infrastructure maintenance, stranding surveys, and provided monitoring equipment for the Mexican component of the Kemp's ridley conservation program.
- Supported research on in situ versus relocated nests to guide future conservation efforts.
- Continued vital work through the Sea Turtle Stranding and Salvage Network including collecting age samples for analysis at the National Sea Turtle Aging Laboratory.
- Investigated protocol and reporting form for documenting human interactions in stranded turtles.
- Continued and expanded fishery observer programs to monitor, report, and estimate Kemp's ridley bycatch.
- Convened a workshop to improve understanding of sea turtle bycatch in vertical lines associated with pot/trap and gillnet fisheries.
- Established an inspection program for modified pound net leaders in the Chesapeake Bay to ensure gear is consistent with sea turtle requirements.
- Supported in-water population studies in the Atlantic and Gulf of Mexico.
- Developed a regulation to give NMFS the authority to observe federal, state, or recreational fisheries, where no authority currently exists, for sea turtle bycatch.
- Developed and tested gear technologies to reduce sea turtle bycatch including modifications to scallop dredges and conducted research on TEDs suitable for use in non-shrimp trawl fisheries.

Priority Recovery Actions Needed: Priority recovery actions needed for the Kemp's ridley sea turtle include the following:

- Minimize commercial fishery bycatch and mortality of Kemp's ridley.
- Support Mexico in its conservation efforts on primary nesting beaches and build capacity for expansion of in-water conservation and research efforts.
- Improve and refine estimation techniques for the takes of sea turtles to ensure that criteria for recovery are being met.
- Continue and improve population assessments, including in-water studies of population size and structure.
- Determine distributional and seasonal movements for all life stages in the marine environment.
- Identify important marine habitats.
- Improve understanding of the effects of commercial fishery harvest on key prey species.

Recovery Priority Number: 5

The recovery priority number for the Kemp's ridley sea turtle is 5. This represents a moderate magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

Leatherback Sea Turtle *(Dermochelys coriacea)*

Photo credit: S.R. Livingstone, University of Glasgow

Date Listed: June 2, 1970 (35 FR 8491)

Legal Status: Endangered

Recovery Plan Status:
Pacific: A final recovery plan was approved on January 12, 1998.
Atlantic: A final recovery plan was approved on April 6, 1992.

Species Status: In the Pacific, the number of nesting leatherback turtles is declining at all key nesting beaches except Jamursba-Medi Beach, Indonesia, where there is a long-term decline in the nesting population, but a short-term (since 1999) stability in nesting numbers. There is growing evidence to suggest a significant decline in leatherback turtle nesting abundance in Papua New Guinea and Solomon Islands over the past 30 years. Predation by pigs and dogs as well as continued direct harvest of eggs and beach erosion remain significant impacts to the Western Pacific population. Leatherbacks were extirpated from Malaysia within the past decade or more, and the potential for Pacific-basin wide extirpation remains. Conversely, in the Atlantic, leatherback nesting populations are increasing on U.S. beaches and are generally increasing elsewhere in the western north Atlantic, with the exception of Costa Rica.

Threats and Impacts: Threats and impacts found in the marine environment affecting leatherback turtles include the following:

- Incidental capture in both commercial and artisanal fisheries: including drift and fixed gillnet, longline, purse seine, trap and pot, pound net, dredge, and trawl fisheries.
- Vessel strikes: Especially in areas where recreational and/or commercial vessel traffic (small, medium, and/or large vessels) is intense, propeller and collision injuries are not uncommon.
- Marine debris and entanglement: Leatherbacks can ingest a wide variety of marine debris, and effects include direct effects as well as secondary effects such as interference with metabolism as well as absorption of toxic by-products. Turtles can become entangled in marine debris, such as “ghost” fishing gear and discarded shipping and packing materials.
- Oil and gas exploration, development, and transportation: Underwater explosions (e.g., gas and oil structure removal and the use of explosives during exploration activities) can kill or injure turtles, and may destroy or damage habitat.
- Military activities: Various short-term and longer-term military exercises in the marine environment may impact the migratory and foraging behavior of turtles and their habitats.
- Illegal harvest of juveniles and adults.
- Habitat destruction and degradation due to development and tourism.

- Global climate change and sea level rise resulting in changes to nesting and foraging habitat (e.g., shoreline erosion, beach temperature changes).

Conservation Actions: Conservation actions conducted in 2006–2008 for recovery of the leatherback turtle include the following:

Pacific/Indian Ocean:

- Identified population home ranges and conducted population identification of nesting, foraging, stranded, and bycaught turtles using DNA analysis and other tools.
- Conducted stable isotope analyses of leatherback soft tissues to determine habitat use and foraging strategies of leatherbacks in the Eastern and Western Pacific.
- Evaluated leatherback turtle population trends and designed and evaluated conservation strategies via stochastic simulation models.
- Provided technical, scientific, and management support to Pacific-wide leatherback turtle projects.
- Supported the development and completion of a Turtle Research Database System in collaboration with six international agencies.
- Convened a workshop with partners from government, non-governmental organizations, and the private sector to develop a Pacific leatherback conservation action plan incorporating coastal fisheries management and nesting beach conservation.
- Conducted aerial surveys to determine abundance of nesting leatherback turtles in Papua New Guinea, Indonesia, Solomon Islands, and Latin America.
- Promoted "best practices" in the major longline fleets operating in the Pacific.
- Reduced leatherback interaction rates and mortality rates in U.S. Pacific swordfish directed longline fleets by requiring large circle hooks combined with non-squid bait; proper handling of hooked and entangled leatherbacks; and use of disentangling and de-hooking equipment such as dip nets, line cutters, and de-hookers.
- Collaborated with foreign partners to export longline fishery technologies through education and outreach, circle hook exchange program, and fishing gear experiments.
- Conducted research to test longline fishing gear modifications to reduce bycatch and mortality.
- Convened a workshop to review and assess the results of all U.S. longline bycatch reduction efforts to date, including the available information on the effects of circle hooks on bycatch species and target catch, and to use this information to (1) identify best gear and fishing practices and (2) develop an action plan to direct NMFS' domestic and international marine turtle longline bycatch reduction efforts.
- Continued TED outreach and training efforts with various foreign governments.

<u>Central and Western Pacific</u>

- Participated in the Indian Ocean MOU on the Conservation and Management of Marine Turtles of the IOSEA, and its associated CMP, to provide a similar comprehensive framework for the conservation and protection of sea turtles and their habitats in the Indo-Pacific region. Led the development and negotiations to obtain agreement and passage of a resolution dedicated to reducing bycatch of sea turtles.

- Educated Hawaii-based longline fishery participants about sea turtle mitigation requirements including safe handling, gear removal, and release of turtles caught incidental to the fishery.
- Assisted national observer programs and supported capacity building through in-country fishery observer training to improve sea turtle species identification, reporting, handling, and education regarding fishery mitigation techniques in Palau, Indonesia, Vietnam, and New Caledonia.
- Supported monitoring and protection of leatherback nesting beaches in the western Pacific, including education of local villagers on the importance of conservation of leatherbacks in Papua New Guinea, Indonesia, Solomon Islands, and Vanuatu.
- Attached satellite tags to leatherbacks in Indonesia to gather information regarding migratory movements and pelagic habitat use.
- Supported work with Kei Island (Indonesia) villagers to reduce and/or eliminate direct harvest of adult leatherbacks in marine and coastal habitats.
- Tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries in collaboration with Japan.

Eastern Pacific

- Convened a workshop on swordfish and leatherback use of temperate habitat (SLUTH) along the U.S. west coast with scientists, fisheries managers, conservationists, and fishers to identify information gaps, exchange ideas, and develop a new cooperative initiative to integrate fisheries management and protected resources conservation.
- Conducted monitoring (aerial surveys) for foraging leatherbacks off central and northern California and conducted capture, tagging, and satellite tracking of foraging leatherbacks off central California.
- Described the distribution and abundance of leatherback turtles within the coastal California ecosystem.
- Conducted first-ever process-oriented cruise of the U.S. west coast to determine the habitat requirements and environmental drivers that dictate leatherback use of temperate habitat.
- Supported monitoring and protection of leatherbacks nesting in Mexico.
- Supported longline observer programs in Chile and Peru.

Atlantic Ocean:

- Conducted population identification of by-caught, foraging, and stranded turtles using DNA analysis, flipper tagging, and satellite telemetry.
- Supported research to assess the health of wild caught leatherback turtles in the western North Atlantic.
- Supported research and monitoring of one of the largest seasonal foraging populations of leatherbacks in the Atlantic, found in Canada.
- Held a bilateral meeting to coordinate with Canada solely on sea turtle conservation activities and worked cooperatively with Canada to identify and address threats to leatherback turtles in Canadian waters and contributed to the development of recovery plans for leatherbacks in Canada.
- Supported research to investigate leatherback movements and behavior along the U.S. Atlantic coast.

- Developed a regulation to give NMFS the authority to observe federal, state, or recreational fisheries, where no authority currently exists, for sea turtle bycatch.
- Implemented and provided training for a Sea Turtle Disentanglement Network in the Atlantic Northeast Region to address sea turtle entanglement in pot and other fishing gear.
- Convened a workshop to improve understanding of sea turtle bycatch in vertical lines associated with pot/trap and gillnet fisheries.
- Conducted gear research to develop TEDs suitable for use in non-shrimp trawl fisheries, such as the whelk, scallop, and sciaenid bottom trawl fisheries.
- Continued TED outreach and training efforts with various foreign governments.
- Convened a Leatherback Turtle Expert Working Group with national and international participants to gather and assess data available on Atlantic leatherback turtles.
- Continued fishery observer programs to monitor, report, and estimate leatherback bycatch.

Priority Recovery Actions Needed: Priority recovery actions needed for the leatherback sea turtle include the following:

- Reduce bycatch in commercial and artisanal fisheries.
- Implement regulations in the United States requiring the use of TEDs, or other suitable conservation measures, wherever the distribution of sea turtles overlaps with the use of trawl gear known to take turtles.
- Develop a strategy to document and address the critical problem of entanglement in fixed pot gear in the Atlantic and Gulf of Mexico.
- Support nations in monitoring and implementing management measures to reduce sea turtle bycatch in pelagic and coastal fisheries.
- Promote the use of large circle hooks in global longline fisheries and continue to identify other gear modifications and fishing practices to reduce bycatch in longline fisheries.
- Continue and improve population assessments on nesting beaches and in foraging habitats.
- Improve understanding of the effects of commercial fishery harvest on key prey species.
- Support nesting beach programs, including outreach and education, to promote increased hatchling production and to reduce killing of nesting females.

Recovery Priority Number: 1

The recovery priority number for the leatherback sea turtle is 1. This priority number represents the critical status of this globally listed species and is based on a high magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

Loggerhead Sea Turtle *(Caretta caretta)*

Date Listed: July 28, 1978 (43 FR 32800)

Legal Status: Threatened

Recovery Plan Status:
Pacific: A final recovery plan was approved on January 12, 1998.
Atlantic: A final revised recovery plan was approved on December 31, 2008.

Species Status: In the Pacific, loggerhead nesting populations are at best stable, if not declining, at the major nesting areas in Japan and Australia. Approximately 2,000 females are estimated to nest annually in the Pacific (Table 2, Figure 4). North Pacific loggerheads nest exclusively in Japan where monitoring began in the 1950s on some beaches and expanded to all known nesting beaches beginning in 1990. In 2008, 10,837 nests were documented, which was the highest recorded number of nests since 1990, whether this increase will be sustained is unknown. Nesting also occurs in New Caledonia, although population trends are unknown. There is no loggerhead nesting in the U.S. Pacific.

Table 2. Status and trends of Pacific loggerhead nesting subpopulations

Subpopulations	No. of Females Nesting Annually	Trends
Japan	<1,000	Mixed[3]
Australia (eastern, 70% of nesting)	<500	Declining
New Caledonia	tens or low hundreds	Unknown

In the U.S. Atlantic and Gulf of Mexico, loggerheads primarily nest from North Carolina through Florida, with Florida hosting the largest assemblage. Total estimated nesting in the United States has fluctuated between 47,000 and 90,000 nests per year over the last decade. Results from standardized nesting beach surveys in Florida have demonstrated a significant decline in nesting over the past two decades (Figure 5). Nesting in Georgia, South Carolina, and North Carolina has also declined, although not as significantly as in Florida. In Mexico, 1,000–2,000 loggerhead nests have been documented annually in recent years, and nesting has been declining.

Threats and Impacts in the Marine Environment: Threats and impacts found in the marine environment affecting loggerhead turtles include the following:

- Bycatch in domestic and international commercial and artisanal fisheries: Fisheries known to interact with loggerheads include trawl, gillnet, longline, hook and line, purse seine, pound net, dredge, and pot/trap fisheries.
- Directed take of immature loggerheads outside the United States.
- Marine debris and entanglement: Loggerheads can ingest a wide variety of marine debris, and effects include direct effects as well as secondary effects such as interference with metabolism as well as absorption of toxic by-products. Turtles can become entangled in marine debris, such as “ghost” fishing gear and discarded shipping and packing materials.

[3] There has been an overall long-term decline of the Japanese population of loggerheads (50– 90 percent decline in the past 50 years), although Yakushima Island (where approximately 40 percent of females nest in Japan) has shown an increase only in recent years.

- Vessel strikes: Especially in areas where recreational and/or commercial vessel traffic (small, medium, and/or large vessels) is intense, propeller and collision injuries, many resulting in death, are common.

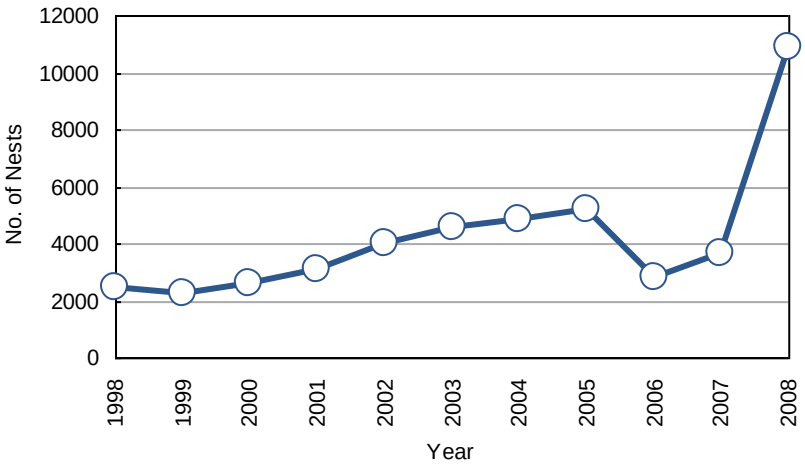


Figure 4. Annual loggerhead nests documented on Japanese beaches, 1998–2008 (Sea Turtle Association of Japan, unpublished data).

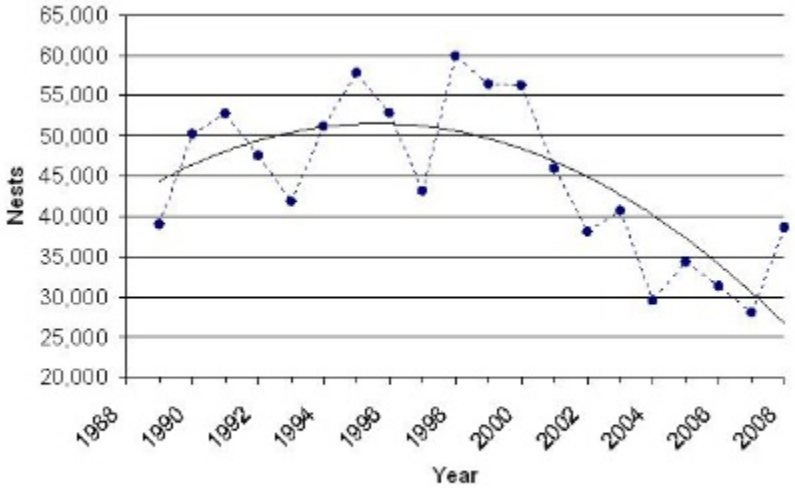


Figure 5. Number of loggerhead nests documented on Florida core index beaches, 1989–2008.

- Power plant entrainment and entrapment, primarily along the U.S. Atlantic coast.
- Habitat loss and alteration from anthropogenic activities in the marine environment.
- Limitation of prey: Commercial fishing may lead to reduction of key prey species for loggerheads.

- Dredging: Dredging can result in marine habitat destruction via both direct and indirect effects and hopper dredges can entrain and kill turtles.
- Oil and gas exploration, development, and transportation: Underwater explosions (e.g., gas and oil structure removal and the use of explosives) can kill or injure turtles, and may destroy or damage habitat.
- Military activities: Various short-term and longer-term military exercises in the marine environment may impact the migratory and foraging behavior of turtles and their habitats.
- Global climate change and sea level rise resulting in changes to nesting and foraging habitat (e.g., shoreline erosion, beach temperature changes).
- Pollution: Point and non-point source pollution (e.g., pesticides, heavy metals, and PCBs) in the marine environment have been detected in turtles and their eggs.

Conservation Actions: Conservation actions conducted in 2006–2008 for recovery of the loggerhead turtle include the following:

Pacific/Indian Ocean:

- Identified population home ranges and conducted population identification of nesting, bycaught, foraging, and stranded loggerheads using DNA analysis.
- Evaluated loggerhead turtle population trends and designed and evaluated conservation strategies via stochastic simulation models.
- Reduced interaction rates and mortality rates in U.S. Pacific swordfish-directed longline fleets (Hawaii-based) by requiring large circle hooks combined with non-squid bait; proper handling of hooked and entangled loggerheads; requiring the use of disentangling and de-hooking equipment such as dip nets, line cutters, and de-hookers; and implementing closures.
- Conducted research to understand longline gear and bait interactions and to evaluate options to reduce bycatch and mortality.
- Investigated migration routes and preferred oceanic habitats by attaching satellite transmitters and tracking loggerheads in the Pacific.
- Supported the development and completion of a Turtle Research Database System in collaboration with six international agencies.
- Collaborated with foreign partners to export longline fishery technologies through education and outreach, circle hook exchange program, and fishing gear experiments in Ecuador, Mexico, Guatemala, Costa Rica, Peru, Brazil, Columbia, Chile, Korea, Thailand, Japan, Philippines, Spain, Vietnam, Indonesia, and the Mediterranean.
- Convened a workshop to review and assess the results of all U.S. longline bycatch reduction efforts to date, including the available information on the effects of circle hooks on bycatch species and target catch, and to use this information to (1) identify best gear and fishing practices and (2) develop an action plan to direct NMFS' domestic and international marine turtle longline bycatch reduction efforts.
- Continued TED outreach and training efforts with various foreign governments.

Western and Central Pacific

- Participated in the Indian Ocean MOU on the Conservation and Management of Marine Turtles of the IOSEA, and its associated CMP, to provide a similar comprehensive framework for the conservation and protection of sea turtles and their habitats in the Indo-Pacific region. Led the development and negotiations to obtain agreement and passage of a resolution dedicated to reducing bycatch of sea turtles.
- Educated Hawaii-based longline fishery participants about sea turtle mitigation requirements including safe handling, gear removal, and release of turtles caught incidental to the fishery.
- Tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries in collaboration with Japan.
- Supported monitoring and protection efforts of loggerhead nesting beaches in Japan in collaboration with the Sea Turtle Association of Japan.
- Supported sea turtle bycatch mortality mitigation in the Palau tuna longline fishery through observer training in partnership with Palau Marine Law Enforcement Division and Bureau of Marine Resources.
- Supported a survey of trawl and longline fishing crews at Indonesian ports to estimate capture rates of marine turtles and supported a trial observer program in Indonesian longline and trawl fisheries.
- Supported an education and outreach coordinator to promote loggerhead sea turtle conservation and management concerns in New Caledonia.

East Pacific

- Performed aerial surveys off Baja California, Mexico to quantify population abundance and distribution of loggerhead turtles in off-shore waters of Baja.
- Supported education and collaborative work to reduce bycatch of sea turtle in Mexican gillnet fisheries.
- Supported an observer program in the Chilean swordfish-directed longline fishery and provided circle hooks and technical support for experiments testing modified gear.
- Conducted capacity training exercises for fishers and boat captains from Peruvian artisanal fleets to educate them on safe handling and resuscitation techniques for comatose turtles incidentally captured in gillnet and longline gear.
- Supported an observer program in Peru to document the threat of shark and mahi mahi longline fisheries on loggerhead turtles.

Atlantic Ocean:

- Supported characterizations (e.g., gear types used, fishing practices, turtle bycatch, etc.) of all fisheries occurring within state waters of all Atlantic and Gulf coast states.
- Conducted gear research to develop TEDs suitable for use in non-shrimp trawl fisheries such as the flynet, whelk, and scallop trawl fisheries, and conducted gear research to develop bycatch reduction solutions for scallop dredge fisheries.
- Continued TED outreach and training efforts with various foreign governments.
- Established an inspection program for modified pound net leaders in the Chesapeake Bay to ensure gear is consistent with sea turtle requirements.
- Convened a workshop to improve understanding of sea turtle bycatch in vertical lines associated with pot/trap and gillnet fisheries.

- Developed a regulation to give NMFS the authority to observe federal, state, or recreational fisheries, where no authority currently exists, for sea turtle bycatch.
- Continued fishery observer programs to monitor, report, and estimate loggerhead bycatch.
- Continued coordination and support of the Sea Turtle Stranding and Salvage Network in the Atlantic Ocean and Gulf of Mexico.
- Supported a comprehensive investigation of a mass stranding event related to red tide in southwest Florida.
- Supported in-water population studies in Maryland, New York, and Florida.
- Identified population home ranges and conducted population identification of nesting, foraging, stranded, and bycaught loggerheads using DNA analysis, flipper tagging, and satellite telemetry.

Priority Recovery Actions Needed: Priority recovery actions needed for the loggerhead sea turtle include the following:

- Reduce incidental capture of loggerheads in domestic and international commercial and artisanal fisheries.
- Promote the use of large circle hooks in global longline fisheries and continue to identify other gear modifications and fishing practices to reduce bycatch in longline fisheries.
- Investigate the effects of commercial fishing on loggerhead prey distribution and abundance.
- Continue and improve population assessments on nesting beaches and in foraging habitats.
- Implement regulations in the United States requiring the use of TEDs, or other suitable conservation measures, wherever the distribution of loggerhead sea turtles overlaps with the use of trawling gear known to take turtles.

Recovery Priority Number: 5

The recovery priority number for the loggerhead sea turtle is 5. This represents a moderate magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

Olive Ridley Sea Turtle *(Lepidochelys olivacea)*

Date Listed: July 28, 1978 (43 FR 32800)

Legal Status:
Endangered (*breeding colony populations of Pacific coast of Mexico*)
Threatened (*rangewide except where listed as endangered*)

Recovery Plan Status: A recovery plan for the U.S. Pacific populations of the olive ridley sea turtle was approved on January 12, 1998.

Olive Ridley Arribada in Mexico
Photo credit: Michael P. Jensen

Species Status: The olive ridley is the most abundant sea turtle in the world and population trends vary among geographic regions as well as within regions. The behavior of olive ridleys, primarily nesting as an arribada (a mass arrival of turtles to the nesting beach), makes it difficult to precisely measure annual nesting. The status of the primary nesting populations of the olive ridley in the Pacific varies from declining to increasing (Table 3). In the western Atlantic, olive ridleys nest in Suriname, French Guiana, and Brazil. Survey effort has fluctuated over the years at these sites and it is difficult to assess nesting trends because of incomplete surveys during many years. In recent years, no more than 5,000–6,000 olive ridley nests are documented annually in the western Atlantic. In the eastern Atlantic, there is widespread, low density olive ridley nesting along many West African beaches, but trends are unknown.

Table 3. Status and trends of Pacific olive ridley nesting populations.

Subpopulation	No. of Females Nesting Annually	Trend
Mexico – Playa Escobilla	525,000 (nests)	Increasing
Costa Rica – Playa Ostional	450,000 - 600,000	Unknown[4]
Costa Rica – Playa Nancite	25,000 – 50,000	Unknown
Guatemala	4,300,000 (eggs)	Declining
Nicaragua	Unknown	Unknown
India (Gahirmatha)	150,000 – 200,000	Mixed[5]
Indonesia	Scattered	Unknown
Malaysia	Scattered	Declining

Threats and Impacts: Threats and impacts found in the marine environment affecting olive ridley turtles include the following:

- Direct harvest.
- Incidental capture in commercial and artisanal fisheries: Fisheries known to interact with olive ridleys include gillnets, longline fisheries, purse seine fisheries, trawl fisheries, gillnets, and hook and line.

[4] Although the data are too limited for a statistically valid determination of a trend, there does appear to be a 6-year decrease in the number of nesting females.
[5] Although there has been no drastic decline in the nesting population in the past 25 years, there are differences in trends between decades. Data from the 1990s show the population is declining or on the verge of a decline, and no arribadas have been documented in recent years.

- Vessel strikes: Especially in areas where recreational and/or commercial vessel traffic (small, medium, and/or large vessels) is intense, propeller and collision injuries are not uncommon.
- Global climate change and sea level rise resulting in changes to nesting and foraging habitat (e.g., shoreline erosion, beach temperature changes).
- Habitat loss and alteration from anthropogenic activities in the marine environment.

Conservation Actions: Conservation actions conducted in 2004–2006 for recovery of the olive ridley turtle include the following:

Pacific/Indian Ocean:

- Supported the development and completion of a Turtle Research Database System in collaboration with six international agencies.
- Identified stock home ranges and conducted population identification of nesting, foraging, stranded, and olive ridleys caught as bycatch using DNA analysis.
- Continued population assessment work under the Sea Turtle Stranding and Salvage Network, including genetic sampling and analysis of age classes.
- Continued TED outreach and training efforts with various foreign governments.
- Conducted experiments to reduce bycatch and mortality in longline fisheries including testing "stealth gear," blue-dyed bait, deep day-time fishing, and new circle hook designs in domestic and international fisheries.
- Continued to collaborate with foreign partners to export longline fishery technologies through education and outreach, circle hook exchange program, and fishing gear experiments in Ecuador, Mexico, Guatemala, Costa Rica, Peru, Brazil, Columbia, Chile, Korea, Thailand, Japan, Philippines, Spain, Vietnam, Indonesia, and the Mediterranean.
- In collaboration with Japan, tested the efficacy of longline gear technology to reduce sea turtle interactions in Pacific Ocean high seas fisheries.
- Continued fishery observer programs to monitor, report, and estimate olive ridley bycatch.
- Developed a regulation to give NMFS the authority to observe federal, state, or recreational fisheries, where no authority currently exists, for sea turtle bycatch.
- Convened a workshop to review and assess the results of all U.S. longline bycatch reduction efforts to date, including the available information on the effects of circle hooks on bycatch species and target catch, and to use this information to (1) identify best gear and fishing practices and (2) develop an action plan to direct NMFS' domestic and international marine turtle longline bycatch reduction efforts.

<u>Western and Central Pacific</u>

- Participated in the Indian Ocean MOU on the Conservation and Management of Marine Turtles of the IOSEA, and its associated CMP, to provide a similar comprehensive framework for the conservation and protection of sea turtles and their habitats in the Indo-Pacific region. Led the development and negotiations to obtain agreement and passage of a resolution dedicated to reducing bycatch of sea turtles.
- Reduced interaction rates and mortality rates in U.S. Pacific swordfish-directed longline fleets (currently Hawaii-based only) by requiring large circle hooks combined with non-squid bait; requiring proper handling of hooked and entangled turtles; and requiring use of disentangling and de-hooking equipment such as dip nets, line cutters, and de-hookers.

- Educated Hawaii-based longline fishery participants about sea turtle mitigation requirements including safe handling, gear removal, and release of turtles caught incidental to the fishery.
- Assisted national observer programs and supported capacity building through in-country fishery observer training to improve sea turtle species identification, reporting, handling, and education regarding fishery mitigation techniques in Indonesia, Vietnam, and New Caledonia.
- Supported sea turtle bycatch mortality mitigation in the Palau tuna longline fishery through observer training in partnership with Palau Marine Law Enforcement Division and Bureau of Marine Resources.
- Supported surveying of trawl and longline fishing crews at Indonesian ports to estimate capture rates of marine turtles and supported a trial observer program in Indonesian longline and trawl fisheries.
- Supported a project in Papua New Guinea to mitigate tuna and prawn fisheries interactions with marine turtles and to build the capacity of the National Fisheries Authority.

Priority Recovery Actions Needed: Priority recovery actions needed for the olive ridley sea turtle include the following:

- Support the use of large circle hooks in global longline fisheries and continue to identify other gear modifications and fishing practices to reduce bycatch in longline fisheries.
- Build capacity of foreign nations to monitor and reduce bycatch in pelagic and coastal fisheries.
- Improve understanding of the effects of commercial fishery harvest on key prey species.

Recovery Priority Number: 5 (*Breeding colony populations of Pacific coast of Mexico*); 5 (*Rangewide*)

The recovery priority number for the olive ridley sea turtle is 5. This represents a moderate magnitude of threat, a high recovery potential, and the presence of conflict with economic activities.

PACIFIC SALMON RECOVERY

Overview for 2006–2008

Salmon and Steelhead Listed under the Endangered Species Act

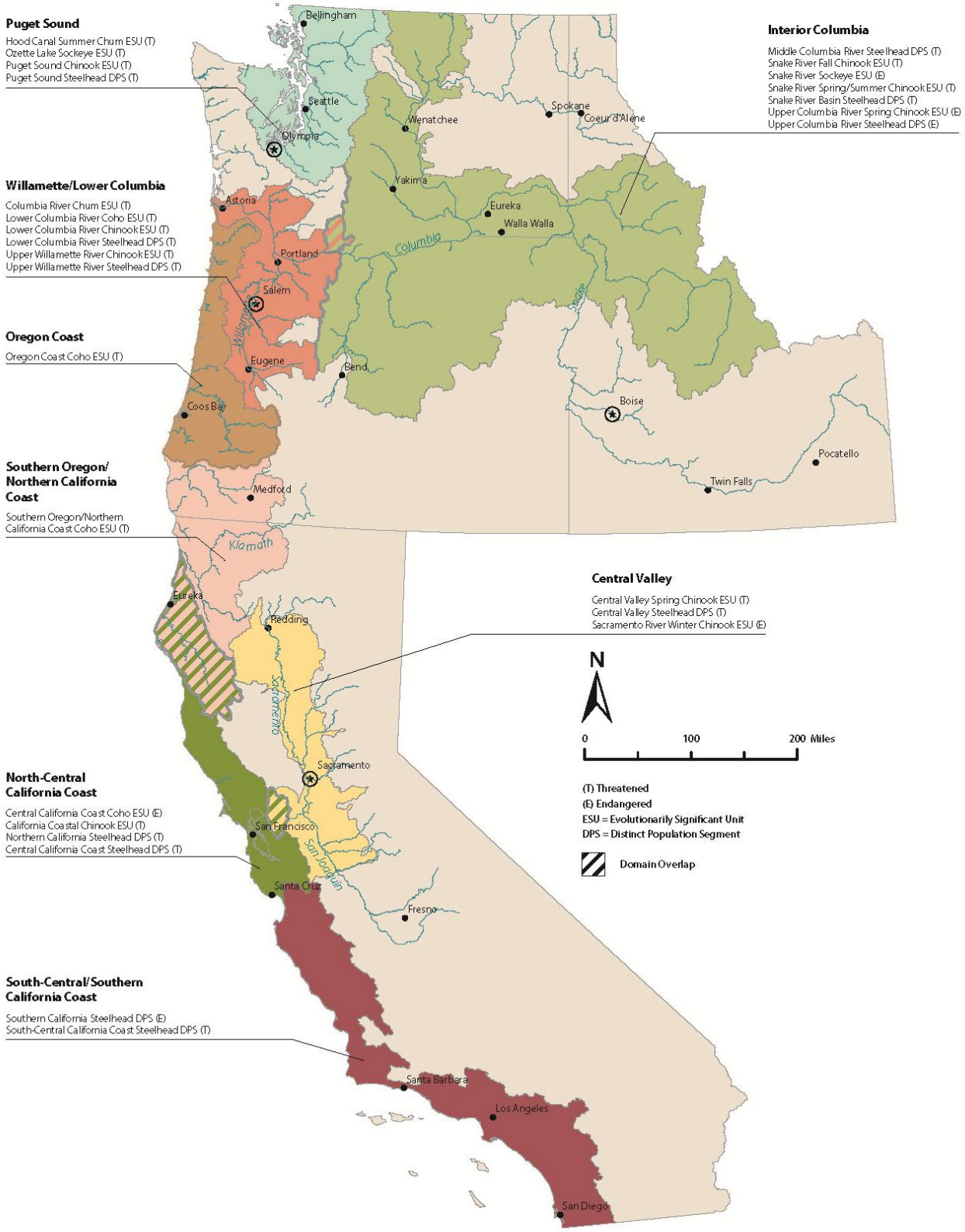
Fifty-two "species"— DPSs or ESUs[6]—of Pacific salmon and steelhead have been identified on the U.S. West Coast. Of these 52 species, 28 are currently protected under the ESA (see "Listing Actions" below)—six are listed as endangered and 22 as threatened. Eighteen occur solely in the NMFS Northwest Region, nine occur solely in the NMFS Southwest Region, and the range of one ESU—the Southern Oregon/Northern California coast coho salmon—overlaps both Regions (Table 4). These species migrate along the West Coast as they grow to adults, before returning to the freshwater rivers where they were hatched. Figure 6 shows the distribution of all ESA-listed Pacific salmon ESUs and steelhead DPSs by recovery domain.

Table 4. Endangered Species Act (ESA) Listing Status of Pacific Salmon and Steelhead.

Recovery Planning Domain	ESU/DPS	Current ESA Listing Status
Puget Sound	Puget Sound Chinook	*Threatened*
	Hood Canal Summer chum	*Threatened*
	Ozette Lake sockeye	*Threatened*
	Puget Sound steelhead	*Threatened*
Willamette/Lower Columbia	Upper Willamette River Chinook	*Threatened*
	Lower Columbia River Chinook	*Threatened*
	Lower Columbia River steelhead	*Threatened*
	Lower Columbia River coho	*Threatened*
	Columbia River chum	*Threatened*
	Upper Willamette River steelhead	*Threatened*
Interior Columbia	Upper Columbia River spring Chinook	*Endangered*
	Snake River spring/summer Chinook	*Threatened*
	Snake River fall Chinook	*Threatened*
	Upper Columbia River steelhead	*Endangered*
	Middle Columbia River steelhead	*Threatened*
	Snake River Basin steelhead	*Threatened*
	Snake River sockeye	*Endangered*
Oregon/N. California Coasts	Oregon Coast coho	*Threatened*
	Southern Oregon/Northern California Coast coho	*Threatened*
North-central California Coast	Central California coast coho	*Endangered*
	Northern California steelhead	*Threatened*
	California coastal Chinook	*Threatened*
	Central California coast steelhead	*Threatened*
South-central/Southern California Coast	South-central California coast steelhead	*Threatened*
	Southern California steelhead	*Endangered*
California Central Valley	Sacramento River winter-run Chinook	*Endangered*
	Central Valley spring-run Chinook	*Threatened*
	Central Valley steelhead	*Threatened*

[6] The ESA defines the term species as "... including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature" (16 US.C. 1531-1544). NMFS refers to a distinct population segment of Pacific salmon as an "evolutionarily significant unit" under the ESA (56 FR 58612; November 20, 1991). The ocean-going (anadromous) steelhead has a related stream-dwelling (resident) life form that is under the jurisdiction of FWS. The two forms delineate separate DPSs, and NMFS has listed the anadromous DPSs specified above as endangered or threatened pursuant to the ESA.

Figure 6. Distribution of ESA-Listed Pacific Salmon and Steelhead by Recovery Domain.



Recovery Planning Efforts for Pacific Salmon and Steelhead

Recovery planning is active for every listed species of Pacific salmon. Table 5 summarizes the status of ESA recovery plans for Pacific salmon and steelhead. NMFS believes it is critically important for the Pacific salmon recovery planning process to partner with the numerous federal, state, regional, tribal, local, and private conservation efforts already underway. Building on this collaborative effort, the agency has established a recovery planning process to include its partners and, to the extent practicable, capitalize on these ongoing efforts.[7] Through these local initiatives, salmon recovery plans bring people, processes, and resources together to guide investments toward a common goal of self-sustaining, viable species of salmon and steelhead.

Table 5. Status of ESA Recovery Plan Development Status for Pacific Salmon and Steelhead.

Recovery Planning Domain	ESU/DPS	Recovery Plan underway	Co-manager & peer review completed	[8]Interim Regional Recovery Plan	Recovery Plan Proposed in Federal Register	Final ESA Recovery Plan Complete
Puget Sound	Puget Sound Chinook					X
	Hood Canal Summer chum					X
	Ozette Lake sockeye				X	
	Puget Sound steelhead	X				
Willamette/Lower Columbia	Upper Willamette River Chinook	X				
	Lower Columbia River Chinook			X		
	Lower Columbia River steelhead			X		
	Lower Columbia River coho	X				
	Columbia River chum			X		
	Upper Willamette River steelhead	X				
Interior Columbia	Upper Columbia River spring Chinook					X
	Snake River spring/summer Chinook	X				
	Snake River fall Chinook	X				
	Upper Columbia River steelhead					X
	Middle Columbia River steelhead				X	
	Snake River Basin steelhead	X				
	Snake River sockeye	X				
Oregon/N. California Coasts	Oregon Coast coho	X				
	Southern Oregon/Northern California Coast coho	X				
North-central California Coast	Central California coast coho		X			
	Northern California steelhead	X				
	California coastal Chinook	X				
	Central California coast steelhead	X				
South-central/Southern California Coast	South-central California coast steelhead	X				
	Southern California steelhead	X				
California Central Valley	Sacramento River winter-run Chinook		X			
	Central Valley spring-run Chinook		X			
	Central Valley steelhead		X			

To develop recovery plans that meet ESA statutory requirements as well as goals for local involvement, NMFS organized the 28 listed species into eight recovery areas or "domains." The four recovery domains in the Northwest Region are Puget Sound, Willamette/Lower Columbia,

[7] For more information on recovery activities, visit NMFS salmon recovery websites at http://www.nwr.noaa.gov/Salmon-Recovery-Planning/index.cfm and http://swr.nmfs.noaa.gov/salmon.htm.

[8] An Interim Regional Recovery Plan addresses portions of ESUs and DPSs and meets the requirements of the ESA for those areas. It has been announced in the *Federal Register*. It is interim until a final plan can be developed that addresses the entire ESU and DPS. It includes a locally developed plan with stakeholder buy-in and a NMFS supplement that clarifies and expands on ESA recovery requirements.

Interior Columbia, and Southern Oregon/Northern California Coast. The four domains in the Southwest Region are the Southern Oregon/Northern California Coast (SONCC), North-Central California Coast, California Central Valley, and South-Central/Southern California Coast (Figure 6). Recovery planning for the Southern Oregon/Northern California Coast domain is managed jointly by NMFS' Northwest and Southwest Regions.

For each domain, NMFS convened technical recovery teams (TRTs) composed of regional technical experts and NMFS scientists. NMFS' intent in establishing TRTs was to seek unique geographic and species expertise and to develop a solid scientific foundation for the recovery plans. NMFS asked the TRTs to develop recommendations on biological viability criteria for each ESU/DPS and its component populations; evaluate the status of each ESU/DPS relative to viability criteria; provide scientific support to local and regional recovery planning efforts; and provide scientific evaluations and peer review of recovery plans. In the Northwest and Southwest Regions, the TRTs have developed either draft or final viability criteria for all listed species except Puget Sound steelhead (which was listed in May 2007).

In all of the Northwest Region's recovery domains except Idaho, local groups made up of local governments, tribes, and other public and private stakeholders have taken the lead for developing recovery plans. In Idaho, NMFS is working with the state to prepare a recovery plan endorsed by the state, tribes, and multiple stakeholders. In the Southwest Region, NMFS staff are preparing recovery plans with the active engagement and support of the State of California, other federal agencies, and numerous tribes and stakeholders. In all cases, the TRT products are being used to develop recovery goals and criteria for delisting, to assess limiting factors, and to prioritize and sequence actions for addressing the limiting factors.

Listing Actions

On May 11, 2007, NMFS issued a final determination listing Puget Sound steelhead as a threatened species (72 FR 26722). On February 11, 2008, NMFS issued a final determination to list the Oregon Coast coho salmon ESU as a threatened species under the ESA (73 FR 7816). The final listing determination was issued in compliance with a ruling by the U.S. District Court for the District of Oregon (*Trout Unlimited v. Lohn*, Civ. No. 06-01493 ST (D. Oreg., October 9, 2007)) invalidating NMFS' earlier decision in January 2006 not to list Oregon Coast coho (71 FR 3033). Table 5 (above) provides a complete roster of West Coast salmon and steelhead currently listed under the ESA.

Critical Habitat

NMFS is responsible for designating critical habitat for threatened and endangered salmon and steelhead. Section 3 of the ESA defines critical habitat as (1) specific areas within the geographical area occupied by the species at the time of listing, on which are found those physical or biological features that are essential to the conservation of the listed species and that may require special management considerations or protection, and (2) specific areas outside the geographical area occupied by the species at the time of listing that are essential for the conservation of a listed species. In designating critical habitat our regulations direct us to focus on "primary constituent elements," in identifying these physical or biological features. Section 4 of the ESA requires us to consider the economic impacts, impacts on national security, and other relevant impacts of specifying any particular area as critical habitat. NMFS may exclude any area from critical habitat if NMFS determines that the benefits of such exclusion outweigh the

benefits of specifying such area as part of the critical habitat, unless the failure to designate such an area will result in the extinction of the species. Section 7(a)(2) of the ESA requires that each Federal agency shall, in consultation with, and with the assistance of, NMFS, ensure that any action authorized, funded or carried out by such agency is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of its designated critical habitat. A critical habitat designation does not set up a preserve or refuge, and applies only when federal funding, permits, or projects are involved. Critical habitat requirements do not apply to citizens engaged in activities on private land that do not involve a federal agency.

Critical habitat is presently designated for all ESA-listed salmon ESUs and steelhead DPSs, except Puget Sound steelhead and Lower Columbia River coho. The specific areas designated in the Northwest Region include approximately 30,085 miles of lake, riverine, and estuarine habitat in the three northwestern states, as well as approximately 2,312 miles of marine nearshore habitat in Puget Sound, Washington. The specific areas designated as critical habitat in the Southwest Region include approximately 10,052 miles of riverine habitat and 470 square miles of estuarine habitat within the geographic areas occupied by the listed species. In February 2008, NMFS designated critical habitat for the Oregon Coast coho ESU (73 FR 7816), including 6,568 miles of riverine habitat, and 15 square miles of lake habitat.

Species Status for Pacific Salmon

NMFS completed its most recent formal status assessment of salmon and steelhead in 2005. The ESA requires that, at least every 5 years, NMFS shall conduct a review of all ESA-listed species and determine whether any species should: (1) be removed from such list; (2) be changed in status from an endangered species to a threatened species; or (3) be changed in status from a threatened species to an endangered species. In 2010 NMFS will initiate 5-year reviews for 26 listed salmon ESUs and steelhead DPSs. The remaining two listed species will receive status reviews in 2012 and 2013. These reviews will consider information that has become available since the most recent listing determinations, and make recommendations as to whether there is substantial information to suggest that a change in listing status may be warranted. For those listed species that may warrant a change in status and consistent with Section 4(a) of the Act, NMFS will conduct a formal ESA status review.

This biennial report presents estimates of the historical abundance of each ESU/DPS, a summary of conclusions from the last formal status review, and information on recent trends, where available. Estimates of historical abundance, recent abundance, and trends should be considered only as general indicators and may have a significant margin of error. Updated status and trends information is available for a few ESUs/DPSs and is included as appropriate. The recent abundance estimates provided for most ESUs/DPSs are those that were available at the time of the last biennial report (2004–2006).[9] Status and trend information will be updated as part of the 5-year reviews being initiated in 2010. Estimates of recent trends (i.e., whether an ESU is

[9] Estimates of historical abundance are reported as ranges intended to reflect conditions before declines in status of salmon and steelhead began to be observed (e.g., early 20th century conditions) and they may have a considerable margin of error. These estimates were developed by NMFS using available information and professional judgment. Recent abundance estimates represent a 5-year geometric mean based on 2001–2005 or 2000–2004 ESU-level abundance estimates as compiled by NMFS for the previous biennial report (2004–2006). The sources of the abundance data varied among and within ESUs, and the totals presented represent only rough estimates. Qualitative assessments of ESU/DPS-level trends were obtained from the FY 2009 Pacific Coastal Salmon Recovery Fund Annual Report to Congress and reflect the trends in the most recent 10 years of ESU-level abundance estimates available.

increasing, decreasing, or remaining stable in abundance over time) are based on the most recent 10 years of available data. Also, the reported trends in abundance may reflect the influence of hatchery fish that spawn in the wild, and therefore do not necessarily indicate trends in the natural production upon which listing decisions and recovery criteria are based. Thus, the trend is a useful but incomplete indicator of ESU status and will be placed in the context of additional indicators when a formal status assessment is conducted.

Limiting Factors and Threats

Population declines and extirpations of Pacific salmon and steelhead are the result of numerous factors affecting habitat (such as hydropower development, land development, resource extraction, timber harvest practices, and other land uses), as well as effects of harvest, hatchery practices (see Box 1), natural variation in ocean-climate conditions, and other factors such as predation and the introduction of non-native species. These threats and limiting factors affect each listed species differently, and no single factor is solely responsible for declines. Furthermore, it is difficult to quantify precisely the relative contribution of any one threat or factor to the decline of a given listed species. Each recovery plan evaluates the role of limiting factors and threats specific to the ESU/DPS and its component populations and identifies site-specific actions to address those factors.

Box 1. Impact of Hatchery Bred-Fish

Potential negative aspects of hatchery-bred fish include competition for food, altered genetic diversity of natural populations and changes in fitness and productivity, domestication, outbreeding depression, homogenization, and reduction in effective population size. Hatchery fish can also benefit recovery by reducing extinction risk and/or by promoting conservation when combined with actions that reduce limiting factors. Hatchery fish can augment individuals from native populations to support harvest and satisfy tribal treaty fishing rights.

Box 2. Impact of Dams and Human Population Growth

In addition to eliminating accessibility to habitat, dams affect habitat quality through changes in river hydrology, temperature profile, downstream gravel recruitment, and the movement of large woody debris. Many of the lower reaches of rivers and their tributaries in Puget Sound have been dramatically altered by urban development. Urbanization and suburbanization have resulted in the loss of historical land cover in exchange for large areas of imperious surface (buildings, roads, parking lots, etc.).

The loss of wetland and riparian habitat has dramatically changed the hydrology of many urban streams. This shift in hydrology reduces floodplain connectivity and function, which increases flood frequency and peak flow during storm events, and decreases groundwater-driven summer flows. Flood events result in gravel scour, bank erosion, and sediment deposition. Land development for agricultural purposes has also altered the historical land cover. However, because much of this development took place in river floodplains, it has directly affected river morphology. River braiding and sinuosity have been reduced by the construction of dikes, hardening of banks with riprap, and channelizing the mainstem. Constriction of rivers, especially during high-flow events, increases the likelihood of gravel scour and dislocation of rearing juvenile fish.

Human Population Growth

Regional population growth is projected to continue and poses a potential threat to listed salmon and steelhead in both the Northwest and Southwest Regions. According to the U.S. Census Bureau, California's population alone is expected to increase from 34 million in 2000 to more than 48 million by 2030. Over the same period, the combined populations of Oregon and Washington are expected to increase from 9 million to over 13 million. The implications of this growth include increased demand for

land, water, and hydroelectricity, all of which have the potential to exacerbate factors that limit species' viability.

Climate Change

Climate change is a potentially significant threat to the recovery of listed species. Changes in climate may adversely affect habitat quality and quantity, water quantity (lower summer streamflows), and water quality (higher summer water temperatures). Warmer temperatures will result in more precipitation falling as rain rather than snow. In addition, snowpack will diminish and the timing of stream flow will be altered. Changes in environmental conditions could affect salmon and steelhead health and survival in the ocean through a variety of mechanisms, including increased ocean temperatures, increased stratification of some waters, changes in the upwelling season, shifts in the distribution of salmon and steelhead, and increased acidity, among others.

ESA Activities Contributing to Recovery

Many federal and non-federal actions are regulated by the ESA in order to help alleviate the many threats to listed species. The contributions of the ESA's statutory and regulatory tools are summarized below.

4(d) Rule Activities

ESA section 9(a)(1) prohibits "take" and import/export of, and commercial transactions involving, all species listed as endangered. "Take" is defined under the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct" (Section 3(19)). In the case of threatened species, section 4(d) of the ESA directs the Secretary of Commerce to issue regulations he or she deems necessary and advisable for the conservation of the species. The 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts prohibited under section 9(a)(1) of the ESA with respect to endangered species. These 9(a)(1) prohibitions and 4(d) regulations apply to all individuals, organizations, and agencies subject to U.S. jurisdiction. Under section 4(d), NMFS has tailored specific "limits" or exemptions from the take prohibitions applicable to threatened Pacific salmonids to authorize certain activities, provided they are consistent with conservation and recovery needs. The Northwest and Southwest Regions have approved hundreds of programs and activities under the 4(d) protective regulations, ensuring that hatchery and harvest management plans, resource management plans, road maintenance activities, and tribal resource management plans benefit threatened West Coast salmonids.

NMFS published a final rule for Oregon Coast coho on February 11, 2008 (73 FR 7816) and Puget Sound steelhead on September 25, 2008 (73 FR 55451) adopting the same 4(d) protective regulations that apply to other threatened Pacific salmonids.

Section 7 Activities

Under section 7 of the ESA, NMFS conducts hundreds of informal and formal consultations every year with federal agencies that authorize, fund, or carry out actions that may affect Pacific salmon. In FY 2007 and FY 2008, the Northwest Region conducted 1,155 section 7 consultations, and the Southwest Region conducted 558. These consultations ensure federal actions are conducted in ways unlikely to jeopardize the continued existence of listed species or

to adversely modify or destroy critical habitat. The scope of section 7 consultations includes actions related to land and water management, transportation, restoration, fill and removal of

materials in stream channels, hydropower operations, hatchery operations, and fishery management.

Section 10 Activities

Section 10 of the ESA provides authorization for take that may occur as a part of otherwise lawful activities carried out by non-federal entities (e.g., timber harvest, water supply management, and other resource extraction and land management activities) or as part of scientific research or enhancement activities. Such authorization allows those conducting such activities to proceed with the certainty of ESA compliance and ensures that any adverse impacts caused to listed species are being avoided, minimized, mitigated, and monitored.

Pacific Coastal Salmon Recovery Fund

The Pacific Coastal Salmon Recovery Fund (PCSRF) was established by Congress in FY 2000 to assist state, local, and tribal salmon recovery efforts. The goal of the PCSRF is to make significant contributions to the conservation and restoration of healthy and sustainable Pacific salmon runs and the habitats on which they depend. The PCSRF has funded many successful projects that are beginning to show direct benefits, such as salmon using newly accessible or improved habitat. A majority of the PCSRF funds have been spent on habitat restoration activities, as this is a significant need for salmon recovery. The PCSRF program has also filled a vital need by supporting regional and locally based recovery planning and building organizational infrastructure toward the long-term goal of salmon recovery. Since the program's inception in FY 2000, Congress has appropriated a total of $544.7 million for restoration projects in Washington, Oregon, California, and Idaho. The states have provided over 33 percent matching funds to these federal funds. Since FY 2000, over 7,900 projects have been funded for habitat protection and restoration; watershed and sub-basin planning and assessment; research, monitoring, and evaluation; and public outreach and education. Over 5,400 instream and riparian stream miles have been treated, over 2,100 barriers to fish passage have been removed opening over 4,200 miles of habitat, and over 645,000 acres of habitat have been created, treated, or protected. The 2009 PCSRF Annual Report to Congress reports on the actions of the PCSRF from FY 2000 to 2008. The report is available online at http://www.nwr.noaa.gov/Salmon-Recovery-Planning/PCSRF/Index.cfm.

Salmon Recovery in the Northwest

Lower Columbia River Coho (*Oncorhynchus kisutch*)

Date Listed: March 24, 1999 (64 FR 14308); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: Recovery planning is underway in both Oregon and Washington portions of this ESU, with a draft recovery plan expected in the fall of 2009.

Species Status: The estimated historical abundance (circa 1900) of the Lower Columbia River coho ESU is 850,000 to 1.1 million. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 24,000, and the mean combined abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 240,300. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. There is insufficient status and trend information for the Lower Columbia River coho ESU to assess recent trends. NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Lower Columbia River coho ESU include the following:

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Hatchery related effects (See Box 1).
- Harvest related effects.

Conservation Actions: During 2006–2008, key conservation actions included:

- Hydropower operational changes and agreements for dam removal (See Box 3).
- Habitat restoration projects: Hundreds of projects have improved riparian areas, fish passage at culvert barriers, and stream and floodplain function.
- Improved forest management practices on federal lands and some state and private lands (see Box 4).
- Hatchery reforms: Hatchery reforms have included integrating some coho hatchery programs with local natural-origin populations to

Box 3. FERC Re-licensing

NMFS continued implementation of Federal Energy Regulatory Commission (FERC) Re-licensing Settlement Agreements for the Cowlitz, Lewis, and Clackamas rivers. These agreements included reintroduction efforts into previously blocked habitat, improved flow releases, dam passage survival studies, plans for passage improvements, hatchery reforms, and habitat improvements. In addition, implementation of FERC de-commissioning settlement agreements resulted in removal of Marmot Dam in 2007 and the Little Sandy River Dam in 2008, restoring unimpeded passage to upstream habitat and in actions to improve fish passage conditions in the Hood River, including plans for removal of Powerdale Dam in 2010.

Box 4. Forest Management

The Northwest Forest Plan Aquatic Conservation Strategy continued in 2006–2008. The strategy is designed to conserve and restore salmon and steelhead habitat and to provide an anchor for federal lands' contribution to salmon recovery. In addition, implementation of the Forest Practices Habitat Conservation Plan, which covers 9.3 million acres of private timber land in Washington and which NMFS approved in 2005, is well underway, formally recognizing the conservation value of state forestry practice rules to the recovery of listed salmonids.

increase abundance and reduce adverse impacts of hatcheries, program closures, and production changes. Hatchery coho continue to be externally marked so fisheries can target hatchery coho and to allow identification of hatchery and wild fish at weirs and traps, on the spawning grounds, and during broodstock collection. The Hatchery Scientific Review Group evaluated hatchery programs to identify additional reforms needed to ensure that hatcheries benefit conservation efforts and reduce risks to the ESU, and is expected to issue a final report in early 2009. NMFS and co-managers will use this report, along with additional science-based recommendations, to identify and implement additional reforms.

- Harvest reforms: The marking of hatchery coho salmon continues to allow implementation of selective commercial and recreational fisheries for coho salmon, reducing impacts to wild coho salmon from 85 percent to 18 percent. A new coho agreement under the Pacific Salmon Treaty (see discussion under the Lower Columbia River Chinook salmon ESU section of this report) will continue to constrain ocean fishery impacts depending on the annual status of natural populations of coho in Canadian, Washington, and Oregon fisheries.
- Completion of the 2008 Federal Columbia River Power System Biological Opinion (see Box 5)

Box 5. Federal Columbia River Power System

The operation of the Federal Columbia River Power System (FCRPS) affects 13 species of Columbia River Basin salmon and steelhead listed for protection under the ESA, which requires the agencies that operate the FCRPS to ensure that their actions are not likely to jeopardize the continued existence of a listed species, nor result in the destruction or adverse modification of habitat designated as critical to its conservation. The three FCRPS Action Agencies are the U.S. Army Corps of Engineers, Bonneville Power Administration, and the Bureau of Reclamation. Under the law, the FCRPS action agencies must consult with NMFS on actions they intend to undertake that may affect a listed species of anadromous fish or its critical habitat. The product of this consultation is a Biological Opinion regarding the FCRPS and the mainstem effects of other projects, as well as authorization for harm to listed species that may be incidentally caused by FCRPS operations. Among other actions, the FCRPS Biological Opinion:

- Includes a habitat program to protect and improve tributary and estuary habitat.
- Provides new and expanded hatchery facilities and safety net conservation programs and supports hatchery reforms.
- Expands efforts to reduce juvenile and adult losses from predation by birds, other fish, and marine mammals.
- Sets standards for survival of juvenile and adult salmon and steelhead migrating through the dams.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include the following:

- Continued implementation of the interim recovery plan for the Washington portion of this ESU.
- Continued implementation of tributary hydropower relicensing agreements in the Cowlitz, Lewis, Hood, Sandy, and Clackamas basins to achieve operational changes, reintroduction into previously blocked habitats, improved fish passage, flow management, and, in the Hood basin,

dam removal.

- Development and implementation of a plan for reintroduction of coho salmon into the White Salmon River after removal of Condit Dam (which may occur as early as October 2009).
- Improved land use practices to protect existing high-quality tributary habitats and prevent further degradation, along with continued, targeted restoration based on priority locations and issues identified in recovery plans.
- Increased monitoring of natural-origin populations to provide statistically reliable abundance and origin estimates.
- Improvements at hatchery facilities to implement hatchery reforms; including the completion of the National Environmental Policy Act (NEPA) Environmental Impact Statement for Mitchell Act funded hatcheries so reforms can be implemented to support ESA requirements and sustainable fisheries mandates.
- Completion of ocean and in-river harvest management actions, including Fisheries Management and Evaluation Plans for coho salmon, to maintain low harvest impacts.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, integrated reduction of most threats can likely achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined “conflict” exists with regard to this ESU.

Oregon Coast Coho (Oncorhynchus kisutch)

Date Listed: August 10, 1998 (63 FR 42587); the 1998 listing of this coho ESU was invalidated as a result of a decision in U.S. District Court on September 10, 2001 (*Alsea Valley Alliance v. Evans*, 161 F. Supp. 2d 1154,. (D. Or. 2001)); relisted February 11, 2008 (73 FR 7816)

Legal Status: Threatened

Recovery Plan Status: Recovery planning was initiated in 2005 when the ESU was previously listed. The State of Oregon adopted an Oregon Coast Coho Conservation Plan in 2007 prior to the ESU's relisting in 2008. Based on the recent listing of this ESU, recovery planning is being reinitiated in coordination with the State of Oregon.

Species Status: The estimated historical abundance (circa 1900) of the Oregon Coast Coho ESU is approximately 1 million fish. This compares to a present estimated mean natural fish abundance of 150,000. The present estimated mean combined abundance (natural and hatchery-origin) is 170,000. Preliminary information on the most recent 12 years of available data indicates a positive trend in abundance for the Oregon Coast ESU. NMFS will conduct an ESA 5-year review of this ESU in 2013 or sooner and will update available status and trend information at that time.

Limiting Factors and Threats: Threats and impacts to the Oregon Coast Coho ESU include degraded freshwater habitat: floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.

Conservation Actions: During 2006–2008, key conservation actions included:

- The State of Oregon adopted an Oregon Coast Coho Conservation Plan in 2007, which identifies limiting factors and threats and identifies actions to recover the ESU. The Plan establishes ambitious conservation goals and identifies a monitoring program to evaluate the effectiveness of conservation actions that contribute to rebuilding the ESU.
- Implementation of the State's Oregon Coast Coho Conservation Plan has included outreach, education, and training for watershed councils, and outreach to coastal lowland landowners in areas of high habitat value for this ESU, with particular emphasis on the agricultural community.
- Habitat restoration projects: Hundreds of projects have improved riparian areas, fish passage at culvert barriers, and stream and floodplain function.
- Improved forest management practices on federal lands and some state and private lands: The Northwest Forest Plan Aquatic Conservation Strategy continued in 2006–2008. The strategy is designed to conserve and restore salmon and steelhead habitat and provide an anchor for federal lands' contribution to salmon recovery.
- Hatchery reforms: Oregon's aggressive hatchery reform work has resulted in substantial reductions of this threat. Hatchery coho are released in only three out of more than 56 populations in the ESU, and the magnitude of releases has declined from a peak of 35 million smolts in 1981 to approximately 500,000 in 2008. The reduction in the number

of hatchery fish released has reduced the potential for competition with, and predation on, natural coho. All hatchery coho releases in the ESU are now marked, affording improved monitoring and assessment of co-existing naturally produced coho populations.

- Harvest reforms: Restrictive harvest regulations, developed concurrently with the State of Oregon, have imposed conservative restrictions on directed and incidental fishery mortality, and appropriately consider marine survival conditions and the biological status of naturally produced coho populations.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include the following:

- Develop a recovery plan in coordination with the State of Oregon.
- Improve land use practices to protect existing high quality habitats and prevent further degradation, along with continued targeted restoration based on priority locations and issues identified in the Oregon Coast Coho Conservation Plan.
- Educate private landowners and develop incentives for lowland landowners to protect and restore high quality coastal coho habitat.
- Research and monitor the distribution, status, and trends of coho salmon.
- Improve agricultural and forestry practices to address limiting factors and threats, particularly regarding riparian protections, road construction, and road maintenance.
- Continue to remove and upgrade high-priority human-made fish passage barriers.
- Conduct freshwater habitat restoration to address erosion, stabilize banks, protect and restore riparian habitat, and reintroduce large wood.
- Improve freshwater habitat quality and quantity.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery of this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined “conflict” exists with regard to this ESU.

Lower Columbia River Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: March 24, 1999 (64 FR 14308); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A recovery plan for the Washington portion of the ESU was completed in February 2006 as an Interim Regional Recovery Plan. This Plan will be combined with plans for the White Salmon basin and for the Oregon portion of the ESU, which are under development. A draft plan for the full ESU is expected in the fall of 2009.

Species Status: The estimated historical abundance (circa 1900) of the Lower Columbia River Chinook ESU is 430,000–560,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 24,400, and the mean combined abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 48,800. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicated that the Lower Columbia River Chinook ESU is "stable or increasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Lower Columbia River Chinook ESU include the following:

- Degraded estuarine and near-shore marine habitat resulting from cumulative impacts of land use and operation of the Columbia River hydropower system.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Reduced access to spawning and rearing habitat, mainly as a result of tributary hydropower systems.
- Hatchery-related effects (see Box 1 on page 39).
- Harvest impacts to fall Chinook salmon.

Conservation Actions: During 2006–2008, key conservation actions included:

- Hydropower operational changes and agreements for dam removal (See Box 3 on page 42).
- Habitat restoration projects: Hundreds of local restoration projects have improved riparian areas, fish passage at culvert barriers, and stream and floodplain function.
- Improved forest management practices on federal lands and some state and private lands (See Box 4 on page 43).
- Hatchery reforms: The Hatchery Scientific Review Group evaluated hatchery programs to identify additional reforms needed to ensure that hatcheries benefit conservation efforts and reduce risks to the ESU, and the Group is expected to issue a final report in early 2009. NMFS and co-managers will use this report, along with additional science-based recommendations, to identify and implement additional reforms. Some reforms are

already underway for Lower Columbia River Chinook, including hatchery closures, production changes, and installation of a weir on the Grays River to trap and remove non-local hatchery fish. Also, beginning in 2008, all hatchery production is externally marked to allow for selective harvest and evaluation of hatchery and natural escapement to spawning grounds.

- Harvest reforms and implementation of Fisheries Management and Evaluation Plans: Since this ESU was listed, harvest rates have been steadily reduced from approximately 70 percent to below 40 percent. The U.S. and Canadian governments approved a new agreement under the Pacific Salmon Treaty that will reduce harvest impacts on Lower Columbia River fall Chinook salmon by 3 percent relative to the previous agreement, as a result of significant reductions (15 percent and 30 percent, respectively) in the Southeast Alaskan and West Coast Vancouver Island Canadian fisheries. NMFS will use its authorities over U.S. ocean fisheries to ensure that the benefits of these reductions accrue to naturally produced Lower Columbia River fall Chinook salmon. Mark-selective fisheries for spring Chinook continue to be implemented to maintain low harvest rates on naturally produced spring Chinook.
- Completion of the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include the following:

- Continued implementation of the Interim Regional Recovery Plan for the Washington portion of this ESU.
- Continued implementation of tributary hydropower re-licensing agreements in the Cowlitz, Lewis, Hood, Sandy, and Clackamas basins to achieve operational changes, reintroduction into previously blocked habitats, improved fish passage, flow management, and, in the Hood basin, dam removal.
- Development and implementation of a plan for reintroducing spring and fall Chinook salmon into the White Salmon River after removal of Condit Dam (which may occur as early as October 2009).
- Improved land use practices to protect existing high-quality tributary and estuarine habitats and prevent further degradation, along with continued, targeted habitat restoration based on priority issues and locations identified in recovery plans.
- Continued improvements to hatchery practices, including marking all hatchery fall Chinook, updating adult traps and weirs, using alternate release strategies, developing localized broodstocks, and following applicable Hatchery Scientific Review Group recommendations.
- Improved ocean fisheries management to address impacts to Lower Columbia River fall Chinook salmon (e.g., by developing additional reference populations by which to gauge harvest impacts and help guide harvest management decisions).
- Complete the NEPA Environmental Impact Statement for Mitchell Act funded hatcheries and then implement reforms to support ESA requirements and to support sustainable fisheries mandates.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU.

Puget Sound Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: March 24, 1999 (64 FR 14308); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: The Shared Strategy for Puget Sound—a coalition of tribes, governments and stakeholders—provided a locally developed recovery plan for Puget Sound salmon to NMFS in June 2005. NMFS published a *Federal Register* Notice of Availability of a proposed recovery plan for the Puget Sound Chinook ESU in December 2005 (70 FR 76445). The final recovery plan for this ESU, including NMFS' Final Supplement, was published in January 2007.

Species Status: The estimated historical abundance (circa 1900) of the Puget Sound Chinook ESU is 600,000–800,000 fish. Based on the most recent 7 years of available data (1999–2005), the mean natural abundance is estimated to be approximately 58,000 fish, and the estimated mean combined abundance (natural- and hatchery-origin fish) of the ESU returning to Puget Sound is approximately 174,000 fish. The last formal review of ESU status in 2003 indicated abundance, diversity, and productivity of this ESU had remained unchanged since the time of listing or first review in 1999. Preliminary information based on the most recent 12 years of available data indicates a positive short-term trend in total abundance (natural- and hatchery-origin) for this ESU.

Limiting Factors and Threats: Limiting factors and threats to the Puget Sound Chinook ESU include the following:

- Degraded nearshore and estuarine habitat: Nearshore and estuarine habitat throughout the ESU has been altered by human activities. Residential and commercial development has reduced the amount of functioning habitat available for salmon rearing and migration. The loss of mudflats, eelgrass meadows, and macroalgae further limits salmon foraging and rearing opportunities in nearshore and estuarine areas.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.

Conservation Actions: During 2006–2008, key conservation actions included:

- Improved forest management practices on non-federal lands. The Northwest Forest Plan Aquatic Conservation Strategy is designed to conserve and restore salmon and steelhead habitat, and provides an anchor for federal lands' contribution to salmon recovery. Implementation of forest practices consistent with the Washington Forest and Fish Agreement, to which NMFS is a party, will improve aquatic habitat conditions for fish and wildlife on state and private timber lands in Washington State.
- Approved a 4(d) limit for the Washington State Department of Transportation Routine Road Maintenance activities. The limit is implemented by local governments.
- Planned dam removal: Completed ESA section 7 consultation with the Olympic National Park on the removal of two dams on the Elwha River that have blocked salmon access to

70 miles of habitat since the early 1900s. The removal of these two dams beginning in 2012 will greatly aid salmon recovery in this system. The project will restore freshwater habitat access, improve habitat conditions within the watershed, and improve estuary habitat at the mouth of the Elwha River.

- Improved harvest and hatchery management. The Puget Sound Harvest Plan includes harvest objectives consistent with optimizing habitat potential and integrating hatchery objectives. Harvest objectives were revised to be consistent with what is known of the productivity in the various watersheds and the contribution of hatchery spawners. The harvest plan also includes implementation, monitoring, and evaluation procedures designed to ensure fisheries are consistent with fishery objectives for conservation and resource use. Co-managers have also implemented time, area, and gear restrictions to maximize harvest opportunity on hatchery and healthy listed Chinook populations and to minimize impacts on weaker populations. These actions include complete closure of some terminal fisheries, non-retention of Chinook, and selective fishing techniques. Several conservation hatchery programs have been implemented to preserve severely depressed Chinook populations while habitat needed to sustain the populations in a natural state are restored.
- Negotiated a new Chinook harvest agreement as part of the Pacific Salmon Treaty re-negotiations: The United States achieved significant harvest reductions in west coast Canadian fisheries that will complement on-going U.S. harvest measures to benefit listed Puget Sound populations.
- Implemented hatchery management modifications: The implementation of hatchery reform measures—based to a significant extent on recommendations developed independently by the Hatchery Scientific Review Group and resulting from consultations between hatchery co-managers and NMFS—has led to operational changes that are expected to benefit natural Chinook populations.
- Washington's Puget Sound Partnership completed its' 2020 Action Agenda, establishing a blueprint for recovery of the Puget Sound Ecosystem by 2020.
- Funded 212 total habitat restoration and protection projects totaling approximately $110.3 million.
- Began restoration of 762 acres in the Nisqually Estuary in 2008 with the completion of the exterior dikes.
- Began hatchery supplementation for the South Fork Nooksack and South Fork Stillaguamish populations.
- Removed 5 fish passage barriers and funded 26 fish passage barrier projects.
- Funded 14 riparian habitat invasive species restoration projects.
- Restored 7.96 miles of stream access and funded 46 stream access restoration projects.
- Funded 43 wetland habitat restoration projects.
- Restored 9 acres of estuarine and freshwater habitat invasive species and funded 89 estuarine and freshwater habitat invasive species restoration projects.
- Restored 78.1 acres of estuarine and freshwater habitat and funded 105 estuarine and freshwater habitat restoration projects.
- Restored 23.37 miles of instream habitat and funded 235 instream habitat restoration projects.
- Protected 8.22 miles of stream bank and funded 69 stream bank protection projects.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include the following:

- Restore degraded floodplain and channel structure.
- Restore and protect estuarine habitat.
- Improve and restore degraded riparian forests and increase large woody debris recruitment.
- Restore natural sediment routing processes.
- Improve water quality, particularly stormwater from paved surfaces and developed lands.
- Curtail nearshore habitat loss and restore nearshore habitat quality.
- Restore natural hydrologic processes and improve flow management.
- Continue to apply measures that reduce the risk of adverse effects from hatchery and harvest management activities to survival and recovery.
- Continue to implement conservation hatchery programs that preserve at-risk Chinook salmon populations, preventing their extinction until natural habitat can be restored.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying implementation of actions to recover this ESU would likely result in a mounting extinction risk rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are somewhat understood and recovery planning is being implemented. Although it would be cost-prohibitive to completely address every limiting factor, there is a general belief that integrated reduction of most threats can eventually achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to affect the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU.

Snake River Fall-Run Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: April 22, 1992 (57 FR 14653); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A draft recovery plan for this ESU was developed in March 1995 but was not adopted. Although no recovery plan has been completed for this ESU, recovery planning is underway. A draft recovery plan for this ESU is expected in early 2010.

Species Status: The estimated historical abundance of the Snake River Fall-Run Chinook ESU is 400,000–500,000. This compares to a present estimated abundance of 4,900 naturally produced spawners. The estimated recent mean combined abundance (natural- and hatchery-origin fish) of the ESU is approximately 12,300. The last formal review of ESU status, based on pre-2005 data, indicated that abundance and productivity of this ESU had improved since the time of listing. Preliminary information based on the most recent 12 years of available data indicates that the Snake River Fall-Run Chinook ESU is "stable or increasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Snake River Fall-Run Chinook ESU include the following:

- Degraded habitat: fish passage.
- Degraded freshwater habitat: Floodplain connectivity and function, and channel structure and complexity have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Harvest-related effects.
- Mainstem Columbia River hydropower impacts.
- Hatchery-related effects (see Box 1 on page 39).
- Degraded estuarine and nearshore habitat.

Conservation Actions: During 2006–2008, key conservation actions included:

- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Protected 12 ESUs and steelhead DPSs in the Columbia Basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce, and Warm Springs tribes; FWS; and NMFS.
- Negotiated a new Chinook harvest agreement as part of the Pacific Salmon Treaty re-negotiations. The U.S. achieved significant harvest reductions in west coast Canadian fisheries that will complement on-going U.S. harvest measures to benefit Snake River fall Chinook.

- Continued improvements in federal land management practices: Land management plans of the U.S. Forest Service and Bureau of Land Management are being designed to protect and restore habitat.
- Continued improvements in water quality working with the U.S. Environmental Protection Agency and the states.
- Conducted local habitat restoration and stream flow restoration (projects by the Northwest Power Planning Council's Fish and Wildlife Program, Pacific Coastal Salmon Recovery Fund, Natural Resources Conservation Service, and the NOAA Restoration Center).
- Worked to improve water quantity via the Snake River basin adjudication settlement of water claims between the Nez Perce Tribe and the State of Idaho, including a program to improve instream flows in the Lemhi River. This was approved by Congress in late 2004 and by the State of Idaho and the Nez Perce Tribe in 2005.
- Continued programs to improve priority irrigation diversions by adding fish screens.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include the following:

- Continue the structural and operational modifications to hydropower dams to improve salmon survival in the migration corridor.
- Protect high-quality habitats.
- Conduct habitat restoration, as 80 percent of historical habitat for this ESU has been lost.
- Manage river temperatures to benefit this ESU.
- Reduce dependence of the ESU on hatcheries.
- Reduce genetic and biological interbreeding between hatchery- and natural-origin fish.
- Explore opportunities to target harvest on hatchery-origin fish as one mechanism for reducing dependence of ESU on hatcheries.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently under way. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU.

Snake River Spring/Summer-Run Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: April 22, 1992 (57 FR 14653); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A draft recovery plan for this ESU was developed in March 1995 but was not adopted. Although a recovery plan has not been completed for this ESU, recovery planning is underway. A revised draft recovery plan for this ESU is expected by December 2009.

Species Status: The estimated historical abundance (circa 1900) of the Snake River spring/summer-run Chinook ESU is 1.75 million to 2.25 million. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 18,000, and the mean combined abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 89,800. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates the Snake River spring/summer-run Chinook ESU is "unstable or decreasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Snake River Spring/Summer-Run Chinook ESU include the following:

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Mainstem Columbia River hydropower impacts.
- Harvest-related effects.
- Predation.

Conservation Actions: During 2006–2008, key conservation actions included:

- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Protected 12 ESUs and steelhead DPSs in the Columbia Basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce, and Warm Springs tribes; FWS; and NMFS.
- Improved federal land management practices by working with the U.S. Forest Service and Bureau of Land Management to design land management plans that will protect and restore habitat.
- Worked with the U.S. Environmental Protection Agency to improve water quality permitting procedures that enhance salmon considerations.

- Conducted local habitat restoration and restoration of stream flows. This includes efforts by the Northwest Power Planning Council Fish and Wildlife Program, Pacific Coast Salmon Restoration Fund, Natural Resources Conservation Service, and the NOAA Restoration Center.
- Worked to improve water quantity via the Snake River basin adjudication settlement of water claims between the Nez Pierce Tribe and the State of Idaho, including a program to improve instream flows in the Lemhi River.
- Equipped hundreds of irrigation diversions with fish screens.
- Reduced overall harvest rates.
- Conducted efforts in hatchery conservation.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include:

- Continue the structural and operational modifications to hydropower dams to improve salmon survival in the migration corridor.
- Protect high-quality habitats.
- Conduct habitat restoration.
- Increase instream flows.
- Implement and continue abundance-based management to reduce harvest impacts during low-return years when protections are most needed.
- Control predation.
- Complete and implement Fishery Management and Evaluation Plans and Tribal Resource Management Plans for tributary fisheries.
- Implement harvest agreements from *U.S. v. Oregon*.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely the integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined “conflict” exists with regard to this ESU.

Upper Columbia River Spring-Run Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: March 24, 1999 (64 FR 14308); reaffirmed on June 28, 2005 (70 FR 37160)

Legal Status: Endangered

Recovery Plan Status: A proposed ESA recovery plan was completed and approved by both the Upper Columbia Salmon Recovery Board and NMFS in July 2006. The final ESA recovery plan for this ESU was completed in September 2007.

Species Status: The estimated historical abundance (circa 1900) of the Upper Columbia River spring-run Chinook ESU is 25,000–35,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 1,800, and the mean combined abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 3,600. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Upper Columbia River spring-run Chinook ESU is "stable or increasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Upper Columbia River Spring-Run Chinook ESU include the following:

- Mainstem Columbia River hydropower-related adverse effects.
- Degraded freshwater habitat: floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Hatchery-related effects (see Box 1 on page 39).

Conservation Actions: During 2006–2008, key conservation actions included:

- Conducted and facilitated local habitat restoration and protection projects: Conservation easements and land purchases of riparian areas along rivers and streams have been used to protect critical spawning and rearing areas; the Natural Resources Conservation Service Conservation Reserve and Enhancement Program protects riparian areas on farms and ranches.
- Equipped irrigation diversion withdrawals with screens, leading to greater productivity and abundance.
- Habitat actions in the tributaries have increased protection of some areas of intact habitat and improved quality of degraded habitats under several funding sources, including the three Habitat Conservation Plans with local public utility districts. In particular, the Bureau of Reclamation has assisted in implementing several significant passage improvement projects in the Methow and Wenatchee basins.
- Completed a new ESA section 7 consultation to protect these fish from overharvest in the Upper Columbia River.

- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Protected these fish in the mainstem and Lower Columbia River basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce and Warm Springs tribes; FWS; and NMFS.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include:

- Protect high-quality habitat—particularly productive, sensitive floodplain habitats—from residential development.
- Improve fish passage at barriers along the migration corridor.
- Improve irrigation efficiencies to improve instream flows.
- Restore habitat and increase habitat complexity.
- A new ESA section 7 biological opinion and new *U.S. v. Oregon* harvest agreement protects these fish during their migration in the Lower Columbia River.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined “conflict” exists with regard to this ESU.

Upper Willamette River Chinook ESU (*Oncorhynchus tshawytscha*)

Date Listed: March 24, 1999 (64 FR 14308); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A draft recovery plan for the ESU was released in September 2007 and a final recovery plan is expected in 2010.

Species Status: The estimated historical abundance (circa 1900) of the Upper Willamette River Chinook ESU is 260,000–340,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 17,100, and the mean combined abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 85,300. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Upper Willamette River Chinook ESU is "stable or increasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Upper Willamette River Chinook ESU include the following:

- Significantly reduced access to spawning and rearing habitat because of tributary dams.
- Degraded freshwater habitat, especially floodplain connectivity and function, channel structure and complexity, and riparian areas and large wood recruitment as a result of cumulative impacts of agriculture, forestry, and development.
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development.
- Hatchery-related effects (see Box 1 on page 39).

Conservation Actions: During 2006–2008, key conservation actions included:

- Completed ESA section 7 consultation between NMFS and the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Bonneville Power Administration on the continued operation of 13 multipurpose dams in the Willamette Basin. Beneficial actions to the ESU include: enhanced upstream fish passage (the dams block access to most historical spawning habitat for this ESU), retrofitting of dams to provide more normative temperature regimes below the projects, enhanced downstream passage at certain projects, and enhanced flow management to ensure safe migration, spawning, incubation, and rearing.
- Conducted ESA consultation at hydroelectric projects as part of FERC re-licensing, new licenses, and settlement agreements. Benefits to salmonids include improved streamflows, habitat restoration, gravel augmentation below dams for spawning, and improved upstream and downstream fish passage at dams. Improvements were made at Willamette Falls Dam, Albany/Lebanon Dam, and Upper Bennett Dam. Agreements were also made for improvements at Clackamas, Dorena, and Trail Bridge dams in the coming years.

- Removed the Brownsville Dam on the Calapooia River as a result of NMFS' Open River Initiative. A second dam is slated for removal in 2009.
- Completed hundreds of habitat restoration projects that have improved riparian areas, fish passage at culvert barriers, and stream and floodplain function. ESA section 7 programmatic consultation with the U.S. Corps of Engineers was completed in 2008 to expedite permitting of these types of salmonid recovery actions.
- Improved forest management practices on Federal lands by continuing the Northwest Forest Plan Aquatic Conservation Strategy. The strategy is designed to conserve and restore salmon and steelhead habitat, and to provide an anchor for federal lands' contribution to salmon recovery. The U.S. Forest Service and Bureau of Land Management worked with NMFS in 2006 to develop a programmatic approach to designing and approving timber sales that would result in minimal impacts to salmonids.
- Completed and implemented an ESA consultation on cleanup of a Superfund site in the Lower Willamette River at an abandoned creosote plant in 2007 to improve water quality for migrating and rearing juvenile salmonids.
- Through recent hatchery reforms, helped develop locally adapted broodstocks and reintroduced fish into habitats above impassable dams to explore the potential for reestablishing self-sustaining populations in those areas.
- Achieved harvest reforms: Selective fisheries continue to be successfully implemented and have reduced impacts to wild fish by more than 75 percent while still allowing recreational and commercial fisheries.
- In a new Chinook harvest agreement as part of the Pacific Salmon Treaty re-negotiations, the U.S. achieved significant harvest reductions in west coast Canadian fisheries that will complement on-going U.S. harvest measures to benefit listed Upper Willamette Chinook.
- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include the following:

- Implement the new recovery actions described in the section 7 biological opinion on the 13 federal dams in the Willamette Basin, an ESA consultation between NMFS and the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Bonneville Power Administration.
- Improve land use practices to protect existing high-quality habitat and prevent further degradation, along with continued, targeted restoration of other priority locations and issues identified in the draft recovery plan. Protection and restoration are particularly important in lowland floodplain stream reaches where channel complexity and floodplain connectivity are severely degraded.
- Continue improvements in hatchery management to reduce genetic risks, improve hatchery Chinook survival for recovery efforts, and minimize impacts from non-native summer steelhead.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of very high risks to its abundance, productivity, spatial structure, and

diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU, particularly if the corrective actions for the federal dams are implemented. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU.

Columbia River Chum ESU (*Oncorhynchus keta*)

Date Listed: March 25, 1999 (64 FR 14508); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A recovery plan for the Washington portion of the ESU was completed by Washington's Lower Columbia Fish Recovery Board and, after public comment, approved by NMFS in February 2006 as an interim recovery plan. This interim plan will be combined with plans for the White Salmon basin and for the Oregon portion of the ESU, which are in process. A draft plan for the full ESU is expected in the fall of 2009.

Species Status: The estimated historical abundance (circa 1900) of the Columbia River Chum ESU is 1.2 million to 1.6 million. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 8,500, and the mean combined abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 8,500. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Columbia River Chum ESU is "stable or increasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Threats and impacts to the Columbia River Chum ESU include the following:

- Degraded estuarine and nearshore marine habitat resulting from cumulative impacts of land use and operation of the Columbia River hydropower system.
- Degraded freshwater habitat, in particular of floodplain connectivity and function, channel structure and complexity, stream substrate, and riparian areas and large wood recruitment as a result of cumulative impacts of agriculture, forestry, and development.
- Degraded stream flow as a result of hydropower and water supply operations.
- Loss of access and loss of some habitat types as a result of passage barriers such as roads and railroads.

Conservation Actions: During 2006–2008, key conservation actions included:

- Habitat restoration projects: Federal, state, and local governments and private entities carried out several habitat restoration projects to increase natural production and add to the ESU's spatial structure, helping to protect against catastrophic loss.
- Improved forest management practices on federal lands and some state and private lands (See Box 4 on page 43).
- Continued "adult capture/juvenile release" hatchery programs. Adults taken from the wild are spawned in a hatchery and the resulting juveniles are released to rear in natural habitat. These programs are designed to reseed historical habitat while minimizing the risk of reduced reproductive success due to captivity.
- Completed genetic analysis of chum salmon returning to Washington tributaries outside of the two primary chum production areas.

- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Protected 12 ESUs and steelhead DPSs in the Columbia Basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce, and Warm Springs tribes; FWS; and NMFS.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include:

- Continued implementation of the interim recovery plan for the Washington portion of this ESU.
- Restoration and protection of natural channel processes at additional tributary sites, which includes reconnecting lower tributary mainstems with side channels and floodplains.
- Monitoring of historical production areas and active restoration of populations in Lower Columbia River tributaries having no current known spawning activity.
- Restoration of shallow-water rearing habitat in the Lower Columbia River and monitoring and evaluation to identify additional restoration sites.
- Avoiding continued degradation and loss of chum spawning and rearing habitat through land and water practices that promote conservation.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have remained the same since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined “conflict” exists with regard to this ESU.

Hood Canal Summer-Run Chum ESU (*Oncorhynchus keta*)

Date Listed: March 25, 1999 (64 FR 14508); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: The Hood Canal Coordinating Council (a regional council of governments) provided NMFS a locally developed recovery plan for Hood Canal Summer Chum in November 2005. The final ESA Hood Canal Summer Chum Recovery Plan, with NMFS' Final Supplement to the Plan, was published in May 2007.

Species Status: The estimated historical abundance (circa 1900) of the Hood Canal summer-run Chum ESU is 60,000–80,000 fish. Based on the most recent 7 years of available data (1999–2005), the mean natural abundance is estimated to be approximately 19,900 fish, and the estimated mean combined abundance (natural- and hatchery-origin fish) of the ESU returning to Hood Canal is approximately 30,600 fish. The last formal review of ESU status in 2003 indicated abundance, diversity, and productivity of this ESU had remained unchanged since the time of listing or first review in 1999. Preliminary information based on the most recent 12 years of available data indicates a positive short-term trend in total abundance (natural- and hatchery-origin) for this ESU.

Limiting Factors and Threats: Limiting factors and threats to the Hood Canal Summer-Run Chum ESU include the following:

- Nearshore and estuarine habitat throughout the ESU has been altered by human activities. Nutrient loading disturbs the ecosystem's natural nutrient and sediment balance. The low dissolved oxygen levels that result from nutrient loading can kill or stress marine organisms, including salmon. Residential and commercial development has reduced the amount of functioning habitat available for salmon rearing and migration. The loss of mudflats, eelgrass meadows, and macroalgae further limits salmon foraging and rearing opportunities in nearshore and estuarine areas.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, stream substrate, and stream flow have been degraded as a result of cumulative impacts of agriculture, forestry, and development.

Conservation Actions: During 2006–2008, key conservation actions included:

- Conducted collaborative habitat restoration efforts with the Washington Department of Fish and Wildlife and the Point No Point Treaty Council; projects in the Jimmycomelately Creek in partnership with the Jamestown S'Klallam tribes; and other projects in the Quilcene, Snow/Salmon, Chimacum, Tahuya, and Dewatto watersheds.
- Implemented eight ESA-approved conservation hatchery programs that preserved at-risk populations, bolstered the abundance of naturally spawning and natural-origin fish, and reintroduced summer chum salmon spawning in two watersheds where the native populations had become extirpated. Implemented measures at hatcheries producing other salmon species that reduce the risk of adverse impacts to summer chum salmon.

- Continued to implement the Harvest Management component of the Summer Chum Salmon Conservation Initiative. Approved under ESA 4(d) Rule limit 6 in 2001, the plan establishes an annual fishing regime designed to minimize incidental take of summer chum salmon, while providing an opportunity for fisheries harvesting other salmon species. The regime includes complete closure of some terminal fisheries, non-retention of summer chum, and gear restrictions. Harvest rates in both U.S. and Canada have been well below expectations.
- Improved forest management practices on non-federal lands: Implementation of forest practices consistent with the Washington Forest and Fish Agreement, to which NMFS is a party, will improve aquatic habitat conditions for fish and wildlife on state and private timber lands in Washington State.
- Approved a 4(d) limit for the Washington State Department of Transportation Routine Road Maintenance activities. The limit is implemented by local governments.
- The Hood Canal Coordinating Council completed several sections of the final Hood Canal Summer Chum salmon recovery plan.

Priority Recovery Actions Needed: Conservation and recovery actions needed for this ESU include the following:

- Restore degraded floodplain and channel structure.
- Restore and protect estuarine habitat.
- Restore degraded riparian forest and enhance recruitment of large woody debris.
- Restore natural sediment routing processes.
- Restore natural hydrologic processes and improve flow management.
- Continue to implement recovery-directed hatchery and harvest management actions.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to affect the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined “conflict” exists with regard to this ESU.

Ozette Lake Sockeye ESU (*Oncorhynchus nerka*)

Date Listed: March 25, 1999 (64 FR 14528); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A proposed recovery plan was sent out for public comment on April 23, 2008 (73 FR 21913) and a final recovery plan is expected in early 2009.

Species Status: The estimated historical abundance (circa 1900) of the Ozette Lake sockeye ESU is 15,000–20,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 2,100, and the mean combined abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 4,200. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Ozette Lake sockeye ESU is "stable or increasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Ozette Lake sockeye ESU include the following:

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood supply, lake beach spawning habitat, and stream substrate have been degraded as a result of cumulative impacts of forestry practices, agriculture, and development.
- Predation: Harbor seals, river otters, and predaceous non-native and native fish species are having an adverse effect on the abundance of adult fish that successfully spawn, and on the abundance of sockeye smolts escaping seaward from the watershed each year, respectively.

Conservation Actions: During 2006–2008, key conservation actions included:

- Conducted monthly multi-stakeholder Steering Committee meetings to develop the proposed Lake Ozette Sockeye Recovery Plan that was noticed for public comment on April 23, 2008.
- Implemented a conservation hatchery program under the ESA-approved joint tribal-state Lake Ozette Sockeye Salmon Resource Management Plan that established a naturally spawning sockeye aggregation in an Ozette Lake tributary, and led to the collection of sockeye salmon life history and status information needed for recovery planning.
- Approved the Washington State Department of Transportation's Routine Road Maintenance 4(d) limit and its implementation by Clallam County.
- Implemented forest practices consistent with the Washington Forest and Fish Agreement, to which NMFS is a party, to improve aquatic habitat conditions for fish and wildlife on state and private timber lands in Washington State.
- Continued harvest restrictions in place since the early 1980s specifying that no fisheries directed at Ozette Lake sockeye will occur until the population is recovered.

Priority Recovery Actions Needed: Conservation and recovery actions needed for this ESU include the following:

- Implement the recovery plan by developing action implementation and research/monitoring priorities and schedules and pursuing funding for plan actions.
- Restore natural sediment routing processes.
- Restore large woody debris recruitment and riparian habitat.
- Restore degraded tributary and river habitat structure.
- Control harbor seal, river otter, and fish predation.
- Restore natural river and lake hydrologic processes.
- Restore lake beach spawning habitat.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 1. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to affect the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this ESU.

Snake River Sockeye ESU (*Oncorhynchus nerka*)

Date Listed: November 20, 1991 (56 FR 58619); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Endangered

Recovery Plan Status: A draft plan was developed in March 1995 but was not adopted. A new draft recovery plan is expected in 2010.

Species Status: The estimated historical abundance (circa 1900) of the Snake River sockeye ESU is 40,000–57,000. During the first decade after listing, adult returns plummeted, with total returns to the spawning areas ranging between 0 and 8 annually. At the time of the 2004–2006 Biennial Report, the mean total abundance (including natural- and hatchery-origin fish) of the ESU was estimated to be approximately 40. Based on the most recent 5 years of available data, the estimated mean abundance (of hatchery-origin fish) in this ESU is approximately 138, driven primarily by the 2008 return. Most of the fish are identifiable as returns from the captive propagation program; some of the returning adults are unmarked, but are likely fish from the captive propagation program. The last formal review of ESU status, completed in 2005, indicated that the abundance and productivity of this ESU had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Snake River sockeye ESU is "unstable or decreasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: The key factor limiting recovery for this ESU is out-of-sub-basin survival, and improvements in population status will rely on improvements in out-of-basin survival. Portions of the migration corridor in the Salmon River are impeded by water quality and temperature. Increased temperatures may reduce the survival of adult sockeye returning to the Stanley Basin. The natural hydrological regime in the upper mainstem Salmon River has been altered by water withdrawals. In most years, sockeye adult returns to Lower Granite suffer catastrophic losses (> 50% mortality in 1 year) before reaching the Stanley Basin, though the factors causing these losses have not been identified. In the Columbia and lower Snake River migration corridor, predation rates on juvenile sockeye salmon are unknown, but terns and cormorants consume 12 percent of all salmon smolts reaching the estuary, and piscivorous fish consume an estimated 8 percent of migrating juvenile salmon.

Conservation Actions: During 2006–2008, key conservation actions included:

- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Increased captive propagation program capacity toward goal of 1 million juveniles.
- Expanded diversity of locations for releases of captive propagation program fish, and continued releasing fish at variety of life stages (eggs, juveniles, and adults).
- Conducted local habitat restoration and restoration of stream flows. This work includes efforts by the Northwest Power Planning Council Fish and Wildlife Program, Pacific Coastal Salmon Recovery Fund, Natural Resources Conservation Service, and the NOAA Restoration Center.
- Continued installation of fish screens on irrigation diversions.

- Established criteria and processes for funding priority PCSRF projects through Memoranda of Understanding between NMFS and five states and three tribal commissions.
- Provided funding commitments for habitat and other projects in the Snake River Basin through an MOU between federal action agencies and Shoshone-Bannock tribes.
- Protected 12 ESUs and steelhead DPSs in the Columbia Basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce, and Warm Springs tribes; FWS; and NMFS.

Priority Recovery Actions Needed: Priority recovery actions needed for this ESU include the following:

- Continue to explore expansion of releases to multiple locations and at multiple life-history stages.
- Expand captive propagation program size to maintain genetic diversity.
- Expand marking of releases to evaluate habitat usage success and to identify downstream sources of mortality.
- Improve survival in the migration corridor for adults and juveniles.
- Continue the structural and operational modifications to hydropower dams to improve salmon survival in the migration corridor.
- Continue to protect high-quality habitats.
- Continue to conduct habitat restoration.
- Provide increases in instream flows.
- Continue efforts to control predation.

Recovery Priority Number: 3

With a high magnitude of threat, a low to moderate recovery potential, and the presence of conflict, this ESU has been assigned a recovery priority number of 3. The magnitude of threat to this ESU has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this ESU would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this ESU has been classified as low to moderate. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are not well understood and research is needed. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined “conflict” exists with regard to this ESU.

Lower Columbia River Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: March 19, 1998 (63 FR 13347); reclassified as a DPS January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status: A recovery plan for the Washington portion of the DPS was completed by Washington's Lower Columbia Fish Recovery Board and, after public comment, approved by NMFS in February 2006 as an interim recovery plan. This interim plan will be combined with the plan for the Oregon portion of the DPS, which is in process. A draft plan for the full DPS is expected in the fall of 2009.

Species Status: The estimated historical abundance (circa 1900) of the Lower Columbia River steelhead DPS is 220,000–280,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 6,000, and the mean combined abundance (including natural- and hatchery-origin fish) of the DPS was estimated to be approximately 8,600. The last formal review of DPS status, completed in 2005, indicated that the abundance and productivity of this DPS had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Lower Columbia River steelhead DPS is "stable or increasing." NMFS will conduct an ESA 5-year review of this DPS in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Threats and impacts to the Lower Columbia River steelhead DPS include the following:

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and recruitment of large wood, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Reduced access to spawning and rearing habitat as a result of tributary hydropower systems and lowland development.
- Avian and marine mammal predation in the lower mainstem Columbia River and estuary.

Conservation Actions: During 2006–2008, key conservation actions included:

- Hydropower operational changes and agreements for dam removal (See Box 3 on page 42).
- Habitat restoration projects: Hundreds of local restoration projects have improved riparian areas, fish passage at culvert barriers, and stream and floodplain function.
- Improved forest management practices on federal lands and some state and private lands (See Box 4 on page 43).
- Hatchery reforms: The Hatchery Scientific Review Group evaluated hatchery programs to identify additional reforms needed to ensure that hatcheries benefit conservation efforts and reduce risks to the ESU. The Group is expected to issue a final report in early 2009. NMFS and co-managers will use this report, along with additional science-based recommendations, to identify and implement additional reforms.

- Improved management of in-river fisheries through the implementation of Fisheries Management and Evaluation Plans designed to minimize impacts from fisheries on wild steelhead. Reductions in impacts to juvenile steelhead from resident trout fisheries have been maintained; harvest impacts on wild steelhead are still reduced from a historical high of 75 percent to an overall impact of 8.5 percent.
- Completion of the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).

Priority Recovery Actions Needed: Priority recovery actions needed for this DPS include the following:

- Implementation of the interim regional recovery plan for the Washington portion of this ESU.
- Continued implementation of tributary hydropower relicensing agreements in the Cowlitz, Lewis, Hood, Sandy, and Clackamas basins to achieve operational changes, reintroduction into previously blocked habitats, improved fish passage, flow management, and, in the Hood basin, dam removal.
- Improved land use practices to protect existing high-quality habitat and prevent further degradation, along with continued, targeted restoration based on priority locations and issues identified in recovery plans. Protection and restoration of lowland off-channel habitats are particularly important.
- Further improvements to hatchery practices, including continued reform and management of hatchery programs releasing non-DPS steelhead to support selective fisheries, and the continued reintroduction of steelhead into historical habitat using appropriate hatchery stocks.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this DPS has been assigned a recovery priority number of 1. The magnitude of threat to this DPS has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this DPS would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this DPS has also been classified as high. Although numerous factors limit the recovery of this DPS, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this DPS. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon and steelhead ESUs and DPSs listed under the ESA, NMFS has determined “conflict” exists with regard to this DPS.

Puget Sound Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: May 11, 2007 (72 FR 26722)

Legal Status: Threatened

Recovery Plan Status: NFMS convened a TRT early in 2008 to identify the historical spawning populations of *O. mykiss* in Puget Sound and establish viability criteria for the listed DPS. Concurrent with the creation of the TRT, NMFS' Northwest Regional Office began recovery planning for listed *O. mykiss*. NMFS began working on a draft recovery plan in 2008 and is expects to be completed by 2010.

Species Status: The estimated historical abundance (circa 1900) for the Puget Sound Steelhead DPS is 327,592–545,987. The estimated recent year (2004–2008) total natural-origin adult abundance for the Puget Sound steelhead DPS has fallen from historical abundance levels to a range of 15,000 to 25,000 fish. The Washington Department of Fish and Wildlife estimated the total natural origin steelhead adult abundance in 2006 for the 56 individual populations preliminarily delineated by the agency for the DPS to be 22,672 fish. NMFS will conduct an ESA 5-year review of this DPS in 2012 and will update the available status and trend information at that time.

Limiting Factors and Threats: Primary biological concerns include: (1) the widespread declines in adult abundance (total run size), despite significant reductions in harvest in recent years; (2) the threats to diversity posed by use of two hatchery steelhead stocks (Chambers Creek and Skamania) inconsistent with wild stock diversity throughout the DPS; (3) the declining diversity in the DPS, including the uncertain but weak status of summer-run fish in the DPS; and (4) a reduction in spatial structure for steelhead in the DPS.

Habitat utilization by steelhead has been most affected by reductions in habitat quality and by fragmentation. A number of large dams in Puget Sound basins have affected steelhead (see Box 2 on page 39 for more explanation).

Conservation Actions: Major accomplishments in 2006–2008 for this DPS include the following:

- Improved forest management practices on Federal lands by continuing the Northwest Forest Plan Aquatic Conservation Strategy. The strategy is designed to conserve and restore salmon and steelhead habitat, and to provide an anchor for federal lands' contribution to salmon recovery. Implementation of forest practices consistent with the Washington Forest and Fish Agreement, to which NMFS is a party, will improve aquatic habitat conditions for fish and wildlife on state and private timber lands in Washington State.
- Approved a 4(d) limit for the Washington State Department of Transportation Routine Road Maintenance activities. The limit is implemented by local governments.
- Planned dam removal: Completed ESA section 7 consultation with the Olympic National Park on the removal of two dams on the Elwha River that have blocked salmon access to 70 miles of habitat since the early 1900s. The removal of these two dams beginning in

2012 will greatly aid salmon and steelhead recovery in this system. The project will restore freshwater habitat access, improve habitat conditions within the watershed, and improve estuary habitat at the mouth of the Elwha River.

- Improved harvest and hatchery management: NMFS worked with the Washington State and Puget Sound tribal co-managers on the development of a harvest management plan for Puget Sound wild steelhead.
- Implemented hatchery management modifications: The implementation of hatchery reform measures—based to a significant extent on recommendations developed independently by the Hatchery Scientific Review Group, and resulting from consultations between hatchery co-managers and NMFS—has led to operational changes that are expected to benefit natural steelhead populations. Specific threat reduction measures for hatcheries that will benefit natural populations are being developed by the co-managers for inclusion in 18 Hatchery and Genetic Management Plans to be submitted in final form to NMFS for evaluation and determination through ongoing NEPA and ESA review processes.

Priority Recovery Actions Needed: Priority recovery actions needed for this DPS include the following:

- Restore degraded floodplain and channel structure.
- Improve and restore degraded riparian forests and increase recruitment of large woody debris.
- Restore natural sediment routing processes.
- Improve water quality, particularly stormwater from paved surfaces and developed lands.
- Restore natural hydrologic processes and improve flow management.
- Continue to apply measures that reduce the risk of adverse effects from hatchery and harvest management activities to survival and recovery.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this DPS has been assigned a recovery priority number of 1. The magnitude of threat to this DPS has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying implementation of actions to recover this DPS would likely result in a mounting extinction risk rather than maintaining the status quo level of risk. The recovery potential for this DPS has also been classified as high. Although numerous factors limit the recovery of this DPS, the source of these factors and their demographic impacts are somewhat understood and recovery planning is being initiated. Although it would be cost-prohibitive to completely address every limiting factor, there is a general belief that integrated reduction of most threats can eventually achieve recovery of this DPS. Finally, as a complex variety of activities and management practices continue to affect the conservation and recovery of all Pacific salmon DPSs and ESUs listed under the ESA, NMFS has determined "conflict" exists with regard to this DPS.

Middle Columbia River Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: March 25, 1999(64 FR 14517); reclassified as a DPS January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status: A draft recovery plan summarizes proposed locally developed (management unit) recovery plans for the Lower Snake, Yakima, Columbia Gorge, and Oregon management units. Notices of Availability for the draft interim regional recovery plans for the Yakima sub-basin and the Lower Snake management unit were published in the *Federal Register* in 2006 (71 FR 26052 and 71 FR 13094, respectively). A final recovery plan is anticipated by August 2009.

Species Status: The estimated historical abundance (circa 1900) of the Middle Columbia River steelhead DPS is 90,000–115,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 20,400, and the mean combined abundance (including natural- and hatchery-origin fish) of the DPS was estimated to be approximately 29,100. The last formal review of DPS status, completed in 2005, indicated that the abundance and productivity of this DPS had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Middle Columbia River steelhead DPS is "stable or increasing." NMFS will conduct an ESA 5-year review of this DPS in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: The limiting factors and threats for this DPS include:

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas, fish passage, stream substrate, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, tributary hydro system activities, and development.
- Mainstem Columbia River hydropower-related impacts.
- Hatchery-related effects (see Box 1 on page 39).
- Harvest-related effects.

Conservation Actions: During 2006–2008, key conservation actions included:

- Accomplished hydropower operational changes.
- Conducted local habitat restoration projects, including reconnecting streams and side channels (e.g., Meacham and Iskuulpa creeks in the Umatilla Basin and Wilson Creek and Manastash Creek in the Yakima River). Conservation easements and land purchases of riparian areas along rivers and streams were used to protect critical spawning and rearing areas. The Farm Service Agency's Conservation Reserve and Enhancement Program has been used to establish riparian areas on farms and ranches in some watersheds (notably the Walla Walla River Basin).
- Opened more than 25 miles of habitat with completion of passage project on Birch Creek (tributary to the Umatilla River).
- Saved water and provided adult and juvenile passage with completion of Lower Touchet River Irrigation Diversion Project.

- Conducted complex negotiations each season through the *U.S. v. Oregon* forum to direct Columbia River harvest rates and fishery structure for the protection of listed steelhead.
- Equipped dozens of irrigation diversion withdrawals with screens, leading to greater productivity and abundance.
- Conducted water conservation projects in over-appropriated streams (where available water is insufficient to meet existing water rights) to transfer water rights to a state trust water program.
- Continued to operate the Warm Springs National Fish Hatchery weir to remove hatchery steelhead, creating natural-origin steelhead refuge in upper Warms Springs River.
- Reached agreement on providing passage above the Round Butte Complex dams on the Deschutes River and currently developing plan to reintroduce anadromous salmon and steelhead into historical habitat above the dams.
- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Protected 12 ESUs and steelhead DPSs in the Columbia Basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce, and Warm Springs tribes; FWS; and NMFS.

Priority Recovery Actions Needed: Priority recovery actions needed for this DPS include the following:

- Protect high-quality habitat, particularly productive, sensitive floodplain habitats.
- Improve fish passage at barriers along the migration corridor.
- Increase instream flows in priority streams and achieve more normative flow regimes in watersheds regulated by the U.S. Bureau of Reclamation.
- Restore habitat and increase habitat complexity.
- Comprehensively mark all hatchery-produced steelhead to identify and remove hatchery strays, and to determine source of the out-of-basin strays.
- Continue implementation of Phase III of Umatilla Water Rights Project.
- Continue Yakima Basin steelhead kelt reconditioning program and initiate similar programs in other Middle Columbia basins.
- Continue to develop locally adapted populations for steelhead mitigation hatchery programs and provide facility improvements (e.g., Dayton Acclimation Pond Trap) to collect broodstock and manage returning adult steelhead.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this DPS has been assigned a recovery priority number of 1. The magnitude of threat to this DPS has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this DPS would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this DPS has also been classified as high. Although numerous factors limit the recovery of this DPS the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently

underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this DPS. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESU/DPSs listed under the ESA, NMFS has determined "conflict" exists with regard to this DPS.

Snake River Basin Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: August 18, 1997 (62 FR 43937); reclassified as a DPS January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status: A draft recovery plan for this DPS is expected in 2010.

Species Status: The estimated historical abundance (circa 1900) of the Snake River steelhead DPS is 275,000–375,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 28,400, and the mean combined abundance (including natural- and hatchery-origin fish) of the DPS was estimated to be approximately 189,300. The last formal review of DPS status, completed in 2005, indicated that the abundance and productivity of this DPS had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Snake River steelhead DPS is "stable or increasing." NMFS will conduct an ESA 5-year review of this DPS in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Limiting factors and threats to the Snake River Basin Steelhead DPS include the following:

- Mainstem Columbia River hydropower-related adverse effects.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Impaired water quality and increased water temperature.
- Related harvest effects, particularly for B-run steelhead.
- Predation.

Conservation Actions: During 2006–2008, key conservation actions included:

- Accomplished structural and operational modification to hydropower system.
- Improved federal land management practices by working with the U.S. Forest Service and Bureau of Land Management to design land management plans to protect and restore habitat.
- Improved water quality permitting procedures by working with the U.S. Environmental Protection Agency to develop procedures that enhance salmon considerations.
- Conducted local habitat restoration and restoration of stream flows. This includes efforts by the Northwest Power Planning Council Fish and Wildlife Program, Pacific Coast Salmon Restoration Fund, Natural Resources Conservation Service, and the NOAA Restoration Center.
- Equipped hundreds of irrigation diversions with fish screens.
- Reduced overall harvest rates.
- Conducted efforts in hatchery conservation.

- Worked to improve water quantity via the Snake River basin adjudication settlement of water claims between the Nez Pierce Tribe and the State of Idaho, including a program to improve instream flows in the Lemhi River.
- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Protected 12 ESUs and steelhead DPSs in the Columbia Basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce, and Warm Springs tribes; FWS; and NMFS.

Priority Recovery Actions Needed: Priority recovery actions needed for this DPS include the following:

- Continue the structural and operational modifications to hydropower dams to improve salmon survival in the migration corridor.
- Protect high-quality habitats.
- Conduct habitat restoration.
- Increase instream flows.
- Complete and implement Fishery Management and Evaluation Plans and Tribal Resource Management Plans for tributary fisheries.
- Implement harvest agreements from *U.S. v. Oregon*.
- Complete and implement Hatchery and Genetic Management Plans.
- Control predation.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this DPS has been assigned a recovery priority number of 1. The magnitude of threat to this DPS has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this DPS would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this DPS has also been classified as high. Although numerous factors limit the recovery of this DPS, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this DPS. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon species listed under the ESA, NMFS has determined "conflict" exists with regard to this DPS.

Upper Columbia River Steelhead DPS (Oncorhynchus mykiss)

Date Listed: Listed as endangered on August 18, 1997 (62 FR 43937), and upgraded and reclassified from endangered ESU to threatened DPS on January 5, 2006 (71 FR 834).

Legal Status: Endangered[10]

Recovery Plan Status: A proposed ESA recovery plan was completed and approved by both the Upper Columbia Salmon Recovery Board and NMFS in July 2006. The final ESA recovery plan for this DPS was completed in September 2007.

Species Status: The estimated historical abundance (circa 1900) of the Upper Columbia River steelhead DPS is 17,000–22,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 3,100, and the mean combined abundance (including natural- and hatchery-origin fish) of the DPS was estimated to be approximately 15,300. The last formal review of DPS status, completed in 2005, indicated that the abundance and productivity of this DPS had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Upper Columbia River steelhead DPS is "stable or increasing." NMFS will conduct an ESA 5-year review of this DPS in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: The limiting factors and threats for this DPS include:

- Mainstem Columbia River hydropower-related adverse effects.
- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large woody debris recruitment, stream flow, and water quality have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Hatchery-related effects (see Box 1 on page 39).
- Harvest-related effects.

Conservation Actions: During 2006–2008, key conservation actions included:

- Worked to improve stream flows through water conservation, leases, and purchases in over-appropriated streams (where available water is insufficient to meet existing water rights).
- Conducted complex negotiations each season through the *U.S. v. Oregon* forum to direct Columbia River harvest rates and fishery structure for the protection of listed steelhead.
- Equipped irrigation diversion withdrawals with screens, leading to greater productivity and abundance.
- Conducted and facilitated local habitat restoration projects. Conservation easements and land purchases of riparian areas along rivers and streams were used to protect critical spawning and rearing areas. The Natural Resource Conservation Service conservation reserve and enhancement program protects riparian areas on farms and ranches.

[10] Pursuant to the decision in Trout Unlimited v. Lohn, 559 F.3d 946 (9th Cir., March 16, 2009), the status of this ESU will be changed to threatened.

- Made hatchery program operational changes to benefit listed steelhead by reducing risks of hatchery reared steelhead.
- Through habitat actions, protected some areas of intact habitat and improved areas of degraded habitat in the tributaries of the Columbia River and continued improvements in mainstem juvenile and adult passage under three Habitat Conservation Plans with local public utility districts. In particular, the Bureau of Reclamation has assisted in implementing several significant passage improvement projects in the Methow and Wenatchee basins.
- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).
- Protected 12 ESUs and steelhead DPSs in the Columbia Basin through a 2008 agreement and NMFS ESA Biological Opinion for managing Columbia River tribal and non-tribal fishing. The new agreement and Biological Opinion have been adopted by the Federal Court (under the authority of *U.S. v. Oregon*) and parties to the agreement include the states of Washington, Oregon, and Idaho; the Umatilla, Yakama, Nez Perce, and Warm Springs tribes; FWS; and NMFS.

Priority Recovery Actions Needed: Priority recovery actions needed for this DPS include the following:

- Protect high-quality habitat—particularly productive, sensitive floodplain habitats—from residential development.
- Improve fish passage at barriers along the migration corridor.
- Improve instream flows in priority tributaries.
- Restore habitat and increase habitat complexity.
- Update and complete Hatchery and Genetic Management Plans.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this DPS has been assigned a recovery priority number of 1. The magnitude of threat to this DPS has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery for this DPS would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this DPS has also been classified as high. Although numerous factors limit the recovery of this DPS, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this DPS. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESU/DPSs listed under the ESA, NMFS has determined "conflict" exists with regard to this DPS.

Upper Willamette River Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: March 25, 1999 (64 FR 14517); reclassified as a DPS January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status: A draft recovery plan for the DPS was released in September 2007 and a final recovery plan is expected in 2010.

Species Status: The estimated historical abundance (circa 1900) of the Upper Willamette River steelhead DPS is 175,000–225,000. At the time of the 2004–2006 Biennial Report, the mean natural-origin abundance was estimated to be approximately 7,800, and the mean combined abundance (including natural- and hatchery-origin fish) of the DPS was estimated to be approximately 10,400. The last formal review of DPS status, completed in 2005, indicated that the abundance and productivity of this DPS had remained unchanged since the time of listing. A preliminary assessment of trends based on the most recent 10 years of available data indicates that the Upper Willamette River steelhead DPS is "stable or increasing." NMFS will conduct an ESA 5-year review of this ESU in 2010 and will update the available status and trend information at that time.

Limiting Factors and Threats: Threats and impacts to the Upper Willamette River Steelhead DPS include the following:

- Degraded freshwater habitat: Floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, and stream flow have been degraded as a result of cumulative impacts of agriculture, forestry, and development.
- Degraded water quality and altered temperature as a result of both tributary dams and the cumulative impacts of agriculture, forestry, and urban development.
- Reduced access to spawning and rearing habitats mainly as a result of artificial barriers in spawning tributaries.
- Hatchery-related effects: Impacts from the non-native summer steelhead hatchery program.

Conservation Actions: During 2006–2008, key conservation actions included:

- Completed ESA section 7 consultation between NMFS and the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Bonneville Power Administration on the continued operation of 13 multipurpose dams in the Willamette Basin. Beneficial actions to the ESU include: enhanced upstream fish passage facilities (the dams block access to some historical spawning habitat for this DPS), retrofitting of dams to provide more normative temperature regimes below the projects that affect steelhead spawning and rearing, enhanced downstream passage of juvenile steelhead at certain projects, and enhanced flow management to ensure safe migration, spawning, incubation, and rearing of steelhead.
- Conducted ESA consultation at hydroelectric projects as part of FERC re-licensing, new licenses, and settlement agreements. Benefits to salmonids include improved streamflows, habitat restoration, gravel augmentation below dams for spawning, and

improved upstream and downstream fish passage at dams. Improvements were made at Willamette Falls Dam, Albany/Lebanon Dam, and Upper Bennett Dam.

- As a result of funding from NMFS' Open River Initiative, removed the Brownsville Dam on the Calapooia River in 2008. Another dam is slated for removal in 2009.
- Conducted hundreds of habitat restoration projects that have improved riparian areas, fish passage at culvert barriers, and stream and floodplain function. ESA section 7 programmatic consultation with the U.S. Army Corps of Engineers was completed in 2008 to expedite permitting of these types of salmonid recovery actions.
- Improved forest management practices on federal lands by continuing the Northwest Forest Plan Aquatic Conservation Strategy. The strategy is designed to conserve and restore salmon and steelhead habitat, and to provide an anchor for federal lands' contribution to salmon recovery. The U.S. Forest Service and Bureau of Land Management worked with NMFS in 2006 to develop a programmatic approach to designing and approving timber sales that would result in minimal impacts to salmonids.
- Completed and implemented an ESA consultation on cleanup of a Superfund site in the lower Willamette River at an abandoned creosote plant in 2007 to provide increased water quality for migrating and rearing juvenile salmonids.
- Modified hatchery programs to reduce the effects of non-native summer steelhead hatchery fish on native, naturally produced winter steelhead populations.
- Made reforms to catch-and-release fisheries to substantially reduce harvest impacts to winter steelhead.
- Completed the 2008 Federal Columbia River Power System Biological Opinion (see Box 5 on page 43).

Priority Recovery Actions Needed: Priority recovery actions needed for this DPS include the following:

- Implement the new recovery actions described in the section 7 biological opinion on the 13 federal dams in the Willamette Basin (an ESA consultation between NMFS and the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Bonneville Power Administration).
- Improve land use practices to protect existing high-quality habitat and prevent further degradation, along with continued, targeted restoration of other priority locations and issues identified in the draft recovery plan. Protection and restoration are particularly important in lowland floodplain stream reaches where channel complexity and floodplain connectivity are severely degraded.
- Work with local stakeholders in the Molalla River Subbasin to secure enhanced riparian and upland management protections in the priority areas for salmonid spawning and rearing.
- Reduce point and non-point sources of thermal and toxic pollution and continue clean-up efforts for contaminated stream areas where juvenile steelhead live.

Recovery Priority Number: 1

With a high magnitude of threat, high recovery potential, and the presence of conflict, this DPS has been assigned a recovery priority number of 1. The magnitude of threat to this DPS has been classified as high, because of strong risks to its abundance, productivity, spatial structure, and diversity (which largely have persisted since its status was first reviewed). Delaying recovery

for this DPS would likely result in mounting extinction risks rather than maintaining the status quo level of risk. The recovery potential for this DPS has also been classified as high. Although numerous factors limit the recovery of this DPS, the source of these factors and their demographic impacts are relatively well understood and recovery planning is currently underway. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this DPS. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon and steelhead ESUs and DPSs listed under the ESA, NMFS has determined "conflict" exists with regard to this DPS.

Salmon Recovery Overlapping the Northwest and Southwest

Southern Oregon/Northern California Coast Coho ESU (*Oncorhynchus kisutch)*

Date Listed: May 6, 1997 (62 FR 24588); reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A Recovery Outline was completed in December 2007 and a draft recovery plan is expected to be released for public review in the fall of 2009.

Species Status: The SONCC coho ESU includes all naturally spawned populations of coho salmon in coastal streams between Cape Blanco, Oregon, and Punta Gorda, California. Three artificial propagation programs are considered to be part of the ESU: the Cole Rivers Hatchery (Oregon Department of Fish and Wildlife (ODFW) stock # 52), Trinity River Hatchery, and Iron Gate Hatchery coho programs. NMFS has determined that these artificially propagated stocks are no more than moderately diverged from the local natural populations.

The estimated historical abundance of the SONCC coho ESU is 150,000. The recent mean abundance is 5,170, which is the highest such abundance since 1980. However, this estimated abundance is derived from the only reliable time series of adult abundance for the naturally spawning component of the SONCC coho ESU—the Rogue River population in southern Oregon. The California portion of the ESU is characterized by a paucity of data, with only a few available spawner indices and presence-absence surveys. Less reliable indices of spawner abundance in several California populations exist, and suggest flat or declining trends. Relatively low levels of observed presence in historically occupied coho streams (32–56 percent from 1986 to 2000) indicate continued low abundance in the California portion of this ESU. Weak returns of coho salmon were recorded in 2007 and indications of an extremely weak 2008 coho salmon return in several California and Oregon populations are expected. Only three rivers have hatchery populations, and natural populations are depressed throughout the range of the ESU. Although extant populations reside in all major river basins within the ESU, there is concern about the loss of local populations in the Eel, Trinity, Klamath, and Rogue river systems. The high hatchery production, especially in the Trinity River Basin, may mask trends in ESU population structure and pose risks to ESU diversity.

The overall ESU trend since the time of listing or first review shows that productivity, spatial structure, diversity, and population abundance have remained unchanged, and are severely depressed throughout most of the ESU.

Threats and Impacts: The SONCC coho salmon ESU declined in abundance over the past several decades as a result of loss of, and damage or change to, the natural environment. Water diversions for agricultural, flood control, domestic, and hydropower purposes have greatly reduced or eliminated historically accessible habitat and degraded the remaining habitat. Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented

habitat. The destruction or modification of estuarine areas has resulted in the loss of important rearing and migration habitats. Oregon wetlands are estimated to have diminished by one-third, and California wetlands by over 80 percent. Habitat fragmentation and loss of habitat complexity have also contributed to the decline of this ESU. Sedimentation from historic and current extensive and intensive land use activities is recognized as a primary cause of habitat degradation throughout the range of this ESU. Most of the primary producing rivers in the range of the ESU were designated as impaired (primarily due to sediment and water temperature) under the Clean Water Act by the Environmental Protection Agency in the 1990s.

Critical sources of current threats to this DPS include: (1) road construction, maintenance, and use; (2) forestry practices; (3) agriculture and related activities (range and crop); (4) fish passage barriers; (5) fire, fire suppression, and related activities; (6) dam and diversion operations, (7) hatchery operations; (8) urbanization; (9) diking/levee construction/channelization and maintenance; (10) poaching/harvest; (11) disease/predators; (12) land conversion; and (13) mining, gravel extraction, and related activities.

As a result of past and current threats, the following stresses are prevalent throughout the range of this ESU and affect most populations to some degree: (1) lack of floodplain and channel structure, (2) impaired estuarine function, (3) altered sediment supply, (4) altered hydrologic function, (5) impaired water quality, (6) degraded riparian forest conditions, (7) increased disease and predation, and (8) barriers impeding fish passage.

Conservation Actions: During 2006–2008, key conservation actions included:

- Completed ESA section 7 Biological Opinions for all Land and Resource Management Plans (LRMPs) and associated activities (under the LRMPs) for all listed species found within each of the individual National Forests or Bureau of Land Management Resource Areas in northern California and southern Oregon, and continued to work with these agencies on issues regarding fire fuel treatments.
- Conducted over 250 ESA section 7 consultations over the past 2 years with federal action agencies that fund or carry out projects such as irrigation and water diversion, timber sales, watershed restoration, fish passage at barriers, gravel mining, grazing, and transportation projects throughout southern Oregon and northern California.
- Continued collaboration with Humboldt, Del Norte, and Mendocino counties on the Humboldt, Del Norte, and Mendocino Gravel Plans.
- Developed “Guidelines for Maintaining Instream Flows to Protect Fisheries below Water Diversions,” which are used by NMFS and the California State Water Resources Control Board for flow standards when issuing water rights permits.
- Continued working with the Bureau of Reclamation on the Klamath Project 10-Year Biological Opinion, the Rogue River Basin Project Biological Opinion, and the Savage Rapids Dam removal and irrigation pump installation work by completing the first phase of Dam removal and the temporary instillation of irrigation pumps.
- Continued working with the city of Gold Hill, the Rogue Valley Council of Governments, and other agencies involved with the removal of the Gold Hill Dam on the Rogue River.
- Developed a database of summer dams and commenced proactive efforts to engage with landowners to minimize the effects of such dams.

- Engaged in on-site reviews of timber operations, and implemented the "Salmonid Guidelines for Forest Practices" when evaluating non-federal timber harvest operations.
- Worked on the Pacific Lumber Company Habitat Conservation Plan (HCP). The HCP covers approximately 210,000 acres of industrial timberlands in Northern California and includes activities related to timber management, forest road development and maintenance, and commercial rock quarrying.
- Collaborated with Humboldt Bay Municipal Water District on the development of a HCP to significantly reduce direct mortality of salmon at the water diversion, better coordinate withdrawals to improve instream flows on the Mad River, and improve operations. Subsequent monitoring of this effort has shown dramatic decreases in coho mortality and is now considered a template for other water districts to emulate.
- Continued working with a variety of entities on restoration activities that will restore Pacific salmon habitat and address man-made barriers to adult and juvenile salmon passage.

Priority Recovery Actions Needed: Several priority recovery actions are needed for the SONCC coho salmon ESU, including the following:

- Research and monitor distribution, status, and trends of salmon.
- Complete and fund a population-monitoring plan.
- Develop Hatchery and Genetics Management Plans to minimize negative influences of hatcheries in California.
- Conduct focused freshwater habitat restoration in anadromous salmonid streams (e.g., erosion control, bank stabilization, riparian protection and restoration, and reintroduction of large woody debris).
- Balance water supply and allocation with fisheries needs through a water rights program, designate fully appropriated watersheds, develop passive diversion devices or off-stream storage, eliminate illegal water diversions, and improve criteria for water drafting and dam operations.
- Improve agricultural and forestry practices, in particular riparian protections, road construction, and road maintenance.
- Improve county and city planning, regulations (e.g., riparian and grading ordinances) programs.
- Fund and remove/upgrade high-priority man-made fish passage barriers (e.g., watercourse crossings and non-hydropower dams).
- Implement screening of all water diversion structures on fish-bearing streams.
- Replace existing outdated septic systems and improve wastewater management.
- Identify and treat point and non-point source pollution of streams from wastewater, agricultural practices, and urban environments.
- Modify channel and flood control maintenance and eliminate artificial breeching of sandbars for improvements in channel and estuarine habitats.

Recovery Priority Number: **1**

Ranking for the SONCC was based on a high magnitude of threat, a high potential for recovery, and anticipated conflict with current and future land disturbance and water-associated development within the range of the ESU. The Biological Review Team conducting an updated status review in 2004 stated that the SONCC coho ESU is "likely to become endangered within the foreseeable future." This determination was made based on substantially low abundance from historical levels, as coho salmon populations occupy roughly 50 percent of their historic range. Long-term abundance trends are clearly down but stable on the Oregon side of the ESU, and there is concern for many lost coho populations within the larger river basins—namely the Rogue, Klamath, Trinity, and Eel rivers. Strong risks to the abundance, productivity, spatial structure, and diversity of this ESU have largely persisted since its status was first reviewed, and the magnitude of threat for this ESU is high. The recovery potential for this ESU has also been classified as high. Although numerous factors limit the recovery of this ESU, the source of these factors and their demographic impacts are known and recovery planning is currently underway. Forestry is the predominant land use; however, high levels of forest conversion to agriculture and urbanization has occurred/is occurring, and water storage and diversions still affect many SONCC coho populations. Although it may be cost-prohibitive to completely address every limiting factor, it is likely that integrated reduction of most threats can achieve recovery of this ESU. Finally, as a complex variety of activities and management practices continue to impact the conservation and recovery of all Pacific salmon ESUs listed under the ESA, NMFS has determined conflict exists with regard to this ESU.

Salmon Recovery in the Southwest

Northern California Steelhead DPS (*Oncorhynchus mykiss*)

Photo credit: Josh Fuller, NMFS, from Eel River, California

Date Listed: June 7, 2000 (65 FR 36074) and reaffirmed January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status: The Recovery Outline was completed and signed July 16, 2007. A Draft Multi-Species (Northern California (NC) steelhead, Coastal California (CC) Chinook, Central California Coast (CCC) steelhead) Recovery Plan is in development and is expected to be finalized in 2010.

Species Status: The NC steelhead DPS includes all naturally spawned populations of steelhead in California coastal river basins from Redwood Creek (inclusive) southward to the Russian River (exclusive). Two artificial propagation programs are considered part of the DPS: the Yager Creek Hatchery and the North Fork Gualala River Hatchery (Gualala River Steelhead Project).

Little historical abundance information exists for the naturally spawning portion of the NC steelhead DPS. Although data were relatively limited, analysis by the original Biological Review Team (BRT) in the 1996 status review suggested the following conclusions: (1) population abundances were low relative to historical estimates, (2) recent trends were downward, and (3) summer-run steelhead abundance was very low. The BRT was also concerned about the negative influences of hatchery stocks, especially from the Mad River Hatchery which is not considered part of the DPS. The Mad River Hatchery program was terminated in 2004, thus reducing the genetic risks associated with propagation of these fish.

New data for the 2005 status review showed both upward and downward population trends. The Middle Fork Eel River and Mad River portions showed a downward trend in adult returns, while juvenile abundance for 10 independent populations showed both upward and downward trends. Overall, the 2005 status review shows that the DPS was declining during the time for which data were available.

The two artificial propagation programs that are part of the NC steelhead DPS are thought to decrease risk of extinction to some degree by contributing to increased abundance. Additionally, changes to regulations concerning sport fishing likely reduce the extinction risk for the DPS. Ultimately, however, the most recent status review concluded that steelhead in the NC steelhead DPS remain likely to become endangered in the foreseeable future.

Threats and Impacts: The following limiting factors, and their level of threat to this DPS, were evaluated during the development of the Internal Draft Multi-Species Recovery Plan:

Degraded Habitat-Estuarine and Nearshore Marine: High Threat
Degraded Habitat-Floodplain Connectivity and Function: Moderate to High Threat
Degraded Habitat-Channel Structure and Complexity: Moderate Threat
Degraded Habitat-Riparian Areas and LWD Recruitment: Moderate Threat
Degraded Habitat-Stream Substrate: Moderate to High Threat
Degraded Habitat-Stream Flow: Moderate Threat
Degraded Habitat-Water Quality: Moderate to High Threat
Degraded Habitat-Fish Passage: High Threat
Hatchery-related Adverse Effects: Low Threat
Harvest-related Adverse Effects: Moderate to High Threat
Predation/Competition/ Disease: High Threat

California's non-federal forest harvest operations are identified in the final listing notice as a critical threat to this DPS. Although this threat continues, California is revising their Forest Practice Rules with the intent to protect watersheds with anadromous salmonids. Final Rules are anticipated to be adopted by the Governor-appointed Board of Forestry in 2009.

Other critical sources of threats to this DPS include: (1) lack of oversight on county grading activities that may affect steelhead; (2) water use, riparian forest removal, erosion, road building, and other practices associated with agricultural operations; (3) changes to channel morphology and reduced floodplain connectivity due to levee construction, flood control structures, roads, erosion control structures, and urbanization; (4) urbanization and rural development leading to reduced riparian forests, pollution, unscreened water diversions, and water demands exceeding availability; (5) potential genetic modification in hatchery stocks resulting from domestication selection; (6) incidental mortality from catch-and-release hooking; (7) climatic variation leading to drought, flooding, and variable ocean conditions; and (8) predation.

Conservation Actions:

- Continuing to work with California Board of Forestry as they propose to revise their forest practice rules to provide for salmonids and their habitats.
- Implementing Fish Friendly Farming program, a multi-agency, third-party certification and technical assistance program for wine grape growers practicing best management practices for salmon. Over 10,000 acres of private property have been inspected and certified through this program.
- Collaborated proactively with counties on General Plan Updates, Grading Ordinances, and Riparian Ordinances.
- Implementing white papers and policies for instream flow, gravel mining, summer dams.
- Encouraging FishNet 4C, a multi-county group, dedicating resources to county restoration activities focused on salmon and steelhead restoration.
- Continued improvements to coho salmon captive broodstock activities at Warm Springs Dam.
- Continued participation with PCSRF Grant program.

Priority Recovery Actions Needed: Several priority recovery actions are needed for the Northern California steelhead DPS, including the following:

- Research and monitor distribution, status, and trends of steelhead.
- Continue working with the California Board of Forestry regarding non-federal timber harvest operations and possible statewide forestry plan.
- Promote operations of current recovery hatcheries and develop Hatchery and Genetics Management Plans to minimize negative influences of hatcheries.
- Improve freshwater habitat quantity and quality.
- Protect and restore habitat complexity and connectivity from the upper watershed to the ocean.
- Conduct focused freshwater habitat restoration in anadromous salmonid streams (e.g., erosion control, bank stabilization, riparian protection and restoration, and reintroduction of large woody debris).
- Balance water supply and allocation with fisheries needs through a water rights program, designate fully appropriated watersheds, develop passive diversion devices or offstream storage, eliminate illegal water diversions, and improve criteria for water drafting and dam operations.
- Improve agricultural and forestry practices, in particular riparian protections, road construction, and road maintenance.
- Improve county and city planning, regulations (e.g., riparian and grading ordinances), and county road maintenance programs.
- Remove/upgrade high-priority man-made fish passage barriers (e.g., watercourse crossings and non-hydropower dams).
- Implement screening of all water diversion structures.
- Replace existing outdated septic systems and improve wastewater management.
- Identify and treat point and non-point source pollution of streams from wastewater, agricultural practices, and urban environments.
- Modify channel and flood control maintenance and eliminate artificial breeching of sandbars for improvements in channel and estuarine habitats.

Recovery Priority Number: 5

The recovery priority number for the NC steelhead DPS is based on a moderate degree of threat, a high recovery potential, and anticipated conflict with development projects or other economic activity. A majority of the BRT that conducted the most recent status review of steelhead populations in Washington, Oregon, and California concluded that natural populations of NC steelhead are likely to become endangered. Abundance and productivity were of concern, while spatial structure and diversity were of lower concern. Uncertainty resulting from lack of data was considered by the BRT to be a source of risk, especially for the winter run portion of this DPS. Due to the lack of data, the recovery priority number will be reevaluated in the future as the recovery plan is developed. A high potential for recovery exists for the NC steelhead DPS because the majority of the DPS is not presently in urban environments. Imminent land use changes and economic activities (timber, ranching, and agriculture) are anticipated to conflict with the conservation needs of NC steelhead.

California Central Valley Steelhead DPS (*Oncorhynchus mykiss*)

Date Listed: March 19, 1998(63 FR 13347), reaffirmed January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status:
A multi-species recovery plan that includes updated information for this ESU is under development. A public review draft is expected to be completed in June 2009, and a final recovery plan is expected in November 2009.

Species Status: The CV steelhead DPS is thought to have occurred historically from the McCloud River and other northern tributaries to Tulare Lake and the Kings River in the southern San Joaquin Valley. It is estimated that more than 95 percent of historical spawning habitat is now inaccessible to this DPS, and little information is available regarding the viability of the naturally spawning component of the CV DPS.

Existing wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries, including Clear, Antelope, Deer, and Mill creeks and the Yuba River. Populations may exist in Big Chico and Butte Creeks and a few wild steelhead are produced in the American and Feather rivers. Recent monitoring has detected small self-sustaining populations of steelhead in the Stanislaus, Mokelumne, and Calaveras rivers, and other streams previously thought to be devoid of steelhead. It is possible that naturally spawning populations exist in many other streams but are undetected due to a lack of monitoring programs.

Two artificial propagation programs are considered to be part of the CV steelhead DPS—the Feather River Fish Hatchery population and the Coleman National Fish Hatchery population. Both are located in the Sacramento River Basin, consisting of large-scale mitigation facilities intended to support recreational fisheries for steelhead, and not to supplement naturally spawning populations. All production is marked and the hatchery fish are integrated with the natural-origin fish.

Although steelhead appear to remain widely distributed in Sacramento River tributaries, the vast majority of historic spawning areas are currently located upstream of impassable dams. Steelhead produced from hatcheries have been widely stocked throughout the Central Valley, Sierra Nevada, and southern Cascades. Stocking may have deleterious effects on native wild populations. There are reports of native wild populations in some areas having received stocked fish. Identification of any particular resident populations that may be part of the CV steelhead DPS has not been possible due to the lack of sufficient status and trend data.

Central Valley steelhead have shown a pattern of a negative growth since the late 1960s. It is estimated that an average of 20,540 adult steelhead occurred in the Sacramento River, upstream of the Feather River through the 1960s. Based on counts at the Red Bluff Diversion Dam, steelhead declined from an average of about 8,000 fish for the period 1967–1977, to an average of approximately 2,000 through the early 1990s, with an estimated total annual run size for the entire Sacramento–San Joaquin system to be no more than 10,000 adults. Estimates in steelhead escapement surveys ended in 1993 due to changes in operations at the Red Bluff Diversion Dam that affected the counting facilities. More recently, steelhead smolt catch ratios at Chipps Island trawl from 1998 through 2001 estimated that about 100,000 to 300,000 steelhead juveniles are produced naturally each year in the Central Valley, which generally corresponds to an adult female population of approximately 3,628.

Central Valley steelhead populations generally show a continuing decline, an overall low abundance, and fluctuating return rates. The future of this DPS is uncertain due to limited data concerning their status. However, based on the information available at this time, there is sufficient evidence to suggest that the DPS is at moderate to high risk of extinction.

Threats and Impacts: Many stressors and threats are contributing to the decline of Central Valley steelhead, including dams, water diversions, levee construction and management, water quality, predation by non-native fish, and hatchery management. The primary limiting factor to the CV steelhead DPS is the inaccessibility of more than 95 percent of its historic spawning and rearing habitat due to impassable dams. This DPS requires cool water found at higher elevations, now largely above impassable dams. The lack of adequate status and trend monitoring and research limits our understanding of the viability of this DPS and our ability to determine how steelhead populations may have interacted before the dams were built.

The degraded and declining ecological condition of the Sacramento–San Joaquin River Delta also is one of the most highly ranked threats to this ESU. The Delta has been substantially modified from its historic condition, and large water withdrawals, water quality problems, habitat degradation and loss, and introduced predatory fish species severely affect juvenile salmon growth and survival.

Conservation Actions: During 2006–2008, progress was made toward addressing some of the limiting factors and threats to this DPS, largely through ESA section 7 consultations and other ESA-related conservation efforts in the Central Valley.

The Anadromous Fish Restoration Program (AFRP) (See Box 6 on page 93) funded a state-of-the-art fish ladder on Antelope Creek, a small spring-run watershed with high restoration potential. The AFRP, in cooperation with NMFS and the California Department of Fish and Game (CDFG) are working with landowners on Antelope Creek to restore flows and habitat below agricultural diversions to increase the upstream and downstream survival of migrating spring-run fish.

The Delta Pumping Plant Fish Protection Agreement and the Tracy Fish Collection Mitigation Agreement mitigate for State Water Project and pumping plant impacts by screening water diversions, enhancing law enforcement efforts to reduce illegal fish harvest, installing seasonal

barriers to guide fish away from undesirable spawning habitat or migration corridors, restoring salmon habitat, and removing four dams to improve fish passage on Butte Creek for Chinook and steelhead. Approximately one-third of the approved funding for salmonid projects specifically targets spring-run Chinook salmon and steelhead in the upper Sacramento River tributaries.

In 2007, NMFS took a successful cooperative approach to ensuring access to fish habitat past hydropower dams on the Feather River in California. Through the Feather River Habitat Expansion Agreement, NMFS creatively worked with energy companies, conservation groups, other federal agencies, and state resource agencies to develop a consensus approach to providing both migratory fish passage and energy generation. The Agreement will provide ESA-listed Central Valley Spring-run Chinook salmon and Central Valley steelhead more habitat for spawning, rearing, and other critical life stages. The Agreement was created to collectively resolve blockages to migratory fish passage at the Oroville, Poe, Upper North Fork Feather River, and Rock Creek-Cresta hydropower dams.

Box 6. Central Valley Conservation Programs

Two large, ongoing conservation programs in the Central Valley provide a wide range of ecosystem and species-specific protective efforts benefiting Chinook salmon; the CALFED Ecosystem Restoration Program, and the Central Valley Project Improvement Act's (CVPIA) AFRP. The CALFED Ecosystem Restoration Program is a cooperative effort of more than 20 state and federal agencies working with local communities to improve water quality and reliability for California's water supplies, and has made efforts to restore the San Francisco Bay-Delta. The Program has funded projects involving habitat restoration, floodplain restoration and protection, instream and riparian habitat restoration and protection, fish screening and passage, research on non-native species and contaminants, research and monitoring of fishery resources, and watershed stewardship and outreach.

The CVPIA's AFRP balances the priorities of fish and wildlife protection, restoration, and mitigation with irrigation, domestic water use, fish and wildlife enhancement, and power augmentation. The Bureau of Reclamation and FWS have conducted studies and implemented hundreds of actions, including modifications of Central Valley Project operations, management and acquisition of water for fish and wildlife needs, flow management for fish migration and passage, increased water flows, replenishment of spawning gravels, restoration of riparian habitats, and screening of water diversions. Actions in the Sacramento River tributaries have focused on riparian and shaded riverine aquatic habitat restoration, improved access to available upstream habitat, improved instream flows, and reduced loss of juveniles at diversions. Habitat restoration includes water acquisition for instream flows; channel restoration and enhancement; removal of dams and blockages to migration; gravel replenishment; and construction or modifications of devices to improve instream habitat and to improve access or reduce fish mortalities during migrations (such as fish ladders and screening diversions).

Ongoing measures to protect steelhead in California include 100 percent marking of all hatchery steelhead, zero bag limits for unmarked steelhead, gear restrictions, closures, and size limits designed to protect smolts. The State also works closely with NMFS to review and improve inland fishing regulations.

Implementation of the Oroville Facility's Habitat Expansion Agreement will increase the abundance and range of Central Valley steelhead. Additionally, implementation of the Feather River Oroville Hydroelectric Facility's Fish Habitat Management Plan will restore habitats below Oroville Dam and reduce the interaction between hatchery and wild fish in the Feather River.

The CDFG—with the technical and scientific support of the Pacific States Marine Fisheries Commission, NMFS, and FWS—is preparing a comprehensive Central Valley Steelhead

Monitoring Plan. The goal of this project is to develop a comprehensive monitoring plan for CV steelhead, that, when implemented, will provide fishery managers the data necessary to assess steelhead population status and trends. This information is necessary as part of an overall strategy to ensure steelhead conservation and is critical to moving forward on numerous management and recovery efforts. The benefits of developing a monitoring program include:

- Providing a sound basis for implementing protective measures and assessing recovery of listed stocks.
- Assisting in the evaluation of restoration projects, such as those implemented and funded through the CVPIA, the AFRP, and the CALFED Ecosystem Restoration Program.
- Fulfilling regulatory needs to assess and quantify population impacts from authorized activities such as water diversions, fisheries, and hatchery programs.
- Evaluating the contribution of hatchery fish to CV steelhead populations.
- Providing life history information to help improve the management of steelhead in the Central Valley.

Priority Recovery Actions Needed: The inability to adequately conduct viability assessments for the CV steelhead DPS is largely due to the lack of comprehensive abundance and trend data for steelhead in the Central Valley. Implementation of the Central Valley Steelhead Monitoring Program is critical for assessing population viability and responses to extensive habitat restoration efforts funded by CALFED and CVPIA.

The Battle Creek Restoration Project is a priority action that is expected to add 42 miles of spawning habitat for this ESU. Battle Creek will be restored under an agreement between Pacific Gas and Electric (which operates nine hydroelectric dams in this reach) and resource agencies. The intent is to remove five of the dams and dedicate water rights to fish. Passage to habitats upstream of Shasta and Keswick dams are also considered critical for improving the viability of this species.

Restoring the ecological health of the Sacramento–San Joaquin River Delta and lower Sacramento River through significant changes in water and levee management, and reducing the abundance of non-native predatory fish, are other important recovery actions. Another important Delta action will be evaluating and implementing alternatives to conveyance of water south of the Delta that minimize/eliminate fish entrainment at existing facilities while allowing the Delta to function as a restored estuary.

The management of put-and-take fisheries immediately upstream from anadromous populations is an ongoing concern due to the risk to wild Central Valley Steelhead in Antelope Creek, Battle Creek, Deer Creek, and other watersheds throughout the Central Valley. Hatchery reforms need to be implemented to reduce the risk of genetic introgression from out-of-basin hatchery stocks.

Recovery Priority Number: 7

The recovery priority number for the CV steelhead DPS was derived from a moderate magnitude of threat, because more than 95 percent of historic spawning habitat is inaccessible (due to impassable dams) and because CV steelhead require cooler water at higher elevations (again, found largely above impassable dams). The recovery potential was determined to be low to moderate due to a lack of suitable habitat (requiring cold water and high elevation) below

impassable barriers, inadequate status and trends data to assess DPS viability, and the widespread stocking of hatchery fish (which could negatively impact wild steelhead populations). The potential for conflict exists because of anticipated future development and habitat degradation issues, as well as increasing demands for Central Valley water supplies.

Central California Coast Steelhead DPS (*Oncorhynchus mykiss*)

Photo credit: Josh Fuller, NMFS, Russian River. California.

Date Listed: August 18, 1997 (62 FR 43937), reaffirmed January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status:
The Recovery Outline was completed and signed May 31, 2007. A Draft Multi-Species (NC steelhead, CC Chinook, CCC steelhead) Recovery Plan is in development and is expected to be finalized in 2010.

Species Status: The CCC steelhead DPS includes all naturally spawned populations of steelhead in coastal streams from the Russian River to Aptos Creek, and the drainages of San Francisco, San Pablo, and Suisun Bays eastward to Chipps Island at the confluence of the Sacramento and San Joaquin Rivers; and tributary streams to Suisun Marsh including Suisun Creek, Green Valley Creek, and an unnamed tributary to Cordelia Slough (commonly referred to as Red Top Creek), exclusive of the Sacramento–San Joaquin River Basin of the California Central Valley. Two artificial propagation programs are considered part of the DPS: the Don Clausen Fish Hatchery and the Kingfisher Flat Hatchery/Scott Creek (Monterey Bay Salmon and Trout Project).

Information on abundance and productivity trends for the naturally spawning component of the CCC steelhead DPS is extremely limited. There are no time series of population abundance for the naturally spawned adult component of the DPS; however, estimates of steelhead statewide show a reduction in number from 603,000 in the early 1960s to 240,000–275,000 in the 1980s, indicating a potential decline of at least 54 percent. Within the CCC steelhead DPS, estimates of run sizes in the largest river system, the Russian River, have gone from 65,000 in the 1960s to 1,750–7,000 in the 1990s, indicating a potential decline of at least 89 percent. Abundance in smaller streams within the DPS was assessed as stable but at low levels.

Short time series of juvenile abundance exist for a number of sites within the CCC steelhead DPS. An analysis of these data indicated a downward trend in fish populations at five locations where adequate information was available: San Lorenzo River, Scott Creek, Waddell Creek, Gazos Creek, and Redwood Creek in Marin County. Although an overall reduction in juvenile abundance is implied by this analysis, it is unclear how such a reduction ultimately affects numbers of returning adults.

In lieu of abundance data, information on available habitat can provide insight about population status. Although small populations of steelhead occur in watersheds throughout the DPS, impassible dams have cut off substantial portions of habitat in some basins, generating concern about the spatial structure of the naturally spawning component of the DPS. In the San

Francisco Estuary, for example, approximately 58 percent of historically occupied streams no longer support anadromy. For the DPS as a whole, 22 percent of historical habitat is estimated to be behind recent (usually man-made) barriers.

The two artificial propagation programs that are part of the CCC steelhead DPS are thought to decrease risk of extinction to some degree by contributing to increased abundance. Additionally, changes to regulations concerning sport fishing likely reduce the extinction risk for the DPS. Ultimately, however, the most recent status review concluded that steelhead in the CCC DPS remain likely to become endangered in the foreseeable future.

Threats and Impacts: The following limiting factors, and their level of threat to this DPS, were evaluated during the development of the Internal Draft Multi-Species Recovery Plan:

Degraded Habitat-Estuarine and Nearshore Marine: Moderate Threat
Degraded Habitat-Floodplain Connectivity and Function: Moderate to High Threat
Degraded Habitat-Channel Structure and Complexity: Moderate Threat
Degraded Habitat-Riparian Areas and LWD Recruitment: Moderate Threat
Degraded Habitat-Stream Substrate: Moderate to High Threat
Degraded Habitat-Stream Flow: Moderate Threat
Degraded Habitat-Water Quality: High Threat
Degraded Habitat-Fish Passage: High Threat
Hatchery-related Adverse Effects: Low Threat
Harvest-related Adverse Effects: Moderate to High Threat
Predation/Competition/Disease: High Threat

Critical sources of threats to this DPS include: (1) lack of oversight on county grading activities that may affect steelhead; (2) changes to channel morphology and reduced floodplain connectivity due to levee construction, flood control structures, roads, erosion control structures, and urbanization; (3) urbanization and rural development leading to reduced riparian forests, pollution, unscreened water diversions, and water demands exceeding availability; (4) incidental mortality from catch-and-release hooking; (5) climatic variation leading to drought, flooding, and variable ocean conditions; (6) predation; and (7) loss of historical habitats due to dams and barriers.

Conservation Actions: During 2006–2008, key conservation actions included:

- Collaborated proactively with counties on General Plan Updates, Grading Ordinances, and Riparian Ordinances.
- Implementing white papers and policies for instream flow, gravel mining, and summer dams.
- Encouraging FishNet 4C, a multi-county group, dedicating resources to county restoration activities focused on salmon and steelhead restoration.
- Continued participation with PCSRF Grant program.

Priority Recovery Actions Needed: Several priority recovery actions are needed for the CCC steelhead DPS, including:

- Research and monitor distribution, status, and trends of steelhead.

- Promote operations of current recovery hatcheries and develop Hatchery and Genetics Management Plans to minimize negative influences of hatcheries.
- Facilitate fish passage in Alameda Creek.
- Work in urban environments to educate the public, cities, and counties to work toward fish-friendly solutions on water flow and fish passage, and on reducing pollution.
- Improve freshwater habitat quantity and quality.
- Protect and restore habitat complexity and connectivity from the upper watershed to the ocean.
- Conduct focused freshwater habitat restoration in anadromous salmonid streams (e.g., erosion control, bank stabilization, riparian protection and restoration, and reintroduction of large woody debris).
- Balance water supply and allocation with fisheries needs through a water rights program, designate fully appropriated watersheds, develop passive diversion devices or offstream storage, eliminate illegal water diversions, and improve criteria for water drafting and dam operations.
- Improve county/city planning, regulations (e.g., riparian and grading ordinances), and county road maintenance programs.
- Remove/upgrade high-priority man-made fish passage barriers (e.g., watercourse crossings and non-hydropower dams) and screen all water diversion structures.
- Replace existing outdated septic systems and improve wastewater management.
- Identify and treat point and non-point source pollution of streams from wastewater, agricultural practices, and urban environments.
- Modify channel and flood control maintenance and eliminate artificial breeching of sandbars for improvements in channel and estuarine habitats.

Recovery Priority: 3

Ranking for CCC steelhead is based on a high degree of threat, a low-moderate recovery potential, and anticipated conflict with development projects or other economic activity. A majority of the Biological Review Team that conducted the most recent status review of steelhead populations in Washington, Oregon, and California concluded that natural populations of CCC steelhead are likely to become endangered. This determination was made based on the following factors: (1) the largest run for the DPS (Russian River) has been reduced in size and this decline continues, (2) populations in the southern part of the range have declined substantially, and (3) habitats are degraded. A low-moderate potential for recovery exists for CCC steelhead due to the large amount of urbanization within the range. Imminent land use changes and encroaching urbanization into rural areas are anticipated to conflict with the conservation needs of CCC steelhead.

South-Central California Coast Steelhead DPS (Oncorhynchus mykiss)

Date Listed: August 18, 1997 (62 FR 43937), reaffirmed January 5, 2006 (71 FR 834)

Legal Status: Threatened

Recovery Plan Status: The Recovery Outline was completed in September 2007. The Draft Recovery Plan is in development and is expected to be finalized in 2010.

South-Central California Steelhead, San Carpoforo Creek – 2007

Species Status: The steelhead population within the South-Central California Steelhead DPS has declined dramatically, from estimated annual runs totaling 25,000 adults in the mid-1960s to mid-1990s to less than 500 returning adult fish. Of the 36 watersheds historically supporting steelhead runs, approximately 90 percent continue to support runs, although run sizes have been sharply reduced in most watersheds. The four largest watersheds (Pajaro, Salinas, Nacimiento/Arroyo Seco, and Carmel rivers) have experienced declines in run sizes of 90 percent or more. Present population trends within individual watersheds continuing to support runs is generally unknown, but may vary widely between watersheds.

Threats and Impacts: The South-Central California Steelhead DPS is near the southern limit of the steelhead's range. There has been extensive loss of populations in most of the major watersheds due to agricultural development, urbanization, dewatering, and modification of rivers and creeks. A significant portion of the spawning and rearing habitat has been rendered inaccessible as a result of dams and other instream structures that block or impede migration.

The principal threats to the viability of the South-Central California Steelhead DPS are associated with the four major river systems listed above. Each of these watersheds is heavily impacted by water facilities (both surface and subsurface) and development of the floodplain and associated riparian corridor (for agricultural, residential, and industrial uses including sand and gravel extraction). Additionally, threats to several of the major watersheds in the southern portion of the DPS (Santa Rosa, San Simeon, San Luis Obispo, and Arroyo Grande creeks) impact the viability of this DPS.

In many of the watersheds, water developments have physically blocked access or impeded migration of adult steelhead to headwater spawning and rearing tributaries, as well as restricted the emigration of juveniles to the ocean. Development of the floodplains have altered the natural fluvial processes that facilitate migration and in some cases sustain over-summering habitat for juvenile steelhead; associated flood control structures and activities have further disrupted the natural fluvial processes necessary to maintain these habitats. Limited harvesting of timber and

increased development of residential structures (and associated roads) on steep-sided erosive slopes have accelerated erosion and sedimentation of river and stream channels. The continued spread and propagation of invasive plants and aquatic species also has further degraded habitats for steelhead, particularly rearing juveniles. The loss and degradation of remaining estuarine habitat as a result of both point and non-point sources of pollution and artificial breaching of sandbars has reduced the suitability of these habitats for rearing and acclimation. Finally, the introduction of exotic fish and the stocking of non-native steelhead fish stocks to support recreational fishing have also contributed to the decline of native steelhead and related resident trout populations in many coastal rivers and streams, though the latter practice has declined since the listing of the species.

Conservation Actions: Fish passage facilities have been constructed on the Carmel River at the Los Padres Dam with funding from the Carmel River Steelheaders and the CalAm Water Agency. A number of impediments to fish passage caused by road crossings and other instream structures have been eliminated or substantially improved as a result of retrofitting such structures. Funding for these projects was provided through PCSRF. Planning for the removal of San Clemente Dam in the Carmel River has advanced and is expected to be completed by 2009. Funding for this project has been provided by the California American Water Agency, California Department of Water Resources, and California Coastal Conservancy.

Angling regulations for sport fishing for native steelhead have been changed to regulate recreational angling in virtually all coastal rivers and streams in this DPS that are accessible to adult steelhead migrating up from the ocean. This recreational fishery is limited to several days a week during the migratory season and is limited to catch-and-release. Additionally, the CDFG has curtailed its stocking of hatchery-reared trout, limiting stockings to reservoirs or stream reaches above impassible barriers.

Finally, NMFS has conducted both formal and informal Section 7 Consultations with federal agencies throughout the range of this DPS that fund, carry out, or regulate projects such as flood protection, road construction, water diversion, and gravel mining.

Priority Recovery Actions Needed:

- Further investigate life-history of the species, including utilization of estuarine habitat, juvenile growth and smolting patterns, distribution of residualized populations above artificial impassable barriers, and the relationship between putative resident and migratory forms of steelhead to refine population viability and delisting criteria for this species.
- Re-establish access to upper watersheds in both small coastal streams and several of the larger river systems.
- Complete planning for the removal of San Clemente Dam on the Carmel River.
- Re-establish adequate flow regimes for the Salinas and Nacimiento rivers.
- Further investigate potential recovery actions south of San Simeon.
- Establish a robust monitoring system to track population trends, the efficacy of recovery actions, and the attainment of viability and delisting criteria.

Recovery Priority Number: 3
Ranking is based on a moderate magnitude of threat, a high potential for recovery, and anticipated conflict with current and future development/disturbance within the range of the DPS. The BRT that was formed to conduct an updated status review in 2005 concluded that the South-Central California Steelhead DPS was "currently not in danger of extinction but likely to become so in the foreseeable future." This determination was based in part on "dewatering from irrigation and urban water diversions and habitat degradation in the form of logging on steep erosive slopes, agricultural and urban development on floodplains and riparian areas, and artificial breaching of estuaries during periods when they are normally closed off to the ocean by a sandbar." NMFS believes that there is a moderate magnitude of threat in smaller watersheds but a higher risk in the four major watersheds, with a high potential of recovery and continued conflict with land disturbance and water-associated impacts.

Southern California Coast Steelhead DPS (Oncorhynchus mykiss)

Date Listed: August 18, 1997 (62 FR 43937); and Southern Range Extension May 1, 2002 (50 CFR Part 224) reaffirmed January 5, 2006 (71 FR 834)

Legal Status: Endangered

Recovery Plan Status: The Recovery Outline was completed in September 2007. The Draft Recovery Plan is under review and is expected to be finalized in 2009.

Southern California Steelhead – Mission Creek 2008

Species Status: The steelhead populations within the Southern California Steelhead DPS have declined dramatically, from estimated annual runs totaling 55,000 adults in the mid-1960s to mid-1990s (estimated from only four of the northernmost watersheds) to less than 500 returning adult fish. Populations from over half of the 46 watersheds historically supporting steelhead runs are believed to have been extirpated. All of the four largest watersheds in the northern portion of the DPS (Santa Maria, Santa Ynez, Ventura, and Santa Clara rivers) have experienced declines in run sizes of 90 percent or more. In the southern range extension (from Malibu to the Mexico border), adult steelhead have been documented in only three watersheds since the original listing of the DPS, although no systematic monitoring of steelhead runs has been conducted within these watersheds. Present population trends within individual watersheds continuing to support runs are unknown but may vary widely between watersheds, and are likely declining in a majority of the watersheds within the DPS.

Threats and Impacts: The Southern California Steelhead DPS is at the extreme southern limit of the steelhead range. The principal threats to the viability of the Southern California Steelhead DPS are associated with all four of the major river systems in the northern portion of the DPS (listed above). Each of these watersheds is heavily impacted by water facilities (both surface and subsurface) and development of the floodplain and associated riparian corridor (for agricultural, residential, and industrial uses including sand and gravel extraction). There has been extensive loss of populations, especially south of Malibu Creek, due to urbanization, dewatering, and channelization of rivers and creeks. Threats to several of the major watersheds in the southern portion of the DPS (San Gabriel, Santa Ana, San Juan, Santa Margarita, San Luis Rey, and Sweetwater rivers) may also impact the viability of this DPS.

The majority of the spawning and rearing habitat of the major river systems has been rendered inaccessible as a result of dams, debris basins, road crossings, and other instream structures that block or impede migration of adult steelhead to headwater spawning and rearing tributaries, and that restrict the emigration of juveniles to the ocean. Development of the floodplains have

altered the natural fluvial processes that facilitate migration and in some cases sustain over-summering habitat for juvenile steelhead; associated flood control structures and activities have further disrupted the natural fluvial processes necessary to maintain these habitats. Increased development of residential structures (and associated roads) on steep-sided erosive slopes has accelerated erosion and sedimentation of river and stream channels and of remaining estuarine habitat.

The continued spread and propagation of invasive plants and aquatic species also has further degraded habitats for steelhead, particularly rearing juveniles. Southern California has also lost approximately 90 percent of its pre-historic estuarine habitat through dredging and filling. The degradation of remaining estuarine habitat as a result of both point and non-point sources of pollution and artificial breaching of sand bars has reduced the suitability of these habitats for rearing and acclimation. Finally, the introduction of exotic fish, and the stocking of non-native steelhead fish stocks to support recreational fishing have also contributed to the decline of native steelhead and related resident trout populations in many coastal rivers and streams, although the latter practice has declined since the listing of the species.

Conservation Actions: Inventories of impediments have been conducted on major watersheds (Santa Maria/Sisquoc, Santa Ynez, Santa Ynez Mountains complex, Ventura, Santa Clara, and Santa Monica Mountains complex, San Juan/Arroyo, San Luis Rey). Fish passage facilities have been constructed on Sal Salsipuedes Creek (Santa Ynez River); San Ysidro Creek (Santa Ynez Mountains) and a number of smaller watersheds along the Conception Coast; Ventura River at the Robles Diversion Dam; Santa Paula Creek at the Harvey Dam; and Santa Paula Creek Flood Control Channel. Additional fish passage projects are in the planning stages within the Santa Monica Mountains and the southern range extension (e.g., San Juan/Arroyo Trabuco). Funding for these projects was provided by the California Coastal Conservancy, California Wildlife Conservation Board, and Pacific Coastal Salmon Recovery Fund. A number of impediments to fish passage caused by road crossings and other instream structures have been eliminated or substantially improved as a result of retrofitting such structures (i.e., Horse Creek on the Sisquoc River). Funding for these projects was provided by through PCSRF and local funders. Planning for the removal of Matilija Dam in the Ventura River watershed (the largest dam removal project in the United States to date) has advanced substantially and planning has commenced on the removal of Rindge Dam on Malibu Creek. Funding for these two major dam removal projects has been provided by the U.S. Bureau of Reclamation, the U.S. Army Corps of Engineers, the U.S. Department of Justice, the California Coastal Conservancy, and the local dam owners.

Angling regulations for sport fishing for native steelhead have been changed to eliminate recreational angling in virtually all coastal rivers and streams in the DPS that are accessible to adult steelhead migrating up from the ocean. Additionally, the CDFG has curtailed its stocking of hatchery-reared trout, limiting stockings to reservoirs or stream reaches above impassible barriers. In at least one case the Department has begun stocking sterile (triploid) fish to prevent the interbreeding of hatchery-reared fish with native steelhead.

NMFS has issued two Biological Opinions regarding fish passage and migration flows: for Santa Felicia Dam on Piru Creek (a tributary to the Santa Clara River) and for the Vern Freeman Diversion on the Santa Clara River. Additionally, NMFS has participated in the Public

Trust/Water Right hearings held by the California State Water Resources Control Board on the re-licensing of the Cachuma Dam project on the Santa Ynez River.

Finally, NMFS has conducted both formal and informal Section 7 Consultations with federal agencies throughout the DPS that fund, carry out, or regulate projects such as flood protection, road construction, water diversion, bridge replacements, and gravel mining operations.

Priority Recovery Actions Needed: The following actions are necessary to recover the endangered steelhead of Southern California:

- Investigate life-history of the species, including utilization of estuarine habitat, juvenile growth and smolting patterns, distribution of residualized populations above artificial impassable barriers, and the relationship between putative resident and migratory forms of steelhead to refine population viability and delisting criteria for this species.
- Re-establish access to upper watersheds in both small coastal streams and several of the larger river systems within each biogeographic region identified by the TRT.
- Complete planning for the removal of Matilija Dam on the Ventura River and Rindge Dam on Malibu Creek.
- Re-establish adequate flow regimes (and in some instances fish passage facilities) for the Santa Maria, Santa Ynez, Ventura, and Santa Clara rivers.
- Further investigate potential recovery actions south of Malibu Creek (within the southern range extension), including watershed barrier inventories, habitat suitability assessments, and metapopulation dynamics between the larger river systems and short run coastal streams.
- Establish a robust monitoring system to track population trends, the efficacy of recovery actions, and the attainment of viability and delisting criteria.

Recovery Priority Number: 3

Ranking is based on a high magnitude of threat, a moderate potential for recovery, and anticipated conflict with current and future development/disturbance within the range of the DPS. The BRT that was formed to conduct an updated status review in 2005 reiterated the conclusions reached in the previous status review: that the Southern California Steelhead DPS "was in danger of extinction." This determination was based in part on the extirpation of populations through much of their historical range, and the blockage and degradation of freshwater habitats. NMFS believes that there is a moderate magnitude of threat in smaller watersheds but a higher risk in the major watersheds, with a high potential of recovery and continued conflict with land disturbance and water-associated impacts.

Central California Coast Coho Salmon ESU (Oncorhynchus kisutch)

Date Listed: October 31, 1996 (61 FR 56138) relisted June 28, 2005 (70 FR 37160)

Legal Status: Endangered (reclassified from original threatened listing)

Recovery Plan Status: Recovery Outline completed in October 2005. The Draft recovery plan is being revised for public release in April 2009. The final plan is scheduled for a late 2009 or early 2010 release.

Juvenile CCC coho salmon.
Photo courtesy Southwest Fisheries Science Center, Scott Creek, California

Species Status: ***Near Extinction***
The Central California Coast coho salmon ESU includes all naturally spawned populations from Punta Gorda in northern California to the south (including the San Lorenzo River in central California), as well as populations in tributaries to San Francisco Bay (excluding the Sacramento–San Joaquin River system). Four artificial propagation programs are considered part of this ESU: the Don Clausen/Warm Springs Fish Hatchery Captive Broodstock Program, Scott Creek/King Fisher Flats Conservation Program, Scott Creek Captive Broodstock Program, and the Noyo River Fish Station Egg-take Program coho hatchery program. The artificially propagated stocks were found to be no more than moderately divergent genetically from the natural populations.

All population data and information indicate that the CCC coho salmon ESU is critically close to extinction. Only a few hundred adults have returned annually over the last several years. CCC coho salmon are extirpated in all but a few watersheds south of the Navarro River. Poor freshwater survival and poor ocean conditions/ocean survival are acting on the population in synchrony to result in the population collapse. "Near final data from across the range of coho salmon on the coast of California reveal there was a 72% decline in returning adults in 2007/08 compared to the same cohort in 2004/05."

Information on the abundance and productivity trends for the naturally spawning component of the CCC coho ESU is extremely limited. No long-term time series of spawner abundance exist for individual river systems. Data are particularly lacking for many river basins in the southern two-thirds of the ESU, where naturally spawning populations are considered to be at the greatest risk. Analyses of juvenile coho presence-absence information, juvenile density surveys, and irregular adult counts for the South Fork Noyo River indicate low abundance and long-term downward trends. The extirpation or near extirpation of natural coho salmon populations in several major river basins and across most of the southern historical range of the ESU represents a significant risk to ESU spatial structure and diversity. Trend data for this ESU show a continuing decline in abundance and a population that is going extinct.

Threats and Impacts: The following limiting factors, and their level of threat to this ESU, were evaluated during the development of the draft Recovery Plan:

Degraded Habitat-Estuarine and Nearshore Marine: High Threat
Degraded Habitat-Floodplain Connectivity and Function: High Threat
Degraded Habitat-Channel Structure and Complexity: Moderate Threat
Degraded Habitat-Riparian Areas and LWD Recruitment: High Threat
Degraded Habitat-Stream Substrate: Moderate to High Threat
Degraded Habitat-Stream Flow: Moderate Threat
Degraded Habitat-Water Quality: Moderate to High Threat
Degraded Habitat-Fish Passage: Moderate to High Threat
Hatchery-related Adverse Effects: Low Threat
Harvest-related Adverse Effects: High Threat
Predation/Competition/ Disease: High Threat

The last remaining CCC coho salmon persist predominately on non-federal forestlands except for Lagunitas Creek. California is currently undergoing revisions to their Forest Practice Rules with the intent to protect watersheds with anadromous salmonids. Final Rules are anticipated to be adopted by the Governor-appointed Board of Forestry in 2009.

Other critical sources of threats to this DPS include: (1) lack of oversight on county grading activities that may affect CCC coho salmon; (2) water use, riparian forest removal, erosion, road building, and other practices associated with agricultural operations; (3) changes to channel morphology and reduced floodplain connectivity due to levee construction, flood control structures, roads, erosion control structures, and urbanization; (4) urbanization and rural development leading to reduced riparian forests, pollution, unscreened water diversions, and water demands exceeding availability; (5) potential genetic modification in hatchery stocks resulting from domestication selection; (6) incidental mortality from catch-and-release hooking; (7) climatic variation leading to drought, flooding, and variable ocean conditions; and (8) predation.

Conservation Actions: During 2006–2008, key conservation actions included:

- Worked with California Board of Forestry as they proposed new rules for the protection of salmonids and their habitats.
- Implementing Fish Friendly Farming program, a multi-agency, third-party certification and technical assistance program for wine grape growers practicing best management practices for salmon. Over 10,000 acres of private property have been inspected and certified through this program.
- Collaborated proactively with counties on General Plan Updates, Grading Ordinances, and Riparian Ordinances.
- Implementing white papers and policies for instream flow, gravel mining, and summer dams.
- Encouraging FishNet 4C, a multi-county group, dedicating resources to county restoration activities focused on salmon and steelhead restoration.
- Continued recovery hatchery improvements to coho salmon captive broodstock activities at Warm Springs Dam.

- Continued participation with Pacific Coast Salmonid Restoration Grant program.

Priority Recovery Actions Needed: ***The first priority is to act immediately to prevent the extinction of CCC coho salmon from California's central coast.*** This would include:

1. Protect all existing populations and work to ensure survival of last remaining individuals and their offspring.
2. Conduct focused and careful restoration work in areas known to support last remaining populations to increase survival.
3. Consider expanding captive broodstock programs to preserve the remaining genetic diversity.
4. Conduct immediate outreach to inform the public, anglers, agencies, etc. of the current state of this population.

Other Needs:

- Research and monitor distribution, status, and trends of coho salmon.
- Improve freshwater habitat quantity and quality.
- Protect and restore habitat complexity and connectivity from the upper watershed to the ocean.
- Conduct focused freshwater habitat restoration in anadromous salmonid streams (e.g., erosion control, bank stabilization, riparian protection and restoration, and reintroduction of large woody debris).
- Balance water supply and allocation with fisheries needs through a water rights program, designate fully appropriated watersheds, develop passive diversion devices or offstream storage, eliminate illegal water diversions, and improve criteria for water drafting and dam operations.
- Improve agricultural and forestry practices, in particular riparian protections, road construction, and road maintenance.
- Improve county and city planning, regulations (e.g., riparian and grading ordinances), and county road maintenance programs.
- Remove/upgrade high-priority man-made fish passage barriers (e.g., watercourse crossings and non-hydropower dams) and implement screening of all water diversion structures.
- Replace existing outdated septic systems and improve wastewater management.
- Identify and treat point and non-point source pollution of streams from wastewater, agricultural practices, and urban environments.
- Modify channel and flood control maintenance and eliminate artificial breeching of sandbars for improvements in channel and estuarine habitats.

Recovery Priority Number: 1

Ranking for CCC coho salmon was based on a high degree of threat, a high recovery potential, and an anticipated conflict with economic activity. The BRT agreed in 2004 that natural populations of coho salmon in the CCC ESU are in danger of extinction. This determination was based on the following factors: (1) substantially low abundance of coho salmon from historical levels (e.g., more than 50 percent of coho streams no longer have spawning runs), (2) long-term trends clearly downward, (3) degraded habitats, (4) threats to genetic integrity due to hatchery plantings, and (5) recent droughts and change in ocean productivity. NMFS believes that a high

potential for recovery is possible for CCC coho salmon because of the likelihood that freshwater impacts can be substantially controlled or reduced through habitat protection, implementation of best management practices, and focused restoration. Over 80 percent of the range of CCC coho lies under private ownership. Forestry is the predominant land use; however, high levels of forest conversion to agriculture and urbanization are currently underway. Imminent land use changes are anticipated to conflict with the conservation needs of CCC coho salmon.

California Coastal Chinook Salmon ESU (Oncorhynchus tshawytscha)

Date Listed: September 16, 1999 (64 FR 50394) and reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status:
The Recovery Outline was completed and signed July 16, 2007. A Multi-Species (NC steelhead, CC Chinook, CCC steelhead) Recovery Plan is expected to be finalized in 2010.

Photo credit: Cathy Meyers, Eel River, California.

Species Status: The California Coastal (CC) Chinook salmon ESU includes all naturally spawned populations of Chinook salmon from rivers and streams south of the Klamath River (exclusive) to the Russian River (inclusive). Seven artificial propagation programs are considered part of the ESU: the Humboldt Fish Action Council (Freshwater Creek), Yager Creek, Redwood Creek, Hollow Tree, Van Arsdale Fish Station, Mattole Salmon Group, and Mad River Hatchery fall-run Chinook hatchery programs.

The status of CC Chinook salmon is critically nearing extinction with continued declining returns of adult spawners. The ocean commercial and recreational fishery has been closed.

Information on abundance and productivity trends for the naturally spawning component of the CC Chinook salmon ESU is extremely limited. A status review conducted by the Biological Review Team (BRT) in 2005 concluded that CC Chinook salmon continue to exhibit depressed population sizes relative to historical abundances. A reduction of geographic distribution was also noted, particularly for spring-run Chinook salmon (which may no longer be extant anywhere in the range of this ESU) and from basins in the southern portion of the ESU. Analyses of the few time series of data available for this ESU showed mixed trends. Positive trends seemed apparent at Freshwater Creek and Mad River, while trends from the Eel River were generally negative. Recent strong return numbers to the Russian River have been documented, but the genetic relatedness of these fish to others in the ESU is uncertain. The lack of data and resultant uncertainty associated with estimates of abundance contributes substantially to assessments of risk facing the CC Chinook salmon ESU.

Artificial propagation of Chinook salmon from the seven hatcheries included in the CC Chinook salmon ESU remains at low levels. It is unknown whether these hatcheries are a benefit or detriment to the naturally spawning portion of the ESU.

Threats and Impacts: The following limiting factors, and their level of threat to this ESU, were evaluated during the development of the Multi-Species draft Recovery Plan:

Degraded Habitat-Estuarine and Nearshore Marine: High Threat
Degraded Habitat-Floodplain Connectivity and Function: High Threat
Degraded Habitat-Channel Structure and Complexity: Moderate Threat
Degraded Habitat-Riparian Areas and LWD Recruitment: Moderate Threat
Degraded Habitat-Stream Substrate: Moderate Threat
Degraded Habitat-Stream Flow: Moderate to High Threat
Degraded Habitat-Water Quality: Moderate Threat
Degraded Habitat-Fish Passage: High Threat
Hatchery-related Adverse Effects: Very Low Threat
Harvest-related Adverse Effects: High Threat
Predation/Competition/ Disease: High Threat

Chinook populations overlay with large tracts of non-federal forestlands. California is currently undergoing revisions to their Forest Practice Rules with the intent to protect watersheds with anadromous salmonids. Final Rules are anticipated to be adopted by the Governor-appointed Board of Forestry in 2009.

Other critical sources of threats to this ESU include: (1) lack of oversight on county grading activities that may affect salmon; (2) water use, riparian forest removal, erosion, road building, and other practices associated with agricultural operations; (3) changes to channel morphology and reduced floodplain connectivity due to levee construction, flood control structures, roads, erosion control structures, and urbanization; (4) urbanization and rural development leading to reduced riparian forests, pollution, unscreened water diversions, and water demands exceeding availability; (5) potential genetic modification in hatchery stocks resulting from domestication selection; (6) incidental mortality from catch-and-release hooking; (7) climatic variation leading to drought, flooding, and variable ocean conditions; and (8) predation.

Conservation Actions: During 2006–2008, key conservation actions included:

- Worked with California Board of Forestry as they proposed new rules to protect salmonids and their habitats.
- Implementing Fish Friendly Farming program, a multi-agency, third-party certification and technical assistance program for wine grape growers practicing best management practices for salmon. Over 10,000 acres of private property have been inspected and certified through this program.
- Collaborated proactively with counties on General Plan Updates, Grading Ordinances, and Riparian Ordinances.
- Implementing white papers and policies for instream flow, gravel mining, and summer dams.
- Encouraging FishNet 4C, a multi-county group dedicating resources to county restoration activities focused on salmon and steelhead restoration.
- Continued recovery hatchery improvements to coho salmon captive broodstock activities at Warm Springs Dam.
- Continued participation with Pacific Coast Salmonid Restoration Grant program.

Priority Recovery Actions Needed: Several priority recovery actions are needed for the California Coast Chinook Salmon ESU, including the following:

- Focus restoration on increasing survival of Chinook salmon in currently occupied watersheds.
- Conduct focused freshwater habitat restoration in salmon streams (e.g., erosion control, bank stabilization, riparian protection and restoration, and reintroduction of large woody debris).
- Research and monitor distribution, status, and trends of Chinook salmon.
- Improve estuarine habitat quantity and quality.
- Balance water supply and allocation with fisheries needs through a water rights program, designate fully appropriated watersheds, develop passive diversion devices or offstream storage, eliminate illegal water diversions, and improve criteria for water drafting and dam operations.
- Improve agricultural and forestry practices, in particular riparian protections, road construction, and road maintenance.
- Improve county and city planning, regulations (e.g., riparian and grading ordinances), and county road maintenance programs.
- Remove/upgrade high-priority man-made fish passage barriers (e.g., watercourse crossings and non-hydropower dams) and implement screening of all water diversion structures.
- Replace existing outdated septic systems and improve wastewater management.
- Identify and treat point and non-point source pollution of streams from wastewater, agricultural practices, and urban environments.
- Modify channel and flood control maintenance and eliminate artificial breeching of sandbars for improvements in channel and estuarine habitats.

Recovery Priority Number: 3

Ranking is based on a high degree of threat, a low-moderate recovery potential, and anticipated conflict with development projects or other economic activity. The high degree of threat is based on: (1) evidence that suggests populations have been extirpated in the southern part of the ESU, or are extremely low in abundance, and (2) loss of the spring-run Chinook salmon life history form. A low-moderate potential for recovery is possible for CC Chinook based on the extremely limited availability of data and the moderate likelihood that freshwater impacts can be substantially controlled or reduced through habitat protection, implementation of best management practices, and focused restoration. Imminent land use changes and encroaching urbanization into rural areas are anticipated to conflict with the conservation needs of CC Chinook.

Sacramento River Winter-run Chinook Salmon ESU (Oncorhynchus tshawytscha)

Emerging larval Sacramento River winter-run Chinook salmon and pre-emergent eggs in the upper Sacramento River near Redding.

Date Listed: November 5, 1990 (55 FR 46515); reclassified January 4, 1994 (59 FR 440); classification reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Endangered (reclassified from original threatened listing)

Recovery Plan Status:
A draft recovery plan was issued in August 1997. A multi-species recovery plan that includes updated information for this ESU is under development. A public review draft is expected to be completed in June 2009, and a final recovery plan is expected in November 2009.

Species Status: The distribution of winter-run spawning and rearing historically was limited to the upper Sacramento River and its tributaries, where spring-fed streams provided cold water throughout the summer, allowing for spawning, egg incubation, and rearing during the mid-summer period. The construction of Shasta Dam in 1943 blocked access to all of these waters. Approximately 299 miles of tributary spawning habitat in the upper Sacramento River is now inaccessible to winter-run. The Sacramento River winter-run Chinook salmon ESU is represented by a single extant population. Construction of the Shasta and Keswick dams completely displaced this ESU from its historical spawning habitat. Cold-water releases from the reservoir behind Shasta Dam artificially maintain the remaining spawning habitat.

Winter-run population estimates were as high as 100,000 fish in the 1960s, but declined to under 200 fish in the 1990s. In recent years, population estimates of winter-run reached a 25-year high of 17,334 in 2006, followed by a precipitous decline in 2007 and 2008 with estimates of 2,775 and 2,186 fish returning to spawn.

An artificial propagation program also is part of the Sacramento River winter-run Chinook ESU. The program is carried out at the Livingston-Stone National Fish Hatchery on the mainstem Sacramento River above Keswick Dam. An assessment of the effects of these artificial propagation programs on the viability of the ESU concluded that the programs decrease risk to some degree by contributing to increased ESU abundance and diversity, but have a neutral or uncertain effect on productivity and spatial structure. The artificial propagation program has contributed to maintaining diversity of the ESU through careful use of spawning protocols to maximize genetic diversity of propagated fish and minimize impacts on the naturally spawning population.

Due to concerns of genetic introgression with hatchery populations, and because winter-run Chinook has only one spawning population, NMFS believes that the winter-run ESU is currently not viable.

Threats and Impacts: The greatest single impact to this population was the blocking of access to spawning areas by the Shasta and Keswick dams. The ESU continues to be threatened by having all of its historic spawning habitat blocked by dams, having only one extant population, a low and declining population size (compared to historic levels), vulnerability to drought, inadequately screened or unscreened water diversions, poor juvenile outmigrant survival throughout all of its in-river range pollution, adverse flow conditions, high summer water temperatures, and high rates of ocean harvest. The degraded and declining ecological condition of the Sacramento–San Joaquin River Delta also is one of the most highly ranked threats to this ESU. The Delta has been substantially modified from its historic condition, and large water withdrawals, water quality problems, habitat degradation and loss, and introduced predatory fish species severely affect juvenile salmon growth and survival.

Adult Sacramento River winter-run Chinook salmon being studied at the Red Bluff Diversion Dam.

Conservation Actions: Harvest protective measures benefiting winter-run Chinook salmon include seasonal constraints on sport and commercial fisheries south of Point Arena. In addition, the State has listed winter-run Chinook under the California Endangered Species Act, and has thus established specific in-river fishing regulations and no-retention prohibitions designed to protect this ESU (e.g., management measures for time and area closures, gear restrictions, and zero bag limits in the Sacramento River). In response to a fishery failure triggered in part by a weak ocean upwelling in 2005, harvest protective measures were implemented in 2008 and may continue into 2009. Based on the recommendations of the Pacific Fishery Management Council, NMFS closed ocean commercial fisheries that incidentally harvest Central Valley spring-run Chinook salmon. In addition, the California Fish and Game Commission closed in-river fisheries in the Central Valley, with the exception of a short season that targeting late fall-run Chinook salmon. These closures are expected to have increased the ocean survival and in-river escapement of the ESU. In addition, the CDFG has continued to implement enhanced enforcement efforts in spring-run tributaries and adult holding areas, which have significantly reduced illegal harvest.

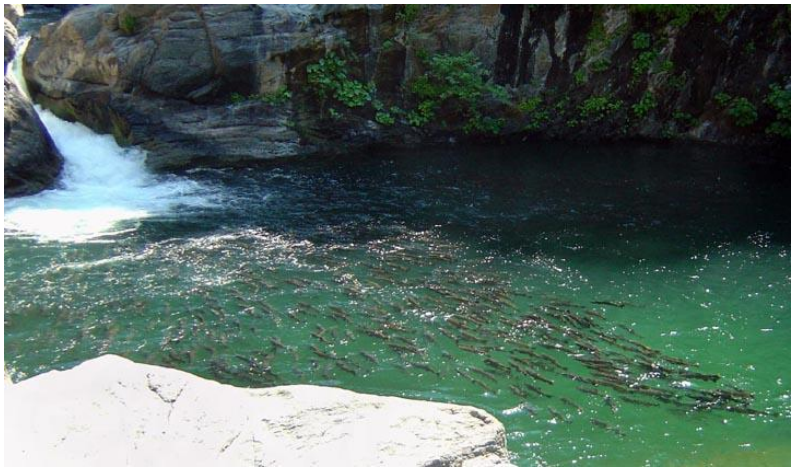
Priority Recovery Actions Needed: Several priority recovery actions are needed for the winter-run Chinook salmon ESU, including the following:

- Primarily, establish an additional population or populations within the ESU.
- The Battle Creek Restoration Project is a priority action that is expected to add 42 miles of spawning habitat for this ESU. Battle Creek will be restored under an agreement between Pacific Gas and Electric (which operates nine hydroelectric dams in this reach) and resource agencies. The intent is to remove five of the dams and dedicate water rights to fish. Passage to habitats upstream of Shasta and Keswick dams are also considered to be critical for improving the viability of this species.
- Restoring the ecological health of the Sacramento–San Joaquin River Delta and lower Sacramento River through significant changes in water and levee management, and reducing the abundance of non-native predatory fish are other important recovery actions.
- Evaluating and implementing alternatives to conveyance of water south of the Delta that minimize/eliminate fish entrainment at existing facilities while allowing the Delta to function as a restored estuary.
- Continued funding and implementation of CALFED's Ecosystem Restoration Program and the CVPIA's AFRP (see Box 6 on page 93) to continue habitat restoration efforts, screening of diversions, flow and temperature monitoring, status and trends research monitoring, modification of structures to improve fish passage, and overall water quality improvements.
- Reduced commercial harvest may also be necessary to increase the abundance of this species. We estimate that up to 30 percent of the adult ocean population is harvested annually.

Recovery Priority Number: 3

The recovery priority number for the Sacramento River winter-run Chinook salmon ESU is based on a high magnitude of threat due to a single extant population vulnerable to loss of genetic diversity, low abundance, unscreened diversions, high water temperatures, and effects of drought. The recovery potential is low to moderate due to the lack of additional populations, lack of available/suitable habitat (cold water), unscreened diversions/passage problems, and inadequate instream flow. Conflict was determined to be present due to anticipated future development, habitat degradation issues, and increasing demands for Central Valley water supplies.

Central Valley Spring-run Chinook Salmon ESU (Oncorhynchus tshawytscha)



Central Valley spring-run Chinook salmon at the Quartz Bowl Pool on Butte Creek.

Date Listed: September 16, 1999 (64 FR 50394), classification reaffirmed June 28, 2005 (70 FR 37160)

Legal Status: Threatened

Recovery Plan Status: A multi-species recovery plan that includes updated information for this ESU is under development. A public review draft is expected to be completed in June 2009, and a final recovery plan is expected in November 2009.

Species Status: Twenty-six historical populations have been identified within the spring-run ESU—19 independent populations, and 7 dependent populations. Of the 19 independent populations of spring-run that occurred historically, only three remain, in Deer, Mill, and Butte creeks. Dependent populations of spring-run continue to occur in Big Chico, Antelope, Clear, Thomes, and Beegum creeks, but rely on the three extant independent populations for their continued survival. A population also occurs in the Feather River but is dependent on Feather River Hatchery (FRH) production (which is considered part of the ESU) but has hybridized with fall-run Chinook.

The remaining independent populations reached low abundance levels during the late 1980s (67–243 spawners compared to a historic peak of about 700,000 spawners). Independent populations displayed a trend of increasing or stable abundance since the late 1990s, with highs of 22,932 adult fish in 1998 and 14,051 fish in 2006; but have declined recently to 6,507 adults in 2007 and 6,450 adults in 2008, with most of these fish occurring in Butte Creek. The abundance of the Deer Creek and Mill Creek populations have decreased in recent years to less than a few hundred fish in each watershed. This increases the potential for depensation, which occurs when populations are reduced to very low densities and per capita growth rates decrease as a result of a variety of mechanisms, including failure to find mates and reproduce.

Threats and Impacts: The CV spring-run Chinook salmon ESU is currently faced with three primary limiting factors and threats: (1) loss of most historic spawning habitat, (2) degradation of the remaining rearing and migration habitat in the Sacramento River and the Sacramento–San Joaquin River Delta, and (3) genetic threats from the FRH spring-run Chinook salmon program. Spring-run Chinook require cool freshwater in summer, most of which is upstream of impassable dams. The ESU is limited to only three natural populations of spring-run (on Mill, Deer, and Butte creeks) that have consistent spawning runs, one small and largely unknown population on the Yuba River, and a Feather River population dependent on FRH production. This ESU

continues to be threatened by habitat loss, degradation, and modification; small hydropower dams and water diversions that reduce or eliminate instream flows during migration; unscreened or inadequately screened water diversions; excessively high water temperatures; and predation by non-native species.

The degraded and declining ecological condition of the Sacramento–San Joaquin River Delta also is one of the most highly ranked threats to this ESU. The Delta has been substantially modified from its historic condition, and large water withdrawals, water quality problems, habitat degradation and loss, and introduced predatory fish species severely affect juvenile salmon growth and survival.

Conservation Actions: Numerous conservation actions were conducted from 2006–2008 for the Central Valley spring-run Chinook salmon ESU.

The AFRP (See Box 6 on page 93) funded a state-of-the-art fish ladder on Antelope Creek, a small spring-run watershed with high restoration potential. The AFRP, in cooperation with NMFS and the CDFG, is working with landowners on Antelope Creek to restore flows and habitat below agricultural diversions to increase the upstream and downstream survival of migrating spring-run.

Box 7. Litigation Settlement

An October 2006 settlement agreement resolved long-standing litigation related to Friant Dam and flows in the San Joaquin River. The agreement calls for the restoration of approximately 150 miles of habitat to re-establish a self-sustaining population of spring-run Chinook salmon. Federal legislation to implement this agreement is under consideration by Congress.

NMFS has worked closely with the Pacific Gas and Electric Company to manage flows in Butte Creek to maximize the abundance of spring-run in this stream. Beginning in 2006, Pacific Gas and Electric voluntarily increased minimum instream flows during the spawning and incubation period by as much as 80 percent to increase the amount of habitat available to spawning fish. In Clear Creek, restoration projects and improved water management have contributed to the steady increase of the Clear Creek population. Clear Creek populations from 2006 to 2008 were at the highest levels ever recorded with 199 and 201 adults returning in 2007 and 2008, respectively, compared to an average of 47 fish between 1992 and 2006. This is promising evidence that this stream may eventually support a viable, independent population.

In 2007, NMFS took a successful cooperative approach to ensuring access to fish habitat past hydropower dams on the Feather River in California. Through the Feather River Habitat Expansion Agreement, NMFS creatively worked with energy companies, conservation groups, other federal agencies, and state resource agencies to develop a consensus approach to providing both migratory fish passage and energy generation. The Agreement will provide ESA listed Central Valley spring-run Chinook salmon and Central Valley steelhead more habitat for spawning, rearing, and other critical life stages. The Agreement was created to collectively resolve blockages to migratory fish passage at the Oroville, Poe, Upper North Fork Feather River, and Rock Creek-Cresta hydropower dams.

In response to a fishery failure triggered in part by a weak ocean upwelling in 2005, harvest protective measures were implemented in 2008 and may continue into 2009. Based on the

recommendations of the Pacific Fishery Management Council, NMFS closed ocean commercial fisheries that incidentally harvest Central Valley spring-run Chinook salmon. In addition, the California Fish and Game Commission closed in-river fisheries in the Central Valley, with the exception of a short season that targets late fall-run Chinook salmon. These closures are expected to have increased the ocean survival and in-river escapement of the ESU. In addition, the CDFG has continued to implement enhanced enforcement efforts in spring-run tributaries and adult holding areas, which have significantly reduced illegal harvest.

Priority Recovery Actions Needed: Several priority recovery actions are needed for the winter-run Chinook salmon ESU, including the following:

- Recovery of the CV spring-run Chinook salmon ESU continues to be limited by the close geographic proximity of the only three remaining wild spring-run Chinook salmon populations with consistent spawning runs, which makes them vulnerable to disease and catastrophic events, loss of spawning habitat, widespread degradation and modification of remaining habitat (especially spawning and rearing habitat), and genetic threats from the FRH. The many small hydropower dams and water diversions on the natal tributaries reduce or eliminate instream flows during spring-run migration periods, leading to predation by non-native species and excessively high water temperatures, and loss of fish attributed to unscreened or inadequately screened water diversions in migratory corridors.
- Continue to support CALFED's Battle Creek Restoration Project, which has already restored stream reaches in the 42 miles of Upper Battle Creek suitable for spring-run Chinook salmon (as mentioned in the spring-run Chinook summary).
- Continue funding and implementing CALFED's Ecosystem Restoration Program and the CVPIA to continue habitat restoration efforts, screening of diversions, flow and temperature monitoring, status and trends research monitoring, modification of structures to improve fish passage, and overall water quality improvements.
- The FRH continues to influence spring-run Chinook salmon populations in the Feather and Yuba rivers, due to straying and hybridization with (unmarked) fall-run fish. This remains a major threat to the genetic integrity of the remaining wild spring-run Chinook populations, and thus addressing this threat remains a priority. Implement the Feather River Oroville Hydroelectric Facility's Fish Habitat Management Plan to reduce the interaction between hatchery and wild fish and between spring-run Chinook salmon and fall-run Chinook salmon in the Feather River.
- Implement the Feather River Habitat Expansion Agreement to increase the abundance and range of spring-run Chinook salmon. Other fish passage actions that expand the range of spring-run Chinook salmon into currently inaccessible historic habitats, and particularly past Englebright Dam on the Yuba River, have been identified as a priority action in the draft Central Valley recovery plan. The upper Yuba River contains several hundred miles of habitat that may be suitable for reintroduction of the species.
- Restore the ecological health of the Sacramento–San Joaquin River Delta and lower Sacramento River through significant changes in water and levee management, and reduce the abundance of non-native predatory fish.
- Evaluate and implement alternatives to conveyance of water south of the Delta that minimize/eliminate fish entrainment at existing facilities while allowing the Delta to function as a restored estuary.

Recovery Priority Number: 7

The recovery priority number for the CV spring-run Chinook ESU was based on a moderate magnitude of threat, due to only three remaining extant natural populations with consistent spawning that are in close geographic proximity; the lack of cool water habitat below impassable dams; and the threat to genetic integrity from the FRH. The recovery potential is low to moderate due to lack of suitable habitat (cold water, high elevation) below impassable barriers, and the low number (three) of extant natural populations. Conflict was determined to exist due to anticipated future development, habitat degradation issues, and increasing demands for CV water supplies.

ATLANTIC SALMON RECOVERY

Atlantic Salmon – Gulf of Maine DPS (Salmo salar)

Date Listed: November 17, 2000, listed jointly by NMFS and FWS (collectively, the Services).[11]

Legal Status: Endangered

Recovery Plan Status: The Final Recovery Plan for the Gulf of Maine (GOM) DPS of Atlantic Salmon was published November 2005 by the Services. The Recovery Plan was prepared jointly by the Services and the Maine Atlantic Salmon Commission.[12] The recovery plan built on and expanded recovery actions identified in Maine's Atlantic Salmon Conservation Plan for Seven Maine Rivers and the recommendations of the 2004 National Research Council report on Atlantic Salmon in Maine. Concurrent with implementing the priority recovery actions, over the past 2 years the Services, the State of Maine, and the Penobscot Indian Nation have been developing a new framework to guide Atlantic salmon recovery based upon the availability of new information since 2006—specifically, the recommendation of the 2006 Status Review Report that the GOM DPS should include the three largest river systems in Maine.

Species Status: The GOM DPS is comprised of all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin northward along the Maine coast to the Dennys, including all associated conservation hatchery populations used to supplement natural populations; currently, such populations are maintained at Green Lake and Craig Brook National Fish Hatcheries. Excluded are those fish raised in commercial hatcheries for aquaculture. The GOM DPS of Atlantic salmon is at very low levels. Adult returns, juvenile abundance estimates, and survival have not significantly increased since the DPS was listed. Data on adult returns and nest counts collected from the Narraguagus, Pleasant, and Dennys rivers have been used to estimate returns to core populations within the GOM DPS. In 2007, 53 adult fish were estimated to return to the GOM DPS (returns to the proposed expanded GOM DPS for 2007 were Androscoggin (19), Kennebec (16), and Penobscot (916)).

Threats and Impacts: As part of the recovery planning process, the Services assembled a team of technical experts from the Maine Bureau of Sea Run Fisheries and Habitat (BSRFH) and the Services to conduct a structured threats analysis. In the threats assessment, the technical experts

[11] Based upon information contained in the 2006 Atlantic Salmon Status Review Report, on September 3, 2008, the Services proposed to include additional larger rivers in the GOM DPS and list this expanded DPS as endangered under the ESA. The final listing rule is expected be completed by summer 2009.

[12] Due to the reorganization of state agencies in Maine, salmon management is now housed in the BSRFH in the Department of Marine Resources.

evaluated the geographic extent and life stages of Atlantic salmon affected by the threats and their severity. As a result, they developed a list of specific threats and identified high-priority actions necessary to reverse the decline of Atlantic salmon populations in the GOM DPS. While the list generated from the threats assessment is valid, it no longer represents the most up-to-date analysis of stressors acting on the GOM DPS. Survival in the marine environment has since been determined to be one of the most significant threats to Atlantic salmon. While the threats assessment touched upon marine survival in relation to climate change, it was not explicitly identified.[13]

Conservation Actions: During 2006–2008, NMFS—in cooperation with the Maine BSRFH, FWS, and other partners—pursued a range of management and research activities intended to mitigate and reduce the most severe threats to Atlantic salmon and to improve our understanding of salmon abundance and health. Recovery actions and activities[14] implemented during 2006–2008 included the following:

- Completed Recovery Team Implementation Action Plan that identified the top-priority recovery actions from the original recovery action list in the Plan and completed the Atlantic Salmon Status Review Report in 2006.
- On September 2 and 5, 2008, respectively, the Services published a proposed rule to expand and list the GOM DPS as endangered and designate critical habitat.
- Worked with the aquaculture industry to implement permit requirements protective of the DPS, including containment measures for aquaculture facilities and fish marking strategies to identify escaped farmed salmon.
- Participated in international management of Atlantic salmon through the North Atlantic Salmon Conservation Organization (NASCO) and hosted the 2007 NASCO Annual Meeting. Participation in NASCO has led to the development of multi-year regulatory measures for high seas Atlantic salmon fisheries, international guidelines for salmon stocking and mitigation of threats from aquaculture practices, and country-specific Action Plans that outline the implementation of all the NASCO guidelines.
- Conducted annual sampling of the Atlantic salmon fishery in West Greenland to support international Atlantic salmon stock assessments and to determine salmon continent of origin. Also collaborated with Canada and France to implement sampling of the salmon fishery off St. Pierre et Miquelon and to conduct continent-of-origin analysis on the sampled fish.
- In response to recommendations from a Sustainable Ecosystems Institute review, the Services and BSRFH are developing a new governance structure for the Maine Atlantic salmon program addressing issues such as: (1) the hatchery program should be more fully integrated with the recovery program; (2) the agencies should develop a conceptual framework for recovery; and (3) this framework should guide all recovery efforts.

[13] The Services' 2008 proposed listing decision includes a revised analysis of primary and secondary stressors, the primary stressors being poor marine survival and dams (i.e., due to passage obstruction and habitat modification as well as inadequate regulatory mechanisms to deal with dams). Secondary stressors identified are poor water quality, disease and predation, overutilization in the past, aquaculture, and water withdrawals. This revised threats analysis was completed on the expanded GOM DPS, which includes three of the largest river systems in Maine that have significant hydro projects. Thus, the results differ from the threats analysis completed on the GOM DPS as it was listed in 2000, which only encompassed the small coastal watersheds.

[14] Actions and activities described in this section are not confined strictly to the GOM DPS as it was listed in 2000. Significant activities being carried out within the proposed expanded GOM DPS also are included.

- In anticipation of the restoration potential of the Penobscot River Restoration Project to purchase the Veazie, Great Works, and Howland dams, Maine BSRFH, in conjunction with Maine Inland Fisheries and Wildlife, has completed a draft strategic management plan for diadromous fish in the Penobscot. In March 2008, the Penobscot Interagency Technical Committee was formed to develop operational management plans for diadromous fish within the basin. In support of the work of the Committee, NMFS has begun developing an ecologically based GIS tool to help set goals and to help identify and prioritize various restoration efforts for the basin.
- Completed analysis of experimental use of non-lethal harassment of comorants to determine effectiveness in increasing smolt outmigration success on the Narraguagus River.
- Continued monitoring and assessment of the status of wild salmon populations.
- Continued the Penobscot Bay Postsmolt Trawl Survey. This survey was designed to identify and quantify factors affecting nearshore survival of Atlantic salmon.

Priority Recovery Actions Needed: The actions needed in the next several years for the Gulf of Maine Atlantic salmon DPS fall into several broad categories:

- Increase our understanding of the factors affecting estuarine, coastal, and marine survival.
- Restore ecosystem function in freshwater and estuarine habitat (i.e., dam removal, predation, competition, restoration, and water quality/quantity).
- Minimize potential for take in freshwater, estuarine, and marine fisheries.
- Maintain conservation hatchery program and conserve the genetic integrity of the DPS.
- Assess stock status of key life stages.
- Promote salmon recovery through increased public and government awareness.
- Assess effectiveness of recovery actions and revise as appropriate.

Recovery Priority Number: 1

This ranking is based on several factors, including a high degree of threat, a high potential for recovery, and the presence of conflict. The degree of threat is considered high due to continued low population numbers and/or threat to Atlantic salmon habitat, and the very low numbers of adult Atlantic salmon returns to the DPS. There is a high potential for recovery, and there is conflict between salmon recovery and construction or other developmental projects or forms of economic activity.

NON-SALMONID FISH RECOVERY

Smalltooth Sawfish *(Pristis pectinata)* – U.S. DPS

Date Listed: April 1, 2003 (68 FR 15674)

Legal Status: Endangered

Recovery Plan Status: The Final Smalltooth Sawfish Recovery Plan published on January 21, 2009.

Smalltooth sawfish entangled in fishing line
Photo: © Florida Museum of Natural History

Species Status: Smalltooth sawfish were once prevalent throughout Florida and were commonly encountered from Texas to North Carolina. Currently, smalltooth sawfish can only be found with any regularity in southwest Florida between Charlotte Harbor and the Everglades National Park. Based on the contraction in range and anecdotal data, it is likely that the population is currently at a level less than 5 percent of its size at the time of European settlement. On November 20, 2008, NMFS proposed designated critical habitat for the species. The proposed designation will facilitate recruitment of juveniles into the population.

There has never been a substantial directed fishery for smalltooth sawfish. However, smalltooth sawfish are endangered because they are caught as bycatch in various commercial fishing gears, including gillnet, otter trawl, trammel net, seine, and longlines. Historically, sawfish caught in nets or trawls frequently had to be cut free, causing extensive damage to nets, and presenting a substantial hazard if brought on board. For these reasons, most smalltooth sawfish caught by fishermen were either killed outright or released only after often-lethal removal of their saws. Smalltooth sawfish are also taken as bycatch in recreational and commercial hook-and-line fisheries. Historically, most of these fish were released alive, but often after lethal removal of the saws, presumably for personal use as trophies or sale as curios. Although there is a market for smalltooth sawfish saws, the species is not directly targeted in the United States, and any captures appear to be incidental.

The life history characteristics of sawfish have clearly contributed to population depletion and are certain to hamper recovery. Sawfish grow slowly, mature late, bear few young, and live long lives. These characteristics make sawfish populations extremely vulnerable to threats, particularly overfishing, and slow to recover once depleted. Even if all threats were removed, recovery is still expected to take 100 years.

Threats and Impacts: The overriding threats to the species include bycatch in commercial and recreational fisheries, and loss and degradation of habitat. Smalltooth sawfish are caught incidentally in various types of fishing gear, including gillnets, otter trawls, trammel nets, seines, and hand lines. The urbanization of the southeastern coastal states continues to modify and remove coastal habitats used by the smalltooth sawfish. Juvenile smalltooth sawfish use red

mangroves, shallow water less than 3 feet deep, and euryhaline systems to forage and to avoid predation.

Conservation Actions: Conservation actions supported in 2006–2008 include the following:

- Juvenile satellite and tracking studies in south Florida and juvenile habitat usage studies in southwest Florida.
- Studies to identify genetic markers for the species to enforce the Convention on International Trade in Endangered Species.
- Monitoring of smalltooth sawfish in the Indian River Lagoon.
- Studies to analyze the population structure, genetic diversity, and natal-site fidelity for the species.
- Support for the National Smalltooth Sawfish Encounter Database.
- Satellite tagging study of adult smalltooth sawfish in the shark bottom long-line fishery.
- Education and outreach efforts from Texas to North Carolina.
- A study to characterize mangrove habitats used by juveniles.

Priority Recovery Actions Needed: Priority actions needed for recovery of the species include the following:

- Increase outreach effort to support the distribution and implementation of the Safe Handling and Release Guidelines for smalltooth sawfish for recreational and commercial fisheries to minimize interactions, injury, and mortality.
- Conduct surveys throughout the current range of the species to determine the locations of current sawfish habitats.
- Determine which habitats, apart from shoreline mangroves, are currently used as nursery areas.
- Monitor water flow into, and salinity of, nursery habitats in all recovery regions.
- Conduct surveys throughout the current range of the species to determine the distribution of adult smalltooth sawfish and identify habitats of aggregation or local abundance.
- Conduct surveys to determine the relative abundance of smalltooth sawfish off the east and west coasts of Florida.
- Implement strategies to reduce bycatch, mortality, and injury in specific fisheries to ensure the species' viability.

Recovery Priority Number: **7**
Smalltooth sawfish has a recovery priority number of 7, based on a moderate magnitude of threat, a low-moderate recovery potential, and the potential for economic conflicts.

Gulf Sturgeon *(Acipenser oxyrinchus desotoi)*

Date Listed: September 30, 1991, listed jointly by NMFS and FWS (56 FR 49653)

Legal Status: Threatened

Recovery Plan Status: The Final Recovery Plan for the Gulf sturgeon was published in September 1995. No revisions have been made to the plan.

Species Status: The Gulf sturgeon is an anadromous fish occurring from the Lake Pontchartrain/Pearl River system in Louisiana east to the Suwannee River in Florida and in the Gulf of Mexico. Adults spawn in large coastal rivers in the summer; they migrate downstream in the fall and winter cued by water temperature into adjacent bays, nearshore coastal waters, and the Gulf of Mexico to forage and grow. Juveniles and sub-adults inhabit the rivers year-round. No estimate of the historical population size of Gulf sturgeon is available.

New population estimates since 2006 are available for the Suwannee and Choctawhatchee rivers: the Suwannee population has increased in size (about 9,700 fish) and average weight, and the Choctawhatchee has about 2,800 fish, mostly juveniles and sub-adults. A survey focusing on juveniles initiated on the Pascagoula River (the first since Hurricane Katrina) revealed they inhabit the estuary until a cold event occurs, when they make extensive excursions into deeper nearshore waters (apparently the high salinity is not limiting). While the overall status of the Gulf sturgeon is considered stable, trends for individual riverine populations are unknown or unclear and likely vary across the range; most population estimates are dated and some are undetermined.

A joint NMFS/FWS 5-year review of the status of the Gulf sturgeon is currently underway and is expected to be finalized in September 2009. In coordination with the 5-year review, NMFS is synthesizing data to accommodate a range-wide Gulf sturgeon stock assessment to provide critical information for developing both the 5-year review and for revising the Gulf sturgeon recovery criteria.

Threats and Impacts: Population-limiting factors for the Gulf sturgeon include habitat loss and degradation that is being exacerbated by water allocation, drought conditions, and development; poor water quality (including temperature, dissolved oxygen, and contaminants); and barriers (i.e., dams and sills) that impede access to historical spawning areas.

Conservation Actions: During 2006–2008, key conservation actions included:

- Relocation trawling is being used in dredging operations to move Gulf sturgeon out of the dredges' path. Nets are dragged over the benthos in front of the dredge to capture sturgeon and sea turtles, and the animals are then moved out of the pathway.

- Seasonal in-water work periods also assist in reducing incidental take. When possible, in-water work occurs when the species is absent from the project area to avoid take.
- Placards have been posted and distributed along the Suwannee River where Gulf sturgeon frequently jump out of the water and sometimes strike boaters: Gulf sturgeon factsheets, large signs, and stickers provide life history information and warn boaters to proceed at slow speeds.
- NMFS continues to fund a number of research projects to increase existing knowledge of how the Gulf sturgeon uses habitat. Data sets including prey distribution, sediment composition, water quality, and other environmental parameters are being compiled and developed into GIS data layers (and verified with field sampling) to be used as a predictive tool to identify areas of greater and lesser value in terms of Gulf sturgeon foraging habitat.
- Molecular techniques are being used to assess the relatedness of individual Gulf sturgeon in egg collections. This information will determine genetic relatedness and assess the number of families represented in the clutch.

Priority Recovery Actions Needed:

- Update the 1995 Recovery Plan and Recovery Criteria.
- Establish section 6 agreement with Gulf Coast states to allow competition for section 6 research funds.
- Re-survey rivers within range, especially those heavily impacted by Hurricane Katrina.
- Investigate population demographics to better understand vulnerable life stages.
- Continue cooperation with FWS for joint management and coordinated research.
- Nurture partnerships with states and researchers.

Recovery Priority Number: 8

This ranking corresponds to a moderate degree of threat, low to moderate potential for recovery, and the absence of conflict with economic activities. In accordance with the FWS Recovery Priority Guidelines, the FWS has assigned the Gulf sturgeon a priority number of 12. The difference in numerical value between NMFS and the FWS reflects the consideration of taxonomic classifications, which are used by FWS but not by NMFS in designating recovery priority numbers.

Shortnose Sturgeon (Acipenser brevirostrum)

Stephen J. Fernandes, pursuant to ESA permit # 1595-02

Date Listed: March 11, 1967[15]
(32 FR 4001)

Legal Status: Endangered

Recovery Plan Status: The final recovery plan for shortnose sturgeon was published in December 1998.

Species Status: The shortnose sturgeon is an anadromous fish inhabiting large coastal rivers along the eastern seaboard of North America from the Saint John River in New Brunswick, Canada, south to the St. Johns River in Florida. Its life history includes fidelity to the natal river resulting in a substantial amount of reproductive isolation and genetic distinctiveness between most populations. Because of the substantial reproductive isolation of shortnose sturgeon between rivers and river systems, NMFS recognized 19 separate populations in the final recovery plan. To date, NMFS has not formally listed DPSs of shortnose sturgeon under the ESA and shortnose sturgeon are listed range-wide as endangered.

NMFS initiated a status review of shortnose sturgeon in 2007, and the review is still underway. As part of the review, the status review team has examined population structure to evaluate whether DPSs should be designated. While historical population estimates for shortnose sturgeon are not available, fishery accounts indicate sturgeon were previously abundant in many river systems along the U.S. East Coast. The current status of the species is mixed as trends in abundance and population demographics vary for the different river systems across their range (Table 6); population estimates for numerous shortnose sturgeon populations remain undetermined or are dated. As resources permit, NMFS continues to support surveys of river systems where shortnose are present or are suspected.

Table 6. Abundance estimates for 10 shortnose sturgeon populations presented from north to south. The estimates are for known spawning populations with the exception of the Penobscot River where spawning status is currently under investigation. "Juv."=Juvenile life stage.

River or River System	Years Surveyed	Population Estimate	95% Confidence Interval	Age Class Represented
Penobscot	2006–2007	1,531	885–5,681	Juv. & Adult
Kennebec System	1998–2000	9,488	6,942–13,358	Adult
Merrimack	1988–1990	32	20–79	Adult
Connecticut Upper	1994	~300	188–1,264	Adult
Connecticut Lower	1989–2002	1,042–1,580		Adult
Hudson	1994–1997	56,708	50,862–64,072	Spawners
Delaware	1999–2003	12,047	10,757–13,589	Adult
Cooper	1996–1998	301		Spawners
Savannah	1999	~1,000		Juv. & Adult
Ogeechee	1999–2004	147–266		Juv. & Adult
Altamaha	2003–2005	6,320	4,389–9,249	Juv. & Adult

[15] Shortnose sturgeon was first listed March 11, 1967, under the Endangered Species Preservation Act; the species remained on the endangered species list when the ESA was enacted in 1973.

Threats and Impacts: Threats to shortnose sturgeon also vary by river system (see Table 7). Many threats to the species are range-wide, while others are specific to populations in the southeast. As threats have been reduced in some rivers, shortnose sturgeon populations have apparently grown or stabilized. In other rivers, particularly in the southeast, sturgeon population size remains low or the status is unknown.

Across the range, dam construction and pollution associated with industrial growth in the late 1800s and early 1900s has resulted in substantial loss of suitable habitat. In addition, habitat alterations from discharges, dredging or disposal of material into rivers, or related development activities involving estuaries/riverine mudflats and marshes, remain constant threats. In addition, bycatch, predominantly in shad gillnet fisheries, likely adversely impacts the recovery of some shortnose sturgeon populations, although the extent of this bycatch is not currently known.

Table 7: A summary of some of the major threats to shortnose sturgeon by various river systems throughout the range. It is important to note that the summary of threats is not exhaustive and that these are not the only river systems in which shortnose sturgeon occur or have ever occurred.

Population Unit	Dams	Dredging	Water Quality/Quantity	Commercial Bycatch
Penobscot	X		X	
Kennebec Complex		X	X	
Merrimack	X		X	
Connecticut,	X	X	X	
Housatonic	X		X	
Hudson		X	X	
Delaware		X	X	
"Chesapeake" & C&D		X	X	X
Susquehanna	X		X	
Potomac		X	X	X
Roanoke	X		X	X
Chowan			X	X
Tar/Pamlico			X	X
Neuse	X		X	X
New				X
Cape Fear	X	X	X	X
Winyah Bay Complex	X	X	X	X
Lower Santee	X		X	X
Cooper	X		X	
Santee Cooper Reservoir System	X		X	
ACE Basin				
Savannah	X	X	X	X
Ogeechee			X	X
Altamaha				X
Satilla			X	
St. Mary's			X	
St. John's	X		X	

Large-scale factors impacting riverine water quality and quantity that likely exacerbate habitat threats to shortnose sturgeon include drought, intra- and interstate water allocation, and climate change. The southeastern United States has been experiencing several years of ongoing drought and it is predicted these conditions will persist, exacerbating the existing impacts from dams. Water allocation issues are increasing with human population growth. Abnormally low stream

flow can restrict access to habitat areas, reduce thermal refugia, and exacerbate water quality issues such as high temperature, low dissolved oxygen, and elevated nutrient and contaminant levels. Further reduction in flow would likely disrupt spawning cues and upstream migration may occur earlier; a disparity between prey availability and demand by larvae could ensue. Data from gauging stations indicate that periods when river flows are inadequate to protect the riverine environment are becoming more frequent. Human-induced modifications to free-flowing rivers also influence coastal and marine systems; often reducing the ability of the system to adapt to natural variability and change.

Conservation Actions: During 2006–2008, key conservation actions included:

- A status review for the species that assesses each riverine population was initiated in 2007 and will evaluate current conservation status.
- Use of relocation trawling to minimize incidental take of shortnose sturgeon in dredge operations. This method was first used to relocate Gulf sturgeon wherein shrimp trawlers sweep benthos in the path of the oncoming dredge.
- An ESA collection permit was issued that allows researchers along the eastern seaboard to obtain tissue samples for research and diagnostic analyses from shortnose sturgeon found dead in the wild or from captive facilities. The same permit allows parts and whole specimens to be held by educators, allowing sturgeon mounts and preserved specimens to assist in outreach and education.
- Since 2006, NMFS has sponsored surveys and/or research on the following rivers: Penobscot, Merrimack, Delaware, Potomac, Pee Dee, Savannah, Altamaha, Ogeechee, Satilla, and St. Marys. Additional surveys are being conducted on the following rivers to assist in the relicensing of hydropower plants and/or bridge construction: Hudson, Connecticut, Saluda, Congaree, Broad, Wateree, and Santee.
- NMFS has also supported research in many areas, including population structure (genetic analysis), movement, diet, health assessments, life history, habitat use, behavior, age and growth, spawning success, sampling techniques and effects of altered environmental parameters (dissolved oxygen and temperature), and contaminants.

Priority Recovery Actions Needed: Several priority recovery actions are needed, including the following:

- A revised recovery plan addressing threats on a riverine-scale needs to be developed to identify conservation actions.
- Comprehensive information on distribution, population dynamics, juvenile movement and behavior, and factors leading to reproductive success is needed.
- Range-wide genetic assessments to determine whether clinal differences are adaptive or a result of isolation or mutation.
- New and more reliable estimates are needed of population size, age structure, and recruitment to help determine appropriate recovery actions and inform future status reviews.
- Research and testing to determine effective sturgeon-passage facilities around locks and dams for both upstream and downstream movement are essential for recovery in rivers where access to spawning or foraging habitats is restricted.

Recovery Priority Number: 5

The recovery priority number for shortnose sturgeon is 5, based on a moderate magnitude of threat, high recovery potential, and anticipated conflict with development projects or other economic activity. The magnitude of threat for shortnose sturgeon is moderate, particularly given the extremely low numbers of shortnose sturgeon in the southern portion of the species' range and considering the more abundant populations in other rivers. The recovery potential for this species is high, as many of the needed management actions are identified in the recovery plan. This species is in conflict with construction or other development projects (e.g., bridge construction/demolition, dredging, blasting, and power plant operations) in most, if not all, of the species' range.

Green Sturgeon *(Acipenser medirostris)* – Southern DPS

A green sturgeon captured in the Gulf of Alaska in 2006. Picture taken by Duane Stevenson, NMFS.

Date Listed: April 7, 2006 (71 FR 17757)

Legal Status: Threatened

Recovery Plan Status: No recovery plan has been developed for the Southern DPS of the North American green sturgeon, but a contract has been awarded for developing a recovery plan. A proposed critical habitat designation was published in September 2008 (73 FR 52084) and is expected to be finalized in June 2009.

Species Status: The Southern DPS of green sturgeon includes all green sturgeon populations south of the Eel River, with the only known spawning population being in the Sacramento River (although spawning may have occurred historically in the Feather River basin). Spawning habitat may have extended into the three major branches of the Sacramento River—the Little Sacramento River, the Pit River system, and the McCloud River. Currently, Keswick and Shasta dams on the mainstem of the Sacramento River block passage to the upper river, while the Red Bluff Diversion Dam blocks passage to a portion of the spawning population on a seasonal basis after May 15.

Acoustic tagging studies investigating oceanic migration and behavior patterns of Northern DPS (originating from freshwater systems north of and including the Eel River in California) and Southern DPS (originating from freshwater systems south of the Eel River) suggest that some individuals engage in sustained migrations (up to 58 km per day) over long distances (California to southeast Alaska) and that spawning periodicity for some individuals may be more frequent (every 2 years) than previously thought (every 3 to 4 years).

No direct evidence demonstrates a clear decline in abundance of Southern DPS green sturgeon, but two pieces of indirect evidence suggest a downward trend in abundance. The first is the most recent abundance estimates for legal-size white sturgeon (117–183 cm FL) in San Pablo Bay, generated by the CDFG, indicating about an order of magnitude decline from estimates made in 1998 compared to those made in 2005. Green sturgeon abundance estimates likely mirror the declines seen for white sturgeon based on a ratio of legal-size green sturgeon to legal-size white sturgeon established by CDFG as part of the San Pablo Bay sampling program. Secondly, juvenile entrainment data provide an indication of how abundance has changed over time (1968–present) with actual numbers of individuals observed per annum prior to 1986 being on the order of 3.5 times higher than those observed after 1986.

Threats and Impacts: There is evidence that threats affecting the long-term survival of the Southern DPS are likely to be increasing in severity. The primary threat to the Southern DPS is the reduction of spawning to limited areas within the Sacramento River due to dams and other

migration barriers. Insufficient water flow and high temperatures are ongoing problems, although temperature problems in the Sacramento River have been reduced since the installation of the Shasta Dam temperature control device in 1997. Water diversions pose an unknown but potentially serious threat to Southern DPS fish within the Sacramento and Feather rivers and the Delta. Poaching also poses an unknown but potentially serious threat to Southern DPS fish because of high demand for caviar and the decline of other sturgeon species around the world. The effects of contaminants and predation on green sturgeon by non-native species are also unknown, but likely less serious than habitat loss and poaching. Lastly, incidental take of Southern DPS fish in fisheries harvest continues to occur, but has been partly addressed in U.S. waters by recent fishing regulations.

Conservation Actions: During 2006–2008, key conservation actions included:

- Fishing regulations: For recreational fisheries, the California Fish and Game Commission approved revised regulations, effective March 1, 2007, to prohibit the retention of green sturgeon, alter the slot (size) limit and bag limit (one fish daily; three fish annually) for white sturgeon, and require implementation of a sturgeon report card system. The Washington Department of Fish and Wildlife and the Oregon Department of Fish and Wildlife also prohibited the retention of green sturgeon in the Columbia River recreational fishery from Bonneville Dam downstream to the mouth of the River, effective January 1, 2007. For commercial fisheries, the retention of green sturgeon has been prohibited in the Columbia River by emergency rule since July 2006 and statewide in Washington by permanent rule since January 26, 2007. In California, commercial fishing for sturgeon has been prohibited since 1917.
- Ongoing salvage of green sturgeon at the Tracy Fish Collection Facility and the Skinner Delta Fish Protective Facility in the South Delta.
- Ongoing green sturgeon-focused research, including fish passage, genetics studies, and acoustic tagging and tracking studies to better understand the distribution and migration of green sturgeon.
- Activities and projects conducted under the CVPIA and the California Bay-Delta Program for the conservation of the Southern DPS and other anadromous fish species and their habitats. These activities and projects include: floodplain and river restoration, riparian habitat protection, fish screening and passage projects, environmental water acquisitions, and contaminant studies.

Priority Recovery Actions Needed:

- Direct assessment and monitoring of the Southern DPS green sturgeon population in the Sacramento and Feather rivers; the Delta; the San Francisco, Suisun, and San Pablo Bays; and coastal areas within the 110-meter bathymetric contour along the western coast of the continental United States and Alaska through out-migrant trapping and tagging programs.
- Continuation of genetic analyses to better understand population structure of both Northern and Southern DPS green sturgeon.
- Continuation of acoustic tagging studies to help elucidate migratory and behavior patterns in coastal areas within the 110-meter bathymetric contour along the western coast of the continental United States, Canada, and Alaska.

- Continuation of development of habitat models that attempt to predict how much spawning habitat may have been lost in California's Central Valley as a result of the construction of impassable dams in the Sacramento and Feather rivers.
- Evaluation of fisheries impacts in Canadian fisheries, especially trawl fisheries on the west coast of Vancouver Island and in Hecate Strait.

Recovery Priority Number: 5

The recovery priority number for the Southern DPS is 5. The risk of extinction is believed to be moderate because, while threats due to habitat alterations are thought to be high and indirect evidence suggests a decline in abundance, there is much uncertainty regarding the scope of threats and the validity of population abundance indices. The recovery potential for this species is likely high if recreational and commercial fisheries remain closed and if activities that decrease habitat quality and quantity, particularly in spawning and rearing habitat, are carefully monitored and limited. There is conflict between the recovery of the Southern DPS and economic interests. Central Valley agriculture, other sources of water resource use, and commercial and recreational fishing are among the industries that will be affected by efforts to recover the Southern DPS.

PLANT RECOVERY

Johnson's Seagrass *(Halophila johnsonii)*

Date Listed: September 14, 1998 (63 FR 49035)

Legal Status: Threatened

Recovery Plan Status: The Johnson's Seagrass Recovery Plan was finalized in September 2002. NMFS is currently revising the plan.

Species Status: Based on the 5-year review (November 2007) for the species, Johnson's seagrass remains vulnerable to natural and anthropogenic factors, and the species still meets the definition of "threatened" under the ESA because it is still likely to become an endangered species within the foreseeable future throughout its range. None of the threats identified at listing have been curtailed or eliminated.

Photo credit: Lori Morris

Threats and Impacts: With the exception of trampling, all of the threats to the species identified in the original listing impact the species' status. These include dredging and filling, shoreline construction and modification, prop scarring, altered water quality, siltation, and storm events. Cumulative impacts are a concern for the species. There has been no improvement in the species' status in terms of its risk of extinction since its listing. Finally, no state or local efforts to protect Johnson's seagrass are ameliorating the impacts and threats to the species, even given Florida's rigorous permitting program regarding projects that impact seagrasses generally. Florida has not listed or otherwise identified Johnson's seagrass for specific protections.

Conservation Actions: During 2006–2008, key conservation actions included:

- Established permanent monitoring plots within the range of the species.
- Supported studies to determine whether local, state, and federal water management practices within the range of the species constitute a potential threat to the species' survival.
- Supported studies to determine the maximum dispersal distance to allow for stable vegetative recruitment and genetic diversity.

Priority Recovery Actions Needed: Priority actions needed to recovery the species include:

- Continue to study the mechanism for recruitment of patches and maximum dispersal distance of vegetative fragments.
- Continue to monitor the northern and southern distribution limits of the species and monitor the temporal variation in these limits.
- Monitor water management practices within the range of the species to determine the potential threats to species survival from freshwater discharges.

Recovery Priority Number: **7**
Johnson's seagrass is assigned a recovery priority number of 7, based on a moderate magnitude of threats, a low-moderate recovery potential, and potential for economic conflict. The recovery potential was considered low-moderate and the economic conflict was considered to exist based on anticipated in-water future construction projects (i.e., dredging, dock construction, and projects that adversely modify water quality).

INVERTEBRATE RECOVERY

White Abalone *(Haliotis sorenseni)*

Date Listed: May 29, 2001
(66 FR 29046)

Legal Status: Endangered

Recovery Plan Status: The final Recovery Plan was completed in October 2008.

Photo credit: John Butler, NMFS, Southwest Fisheries Science Center

Species Status: Commercial and recreational exploitation of white abalone has occurred over the past 50 years in California, and landings data indicate that catches reached a peak between 1972 and 1974 and declined to near zero in just 5 years. Fishery-independent surveys conducted in Southern California since that time confirm a 99 percent reduction in white abalone density has occurred between the 1970s (densities on the order of 2,000 per hectare) and 2008 (<5 per hectare; Figure 7). It is believed that overfishing drove white abalone densities to such low levels that, despite fishery closure in 1996, adults do not occur in high enough densities to successfully reproduce, resulting in repeated recruitment failure and an effective population size near zero. While the most recent estimates of total population size in three Southern California locations are higher than those estimated in a status review conducted in 2000 (1,600 individuals), the reproductive viability of these populations is still believed to be very low given that most individuals are reproductively isolated from one another (>2 m apart from their nearest neighbor; Table 8) and the absence of small individuals (<9 cm) in extant populations. Although commercial fishing for white abalone in Mexico is not occurring, data from surveys conducted in October 2006 suggest that populations in Mexico have also declined dramatically in recent years.

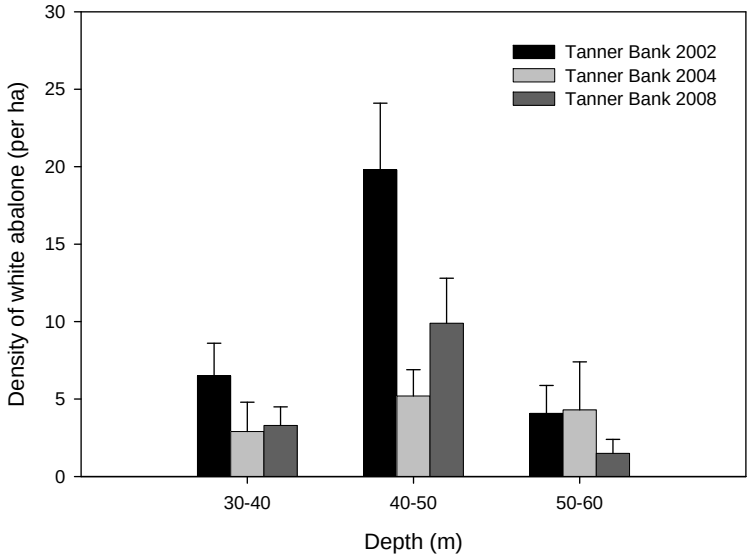


Figure 7. Density of white abalone by depth at Tanner Bank (2002, 2004, and 2008). Error bars represent standard error.

Table 8. Nearest neighbor estimates over time for Tanner Bank. These data represent the number of individuals (and percent of observed individuals) found less than 2 m and greater than 20 m from the next nearest abalone observed. Also shown are the percentage of individuals observed in groups of two or more individuals that are all less than 2 m apart from one another.

Year	Abalone sighted	<2m	>20m	% in groups
2002	195	28 (14%)	65 (33%)	6.0
2004	20	7 (35%)	5 (25%)	-
2008	73	12 (16%)	36 (51%)	2.8

Threats and Impacts:

- Critically low levels of abundance (<0.1 percent of the estimated pre-exploitation population size) resulting in increased distance between individuals and repeated recruitment failure during the 1990s leading to a decreasing population trend.
- Illegal harvesting and inadequate enforcement.
- Reduced genetic diversity resulting in lower reproductive potential and fitness of wild populations.
- Spread of disease from captive propagated individuals to wild individuals during supplementation.
- Habitat modification through human activities and environmental/climate change.

Conservation Actions: During 2006–2008, key conservation actions included:

- Assessment and monitoring of historic and current white abalone populations at the Northern and Southern Channel Islands and offshore banks by NMFS, the National Park Service, the Channel Islands Marine Resources Institute, and CDFG.
- Continued development of a captive propagation program at the Channel Islands Marine Resources Institute, University of California Santa Barbara, and the University of California Davis' Bodega Bay Marine Laboratory.
- Examination of disease (i.e., withering syndrome) prevention and treatment among captively reared abalone by the University of Washington and the Bodega Bay Marine Laboratory.
- Examination and assessment of future outplanting sites and methodologies by NMFS, the Channel Islands Marine Resources Institute, National Park Service, CDFG, and Channel Islands National Marine Sanctuary.
- Initiation of abalone early life history studies at the Southwest Fisheries Science Center to: (1) develop techniques for producing disease-free abalone and (2) identify appropriate outplanting methodologies through field experimentation.

Priority Recovery Actions Needed:

- Assess and monitor subpopulations of white abalone in the wild in cooperation with the State of California, other federal agencies, private organizations, and the Mexican government.
- Identify and characterize existing and potential white abalone habitat through acoustic remote sensing technology.
- Protect white abalone populations and their habitat in the wild.
- Continue and expand a captive propagation program for white abalone in California.
- Develop enforcement, public outreach, and education plans.

Recovery Priority Number: 2

The white abalone priority number of 2 is based on a high magnitude of threat, a high recovery potential, and the potential for economic conflict. The risk of extinction is believed to be high because of observed declines in abundance, the rarity of clusters that might reproduce, and the absence of small individuals in extant populations. The existing animals may be reaching their maximum age and dying without leaving younger animals to take their place. The recovery potential for this species is high if captive breeding in a disease-free facility can be achieved and these animals can be used to supplement and/or create viable wild populations. Another key component to recovering this species is to increase monitoring and enforcement efforts and limit anthropogenic impacts in areas where white abalone currently occur and in areas where they will be re-established. The latter requirement may create conflict between the recovery of white abalone and economic interests. Commercial and recreational fishing for all species of abalone is currently closed in Southern California; however, there is continued pressure to open offshore island areas to fishing non-listed abalone species, which could put listed species at greater risk of illegal take even in seemingly remote areas (e.g., offshore islands and banks primarily >100 feet deep).

Elkhorn and Staghorn corals (*Acropora palmata and A. cervicornis*)

Staghorn Coral
Photo credit: Andy Bruckner, NOAA

Date Listed: May 9, 2006 (71 FR 26852)

Legal Status: Threatened

Recovery Plan Status: A Recovery Outline was completed in August 2006 and a Recovery Team was appointed in September 2006. A draft Recovery Plan is anticipated to be available for public comment in summer/fall 2009.

Species Status: Elkhorn and staghorn corals are branching corals found in shallow (<30 m) tropical waters throughout the wider Caribbean. Studies of historical distribution and abundance patterns for these two species focus on percent coverage, density, and relative size of the corals during three periods: pre-1980, the 1980s and 1990s, and recent (since 2000). Few data are present before the 1980 baseline, likely due in part to researchers' tendencies to neglect careful measurement of abundance of ubiquitous species. Both acroporid species underwent precipitous declines in the early 1980s throughout their ranges, and this decline has continued, albeit at a much slower rate. Although quantitative data on former distribution and abundance are scarce, in the few locations where quantitative data are available (e.g., Florida Keys, Dry Tortugas, Belize, Jamaica, and the U.S. Virgin Islands), declines in abundance (coverage and colony numbers) are estimated at >97 percent.

Threats and Impacts: The major threats to both species are disease, temperature-induced bleaching, ocean acidification, and physical damage from hurricanes. These threats are severe, ongoing, and synergistic, and have displayed an increasing trend in the recent past. Disease is widespread, episodic, and unpredictable in its occurrence and results in high amounts of mortality. Sea-surface temperature and ocean acidity are expected to continue rising over time and may exacerbate disease impacts. The number of hurricanes affecting Caribbean reefs has increased over the past two decades. The threats to elkhorn and staghorn corals are exacerbated further by less severe threats (e.g., nutrients, sedimentation, anchoring, and boating), which degrade coral condition and increase synergistic stress effects (e.g., bleaching).

Conservation Actions: Since listing, protective regulations pursuant to section 4(d) have been put in place and critical habitat has been designated. The following projects were also supported in 2006–2008:

- Assessed the status and conducted monitoring of Acropora in the Eastern Caribbean, Puerto Rico, and the U.S. Virgin Islands.
- Developed a population model that will enable managers to choose recovery strategies for elkhorn and staghorn coral based on quantitative, defensible guidelines.

- Identified acroporid propagule transfer zones (i.e., zones within which sexually and/or asexually produced transplants may be moved safely).
- Performed chemical and biological analyses to characterize Caribbean reef sites in relation to place-specific acroporid reproductive condition.
- Supported the maintenance and expansion of acroporid field nursery in the Florida Keys.
- Responded to several vessel groundings in Florida, Puerto Rico, and U.S. Virgin Islands to reattach injured acroporids and work with responsible parties to conduct other restoration efforts.

Priority Recovery Actions Needed: The focus of the initial phase of recovery will be the protection of the current species distribution and their habitat, and finding additional populations. Public awareness through various outreach efforts may play a role in generating voluntary protection actions. The recovery effort should be based on existing conservation efforts. Specific actions that will be undertaken early in the process may include the following:

- Establish large-scale *in situ* nurseries.
- Identify appropriate regulatory mechanisms for threat abatement.
- Identify the specific areas used by the species requiring habitat conservation and assign priorities to each area.
- Continue research to determine distribution, abundance, habitat requirements, causal factors of disease, and genetic status.
- Continue and expand efforts to provide information to educate the public about the needs of the species.

Recovery Priority Number: 7

Elkhorn and staghorn corals have a recovery priority of 7, due to a moderate magnitude of threat, low-moderate recovery potential, and the potential for economic conflicts.

MARINE MAMMAL RECOVERY

Seals and Sea Lions

Caribbean Monk Seal (*Monachus tropicalis*)

Date Listed: March 11, 1967 (32 FR 4001); delisted 10/28/2008 (73 FR 63901)

Legal Status: Extinct

Recovery Plan Status: No recovery plan exists for the Caribbean Monk Seal.

Species Status: The Caribbean monk seal was delisted from the ESA on October 28, 2008, and is considered extinct. This is the only known case where humans drove a marine mammal to extinction in tropical seas. While the pre-exploitation population is unknown, it is estimated at between 233,000 and 338,000 animals. Overharvesting in the 1800s made positive sightings increasingly less common by the turn of the 20th century. In the early 20th century, the rise in collections of skeletons for private and museum displays expedited monk seal extinction. This species historically ranged throughout the Caribbean region, from South Carolina to the northern coast of South America. Despite extensive surveys over the past 50 years, there has not been an authoritative sighting since 1952.

Threats and Impacts: Overharvesting in the 1800s was a significant factor in reducing species numbers and fragmenting populations. The tame behavior of seal pups probably increased their vulnerability to harvest and collection. Non-harvest disturbances related to human settlement expansion around Caribbean monk seal haulouts and rookeries likely contributed to species decline. Historical observations documented that adults were easily disturbed when in proximity to humans. Prey decline may have influenced declines in some localized cases. Scientific and recreational collection also contributed to species extinction.

Conservation Actions: No conservation actions were conducted during 2006–2008.

Priority Recovery Actions Needed: Because this species is extinct, no priority recovery actions are needed.

Priority Recovery Number: Not Applicable

Guadalupe Fur Seal (Arctocephalus townsendi)

Date Listed: December 16, 1985 (50 FR 51252)

Photo credit: NOAA

Legal Status: Threatened

Recovery Plan Status: No recovery plan has been completed for the Guadalupe fur seal.

Species Status: Commercial sealing during the 19th century reduced the once-abundant Guadalupe fur seal to near extinction in 1894. The size of the population prior to the commercial harvests of the 19th century is not known, but estimates range from 20,000 to 100,000 animals. Prior to the harvest, this species ranged from Monterey Bay, California, to the Revillagigedo Islands, Mexico. The capture of two adult males at Guadalupe Island in 1928 established the species' return; however, they were not seen again until 1954. Guadalupe fur seals pup and breed mainly at Isla Guadalupe, Mexico. In 1997, a second rookery was discovered at Isla Benito del Este, Baja California, and a pup was born at San Miguel Island, California. The population is considered to be a single stock because all individuals are recent descendants from one breeding colony at Isla Guadalupe, Mexico.

Counts of Guadalupe fur seals have been made sporadically since 1954. A few of these counts were made during the breeding season, but the majority were made at other times of the year. Documented seal counts in the literature generally provide only the total of all Guadalupe fur seals counted (i.e., the counts are not separated by age/sex class). The counts made during the breeding season, when the maximum number of animals is present at the rookery, were used to examine population growth. These data indicate that the population of Guadalupe fur seals has been increasing at an average annual growth rate of 13.7 percent. The population was estimated to be about 7,408 animals in 1993.

Threats and Impacts: Drift and set gillnet fisheries may cause incidental mortality of Guadalupe fur seals in Mexico and the United States. In the United States, there have been no reports of incidental mortalities or injuries of Guadalupe fur seals in commercial fisheries. No information is available for human-caused mortalities or injuries in Mexico; however, similar drift gillnet fisheries for swordfish and sharks exist along the entire Pacific coast of Baja California, Mexico, and may take animals from the same population.

NMFS has documented strandings of Guadalupe fur seals in California. Although most of these animals died of natural causes, some mortalities likely can be attributed to interactions with commercial fisheries and marine debris. NMFS documented an increasing number of stranded Guadalupe fur seals on California's Channel Islands and along the central California coast.

Guadalupe fur seals have undergone an extreme genetic bottleneck. This reduction in genetic diversity may influence further population expansion. Increasing levels of anthropogenic noise in the oceans may also be a concern for Guadalupe fur seals.

Conservation Actions: Guadalupe fur seals are listed as a threatened species by the State of California. In addition, they are listed as vulnerable on the World Conservation Union Red List and as an Appendix I species under the Convention on International Trade in Endangered Species. The Guadalupe fur seal is protected by the Government of Mexico, and the Isla de Guadalupe is now a pinniped sanctuary. As most of the range of this species lies in Mexico, NMFS took no conservation actions during the 2006–2008 time frame.

Priority Recovery Actions Needed: As most of the range of this species lies in Mexico, no priority recovery actions are needed at this time for the Guadalupe fur seal.

Recovery Priority Number: 10
The recovery priority number for the Guadalupe fur seal is designated as 10, due to low magnitude of threat, a high recovery potential given that the population is increasing, and the absence of significant conflict with economic projects.

Hawaiian Monk Seal (*Monachus schauinslandi*)

Date Listed: November 23, 1976 (41 FR 51611)

Legal Status: Endangered

Recovery Plan Status: The first Recovery Plan for the Hawaiian Monk Seal was completed by NMFS in 1983. NMFS published a revised Recovery Plan in August 2007.

Photo credit: NOAA

Species Status: Hawaiian monk seals are found throughout the Hawaiian Archipelago. The best current estimate of Hawaiian monk seal total population size is 1,208 seals—1,125 in the Northwestern Hawaiian Islands (NWHI), and 83 in the main Hawaiian Islands (MHI). The first range-wide beach count surveys of Hawaiian monk seals were conducted in the late 1950s. Surveys were repeated throughout the 1960s and 1970s, and results suggest that the species declined by about 50 percent between the late 1950s and the mid-1970s. More recently, beach counts declined rapidly from 1985–1993, and then became relatively stable until the current decline began in 2001. Total abundance at the six main NWHI sites (French Frigate Shoals, Laysan, Lisianski, Pearl and Hermes, Midway, and Kure) is declining at a rate of about 4 percent per year. Since 2000, many sites have shown indications of decline in abundance, apparently due to low juvenile survival. The decline at French Frigate Shoals is of particular consequence to the welfare of the overall population because this site once accounted for over 50 percent of the total non-pup beach counts in the NWHI. While that proportion has now dropped to approximately 25 percent of its observed peak, there are still more seals at French Frigate Shoals than any other island or atoll.

Although monk seals historically occurred throughout the Hawaiian Archipelago, the great majority of the population is now constrained to the NWHI. Human settlement appears to have largely excluded monk seals from the MHI, although seal bones have been found at archeological sites dating from 1400–1700. From 1928 to 1956, seven monk seal sightings were documented in the MHI, and Niihau residents reported that seals appeared there in the 1970s. Since 1990, an increasing number of sightings and births have occurred in the MHI. Combined aerial and ground surveys in the MHI counted 45 hauled-out monk seals in 2000, and 52 in 2001. Sightings in the MHI tallied 77 individually identifiable monk seals in 2005, and 83 in 2006. Documented annual births of monk seal pups in the MHI have increased since the mid-1990s. Together, these observations suggest that monk seals are recolonizing the MHI.

Threats and Impacts: There are eight primary threats to the recovery of the Hawaiian monk seal: (1) food limitation, (2) entanglement, (3) shark predation, (4) infectious diseases, (5) habitat loss, (6) fishery interactions, (7) male aggression, and (8) human interactions.

- Food limitation is affecting monk seal population growth in the NWHI. At French Frigate Shoals, the juvenile survival has declined most dramatically with significantly smaller pup and juvenile sizes, consistent with signs of food limitation. In recent years,

low juvenile survival, in part due to food limitation, has been evident at all NWHI subpopulations. This situation contrasts with the MHI, where pups tend to wean much larger than in the NWHI, and where thin animals are rarely observed. Because most of the monk seal population occurs in the NWHI, food limitation is a major threat to the recovery of the monk seal.

- Hawaiian monk seals have one of the highest documented entanglement rates of any pinniped species, and marine debris and derelict fishing gear are chronic forms of pollution affecting monk seal habitat in the NWHI. The number of monk seals found entangled has not changed, nor has there been a reduction in the accumulation rates of marine debris in the NWHI.
- In recent years, shark predation on monk seal pups has increased at French Frigate Shoals, where shark-related injury and mortality of pre-weaned pups have been conspicuously higher than at other sites. Based on field observations, shark predation may also be compromising recovery at Midway and Kure.
- Recent MHI monk seal deaths have heightened concern about monk seal exposure to diseases not previously encountered, such as leptospirosis, toxoplasmosis, and West Nile virus. The lack of antibodies in monk seals to these diseases makes them extremely vulnerable to potential infection. While the frequency of disease outbreaks may be rare, their potentially devastating effects, should they spread throughout the population, makes infectious diseases a serious threat.
- The loss of terrestrial habitat is a significant issue of concern in the NWHI, which are mostly low-lying atolls subject to beach loss from storm erosion and sea level rise. While some habitat loss (e.g., the subsidence of Whaleskate Island at French Frigate Shoals) has already been observed, sea level rise over the longer term may threaten a large portion of the resting and pupping habitat in the NWHI.
- Due to management actions, direct and indirect fishery interactions between commercial fisheries and Hawaiian monk seals in the NWHI are currently limited or nonexistent. However, monk seals in the MHI are subject to hooking and entanglement in fishing gear; several seals have required removal of embedded hooks from recreational fishing gear, and recent mortalities in gillnets have occurred.
- The primary identified cause of adult and immature female mortality affecting the recovery potential in the monk seal population during the 1980s and early 1990s was injury and often death caused by multiple male aggression (especially at Laysan and Lisianski islands). Most recently, this emerged as a serious issue at French Frigate Shoals in the late 1990s. While this threat tends to be episodic (it is usually limited in geographic area at any given time) and the methods for mitigating it have been successful, this is still considered a serious threat.
- Monk seals in the NWHI avoid pupping on beaches that are frequented by humans. However, in the MHI, some seals appear to be getting accustomed to humans, and pupping has increased in recent years, even on beaches with daily human activity. If the MHI population grows, both in absolute number and proportion of total abundance, disturbance of seals by humans and their pets will become a larger management challenge.

Conservation Actions: During 2006–2008, key conservation actions included:

- Short-term response actions for haul-outs, pupping events, de-hookings, entanglements, mortalities, etc.
- Long-term response actions for conditioned seals, abandoned pups, relocations, etc.
- Interagency collaborations: Memorandum of Agreement with the University of Hawaii at Hilo and the U.S. Coast Guard, State of Hawaii (e.g., Incidental Take Permit Coordinator), Hawaiian Islands Humpback Whale National Marine Sanctuary, National Parks Service, etc.
- Hawaiian Monk Seal Volunteer Program: Annual meetings, volunteer manual, detailed trainings, monitoring events, newly organized non-profit status.
- Semi-annual Main Hawaiian Islands Monk Seal Count: Ongoing, statewide outreach event with four completed thus far.
- Supported State of Hawaii legislation: Designation as official State Mammal of Hawaii.
- Other Outreach and Education activities: Oahu Lifeguard Marine Mammal Response Training, Hawaii State Public School Curriculum, Public Service Announcements, Preserve America Grant program to fund 5- to 6-minute video describing monk seals in Native Hawaiian culture, fairs and festivals building volunteer capacity to perform outreach, fact sheets.

Priority Recovery Actions Needed: Top-priority Recovery Actions needed:

1. Investigate and mitigate factors affecting food limitation.
2. Prevent entanglements of monk seals.
3. Reduce shark predation on monk seals.
4. Continue population monitoring and research.

Recovery Priority Number: 1

The Hawaiian monk seal has a recovery priority number of 1 due to a high magnitude of threats, high recovery potential, and the potential for economic conflicts while implementing recovery actions. The magnitude of threat is considered to be high based on the population decline that has persisted for over 20 years. Although our understanding of the most serious threat of food limitation is improving, the recovery potential is also high because the mitigation of other critical threats are known and in place or are in the process of being implemented. One such example is that the species' current core habitat in the NWHI is well-protected, and if foraging conditions improve, then recovery can be expected. In addition, the recovery potential can be considered high because the MHI represent a large amount of under-occupied habitat, which could support a larger population of seals if appropriate management actions were in place. Finally, potential economic conflict exists in the MHI with fishery interactions, shoreline developments, increased tourism, aquaculture projects, and boat strikes.

Steller Sea Lion – Western and Eastern DPS (Eumetopias jubatus)

Photo credit: Rolf Ream, National Marine Mammal Laboratory, 1993

Date Listed: Steller sea lions were originally listed as threatened as a single species on April 5, 1990 (55 FR 12645). In 1997, based on genetic and demographic dissimilarities, NMFS recognized two distinct population segments of Steller sea lions: a western and an eastern distinct population segment at Cape Suckling, Alaska [144°W longitude] (Figure 8) (62 FR 24345, 62 FR 30772).

Legal Status:
Endangered (Western DPS)
Threatened (Eastern DPS)

Recovery Plan Status: The first Recovery Plan for Steller Sea Lions was completed in December 1992. A revised draft plan was released for public review and comment in May 2006 and released on May 21, 2007 (72 FR 28473). The Final Recovery Plan was released on March 8, 2008.

Species Status: There appear to be two very distinct phases in the decline of the western DPS. The population declined about 70 percent between the late 1970s and 1990, but the initial decline likely began as early as the late 1950s in some areas. The rate of decline in the 1980s was very rapid, reaching about 15 percent per year during 1985–1989. During this period, mortality incidental to commercial fishing was thought to contribute to as much as 25 percent of the observed decline. In addition, during that period it was legal for fishermen to protect their gear and catch by shooting Steller sea lions. Adequate records on the magnitude of such takes are not available. Some evidence indicates that animals in this population were nutritionally stressed during this time period, while other sources of mortality (e.g., predation by killer whales and mortality associated with disease) cannot be quantified due to a lack of information. There were distinct differences in the rates and pattern of decline in the six subareas used to monitor this population: the eastern Gulf of Alaska, central Gulf, western Gulf, eastern Aleutians, central Aleutians, and western Aleutians. Therefore, it is possible that several factors were important in driving the population decline during this period.

In the 1990s, the rate of decline in the western DPS decreased from 15 percent to 5 percent per year. This decrease in the rate of decline followed further environmental changes in the 1990s and the implementation of extensive fishery regulations intended to reduce direct impacts, such as shooting, and indirect impacts, such as competition for prey. During this decade, Steller sea lions did not appear to be nutritionally stressed. The primary factors associated with the decline during this period have not been identified. As was the case in the 1980s, the pattern and rate of declines in abundance varied significantly by subregion.

Based on aerial surveys conducted in June and early July of 2008, the recent (2004–2008) overall trend in abundance of adult and juvenile (non-pup) Steller sea lions in the western DPS in Alaska

is either stable or slightly declining. This follows a brief (2000–2004) period of overall increase of approximately 3 percent/year. This brief period of overall increase, during which decline was still observed in large subregions, was the only period of increase observed since collection of trend information began in the 1970s. Current data indicate there is substantial variation in the recent (2004–2008) trend in abundance of non-pups among subregions throughout the range of this population. Abundance is still at relatively high rates in some parts of the range. Percentages listed below are the percent change between years:

- The eastern Aleutians is the only consistently increasing area (+7%).
- The western and central Aleutians declined at relatively high rates (–30% and –16%, respectively).
- The count in the eastern Gulf of Alaska increased (+35%) but probably because of the timing of the survey and seasonal use of the area by sea lions from the eastern population.
- The central and western Gulf of Alaska increased between 2004 and 2007 but declined slightly between 2007 and 2008.

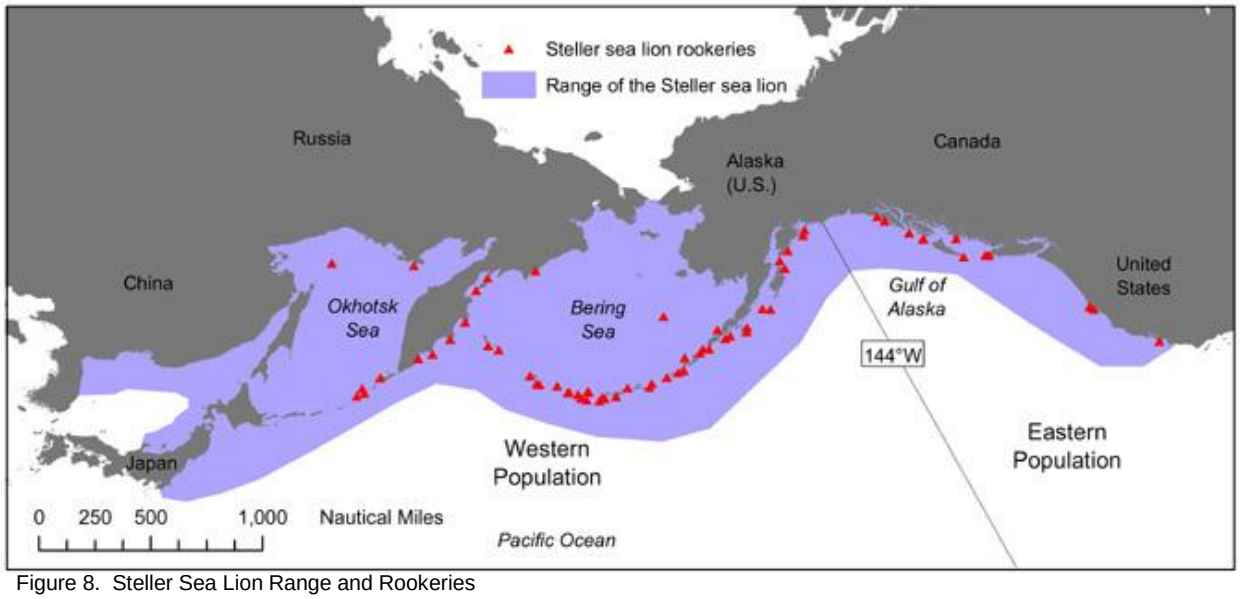


Figure 8. Steller Sea Lion Range and Rookeries

Available information also indicates that the current relative stability of the population may depend on high adult survival and that declining birth rate may be a problem for this population in a significant part of its range.

The eastern DPS was estimated to number between 46,000 and 58,000 animals in 2002, and has been increasing at approximately 3 percent per year since the late 1970s. Populations in Southeast Alaska, British Columbia, and Oregon have more than doubled in size since the late 1970s. While no rookeries exist in Washington, the numbers of animals using haulouts in the state has been increasing. In California the population is thought to be stable or declining, with poor performance in the southern part of the state. Historically subjected to substantial mortality by humans, much of this DPS has recovered.

Threats and Impacts: For the western DPS, the first slowing of the decline began in the 1990s, suggesting that the management measures implemented in the early 1990s may have been effective in reducing some anthropogenic effects (e.g., shooting, harassment, and incidental take). The apparent relative population stability or slight decline observed in recent years is correlated with comprehensive fishery management measures implemented since the late 1990s. However, because of the lack of recovery of this population, and continued decline in some large portions of its range, there is concern that potentially high threats to the recovery of this population remain. Most of the 61 recovery actions in the original 1992 recovery plan were accomplished to a substantial degree with one exception—the development of international conservation agreements. Much of the conservation effort under the 1992 recovery plan was focused on eliminating the most direct and certain causes of decline (e.g., shooting, incidental take). These efforts resulted in the following:

- Substantial reduction in disturbance of important rookeries and haulouts.
- Substantial reduction in the incidental catch of Steller sea lions in commercial fishing operations, particularly the groundfish trawl fishery.
- Significant efforts to reduce intentional take by prohibiting shooting at or near Steller sea lions.
- Intensive research to better describe the threats to Steller sea lions and to provide management with options for recovery actions.
- Potential reduction in the competitive interactions between Steller sea lions and commercial fisheries for pollock, Atka mackerel, and Pacific cod in Alaska.
- Acquisition of additional information on the status, foraging ecology, and survivorship of Steller sea lions.

The extensive research program has increased the understanding of the relative impacts of threats that potentially impede the recovery of Steller sea lions. For the western DPS, NMFS has concluded that the following threats are now relatively minor: (1) Alaska Native subsistence harvest, (2) illegal shooting, (3) entanglement in marine debris, (4) disease, and (5) disturbance from vessel traffic and scientific research.

Considerable uncertainty remains about the magnitude and likelihood of the following potential threats to the recovery of the western DPS (relative impacts in parentheses): competition with fisheries (potentially high), environmental variability (potentially high), incidental take by fisheries (low), toxic substances (medium), predation by killer whales (potentially high).

Uncertainty, controversy, and disagreement within the scientific and stakeholder communities regarding the potential threat posed by killer whale predation is especially great, with conclusions about the magnitude of that threat being fairly polarized (low versus high). However, due to the uncertainty and the need to be precautionary in our assessment of possible threats to the recovery of this endangered DPS, NMFS has categorized the relative potential impact of this threat as “potentially high.”

The Mineral Management Service’s 5-year (2007–2012) plan includes potential oil and gas activity in portions of the southeastern Bering Sea, in areas adjacent to, and within, Steller sea lion critical habitat.

For the eastern DPS, many of the threats are similar (e.g. environmental variability, killer whale predation, toxic substances, disturbance, entanglement, shooting) to the western DPS. These threats do not appear to be at a level sufficient to keep populations from continuing to recover in many areas. For populations in the southern part of their range, climate change, increasing competition with other seal species, and other activities associated with high human population density may have more acute adverse impacts.

Conservation Actions: During 2006–2008, key conservation actions included:

- Revision and finalization of the Steller Sea Lion Recovery Plan following input and substantial involvement of a diverse recovery team, opportunities for public review and comment, and independent peer review.
- Acquisition of high-quality aerial survey data throughout the range of the Steller sea lion in Alaska to enable evaluation of recent trends of non-pups in this endangered population.
- Continued coordination of Steller sea lion research.
- Issuance of a draft policy and guidance document for the issuance of research permits for Steller sea lions and northern fur seals following finalization of a report from an independent expert panel.
- Completion of a Final Programmatic Environmental Impact Statement for Steller Sea Lion and Northern Fur Seal Research, resulting in the issuance of a Record of Decision in June 2007.
- Completion of a biological opinion following consultation under Section 7 of the ESA related to NMFS' preferred strategy for the issuance of grants and permits for scientific research on Steller sea lions and northern fur seals. This opinion concluded that the research program is not likely to jeopardize the continued existence of the endangered western Steller sea lion DPS or the threatened eastern Steller sea lion DPS.
- Continuation of high-quality research on Steller sea lion foraging ecology, habitat use, status, health, and predation threat.
- Continuation of cooperative research with Russian scientists on Steller sea lions in Russian waters.
- Signing of co-management agreements for northern fur seals and Steller sea lions between NMFS and the Aleut Community of St. George Island and the Aleut Community of St. Paul Island.
- Signing of an agreement between NMFS and the Aleut Marine Mammal Commission for the conservation and management of all marine mammal subsistence species with particular focus on Steller sea lions and harbor seals in November 2006.
- Issuance of a cooperative agreement between NMFS and the Alaska Sea Otter and Steller Sea Lion Commission for outreach, education, and bio-sampling related activities.

Priority Recovery Actions Needed:

- Completion of analysis of impacts of groundfish fisheries on Steller sea lions and completion of ESA Section 7 consultations.
- Continue to monitor trends in the abundance of pups and non-pups.
- Research on adult female body condition, health, foraging, reproduction, and movements in the western part of the range in Alaska to better evaluate factors that may be impeding recovery.

- Research on foraging ecology of all population segments in the western and central Aleutians.
- Maintain or improve management actions until substantive evidence demonstrates that these measures can be reduced without limiting recovery.
- Design and implement an adaptive management program to evaluate fishery conservation measures.
- Develop a more detailed recovery task implementation plan, including a research implementation plan. An implementation plan needs to be developed that includes a comprehensive ecological and conceptual framework that integrates and further prioritizes the numerous recovery actions provided in this plan. The implementation plan will contain a synthesis of, and establish priorities among, the individual actions, as well as coordinate their implementation in a cohesive strategy. Several components will be integrated in the conceptual framework of the implementation plan: (1) the complex dynamics of the North Pacific marine ecosystem, (2) multiple causation in those systems, (3) the need for long-term research, (4) the monitoring required to assess the effectiveness of management regulations, and (5) the development of a modeling approach that examines possible effects of multiple threats on sea lion population dynamics to evaluate the strength of the evidence for different hypotheses.

Recovery Priority Number: 7 (*western DPS*); 10 (*eastern DPS*)
The western DPS has a recovery priority number of 7 due to a moderate magnitude of threats, moderate recovery potential, and the potential for economic conflict. The recovery priority number for the eastern DPS is 10 due to a low magnitude of threat, high recovery potential, and no significant potential for economic conflict.

Whales

Beluga Whale – Cook Inlet DPS (Delphinapterus leucas)

Date Listed: October 22, 2008 (73 FR 62919)

Legal Status: Endangered

Recovery Plan Status: No recovery plan has been written for this DPS. NMFS has prepared a final Conservation Plan for this DPS that serves many of the functions of a recovery plan and provides interim recovery measures until a recovery plan is available. NMFS intends to prepare a recovery plan for this species, and will begin that process after designating critical habitat as required by the ESA.

Photo credit: NOAA National Marine Mammal Lab

Species Status: The most recent abundance estimate for this DPS is 375 whales. No reliable estimate of historic abundance exists, although NMFS has used partial survey data from the State of Alaska to estimate the carrying capacity to be 1,300 whales. Despite measures to regulate subsistence harvests by Alaskan Natives (only five beluga whales have been harvested since 1999), the population is still in decline. An extinction risk analysis completed in 2008 projects a 29 percent probability of extinction within 100 years for the Cook Inlet beluga.

Threats and Impacts: The Cook Inlet beluga population may be affected by myriad natural and human impacts. Natural threats include stranding events, predation, parasitism and disease, and environmental change. Potential human impacts include subsistence harvest, poaching, fishing, pollution, vessel traffic, tourism and whale watching, coastal development, noise, oil and gas activities, and scientific research. Stranding events, reduced prey, and noise are threats that have been identified by NMFS as having both a high likelihood of occurrence and a high potential impact to species recovery in the next 5 years. The frequent use of shallow nearshore and estuarine habitats makes beluga whales particularly prone to threats from human activities.

Conservation Actions:

- The subsistence hunting of Cook Inlet belugas by Alaskan Natives is now managed through harvest regulations promulgated in 2008.
- All subsistence harvests from this population require a plan of cooperation between NMFS and an Alaskan Native Association. While several such agreements have been prepared, there is no current agreement in place because no harvest is projected until the population's numbers increase.
- A final MMPA conservation plan was released in 2008. While this is not an ESA recovery plan, it does identify threats to this population and establishes actions for recovery.
- NMFS is currently consulting under Section 7 of the ESA on various actions throughout the range of this DPS.

- Administration of the MMPA section 101(a)(5) program to authorize small takes of Cook Inlet beluga whales incidental to lawful activities, including mitigative measures to reduce adverse effects.

Priority Recovery Actions Needed: NMFS has completed necessary actions to address the most immediate threat to this population through harvest regulation. While various threats remain, it is difficult to assign priority to these or necessarily to define actions to remove certain threats and promote recovery. For example, both predation by killer whales and deaths due to stranding along Cook Inlet's shallow tidal flats may be significant impediments to recovery, but no practical remedial measures are known. Designation of critical habitat for this population is required to be completed within 12 months of listing, and NMFS intends to complete this process no later than October 2009.

Recovery Priority Number: 3
The magnitude of threats for this species is considered high, as the results of a NMFS population viability model place the risk of extinction to be very high in the near future. The recovery potential for the Cook Inlet beluga is considered low to moderate, because the population has not shown positive recovery after harvest controls were implemented and because some threats may be naturally occurring. Conflict is associated with this population, as it shares its range with the most populated and industrialized region of Alaska.

Blue Whale (*Balaenoptera musculus*)

Date Listed: June 2, 1970 (35 FR 18319)

Legal Status: Endangered

Recovery Plan Status: A recovery plan for the blue whale was completed in July 1998.

Photo credit: NOAA

Species Status: Blue whales are found in all oceans worldwide and are separated into populations from the North Atlantic, North Pacific, and Southern Hemisphere. Worldwide, blue whales were significantly depleted by commercial whaling activities. In the Southern Hemisphere, pre-exploitation population estimates range from 150,000 to 210,000 whales; recent abundance estimates place the population size at 400 to 1,400 whales. In the North Pacific, pre-exploitation population size is speculated to be approximately 4,900 blue whales. The current minimum population estimate for the eastern North Pacific stock is 1,136 whales. In the North Atlantic, estimates for the entire basin are considered unreliable, but range from 1,100 to 1,500 blue whales pre-exploitation population size.

The distribution of blue whales in the western North Atlantic generally extends from the Arctic to at least mid-latitude waters. The current range of the blue whale in the North Atlantic remains unknown, but it is considered an occasional visitor in U.S. Atlantic waters, which may represent the current southern limit of its feeding range. The 2002 minimum population estimate for the western North Atlantic stock is 308 whales. There are insufficient data to determine a population trend for this stock.

Blue whale population structure in the North Pacific remains uncertain, but two stocks are recognized within U.S. waters: the Hawaiian and the eastern North Pacific (formerly California/Mexico) stocks. With the exception of the blue whale population that summers off California, there are no reliable estimates of blue whale abundance in the North Pacific Ocean. In Hawaii, blue whales are considered to be extremely rare. No data are available to provide a minimum population estimate or to determine a population trend for the Hawaiian stock. The eastern North Pacific stock feeds in waters from California to Alaska in summer and fall, and migrates south to waters from Mexico to Costa Rica in winter. It is unclear whether this population is increasing, decreasing, or stable.

Threats and Impacts: A primary threat to blue whales is mortality and serious injury caused by ship strikes. In the North Atlantic in March 1998, a dead blue whale was brought into Rhode Island waters on the bow of a tanker. The cause of death was determined to be a ship strike, although the location of the strike is unknown. Ship-strike deaths and serious injuries averaged 1.2 whales per year in California waters between 2003 and 2007. Four blue whale deaths in

California waters in 2007 were attributed to ship strikes. Additional, unreported ship-strike mortality of blue whales likely occurs. Several of the whales photo-identified off California had large gashes on the dorsal body surface, thought to be caused by collisions with vessels.

Other threats and impacts to blue whales include incidental take in fisheries, fishing gear entanglement, and anthropogenic noise. Off California and Mexico, there is potential for bycatch of blue whales in drift gillnet fisheries for swordfish and sharks. Observer coverage in gillnet fisheries that may interact with blue whales in California waters was approximately 20 percent between 2006 and 2008. In the observed fisheries, no blue whale mortality was documented; however, entanglement rates may be underestimated, as blue whales may break through or carry away fishing gear, perhaps suffering unrecorded subsequent mortality. While impacts are unknown, the increasing levels of anthropogenic noise in the oceans may be an additional concern for blue whales.

Conservation Actions:

- Collaborative efforts in 2008 by NMFS, U.S. Coast Guard, and the National Ocean Service's Channel Islands National Marine Sanctuary resulted in periodic and frequent broadcast of vessel speed advisories of 10 knots or less when transiting the Santa Barbara Channel in periods when blue whales occur there. In the coming years NMFS expects to continue monitoring the occurrence of this species in nearshore waters and enact protective measures when the threat of ship strikes arise.
- Implementing the blue whale strike response plan, including weekly overflights to record whale locations (see http://channelislands.noaa.gov/focus/alert.html).
- Monitoring the status of the eastern North Pacific stock of blue whales via shipboard surveys, conducted every 3 years with MMPA funding.
- Placing observers onboard vessels in the California/Oregon swordfish/thresher shark drift gillnet fishery to monitor for the take of protected species, including marine mammals (MMPA funding).
- Implementing marine mammal take reduction measures identified in the Pacific Offshore Cetacean Take Reduction Plan (including the use of acoustic pingers) to reduce the bycatch of marine mammals (MMPA funding).

Priority Recovery Actions Needed: Continue ongoing recovery actions listed above.

Recovery Priority Number: 7
This priority number ranking reflects a moderate magnitude of threat, low to moderate recovery potential, and the presence of conflict.

Bowhead Whale (Balaena mysticetus)

Photo credit: NOAA

Date Listed: June 2, 1970 (35 FR 8495)

Legal Status: Endangered

Recovery Plan Status: No recovery plan has been written for this species. NMFS has determined the combined efforts of several managing entities, especially those of the International Whaling Commission, NMFS, and the Alaska Eskimo Whaling Commission (operating under a NOAA/AEWC Cooperative Agreement)—along with the fact that four of the five stocks of bowhead whales exist outside of U.S. waters—obviate the need for and benefit of a recovery plan.

Species Status: Five populations of bowhead whales are currently recognized. The Spitsbergen population is found in the North Atlantic east of Greenland in the Greenland, Kara, and Barents Seas. Thought to have been the most numerous of bowhead populations (estimated unexploited population of 24,000 animals), the Spitsbergen bowhead is now severely depleted, possibly numbering in the tens of animals.

The Davis Strait population is found in Davis Strait, Baffin Bay, and along the Canadian Arctic Archipelago. The current population is estimated at 350 animals and recovery is described as "at best" exceedingly slow.

No reliable estimate exists for the Hudson Bay population. Recent estimates of 256 to 284 have been presented for the number of whales within Foxe Basin. There has been no appreciable recovery of this population.

The Okhotsk Sea population may have been 3,000–6,500 animals, and may now number somewhere in the 300–400 range, although reliable population estimates are not currently available.

The Western Arctic stock of bowhead whales is improving, and may be nearing a recovered status. The current abundance estimate for this stock is 10,545. This is considered to be between 46 percent and 101 percent of pre-exploitation abundance. Some analysts suggest this stock may be approaching carrying capacity, although the population growth rate shows no sign of slowing.

Threats and Impacts: While commercial exploitation of bowhead whales is prohibited, managed subsistence hunting in Alaska and Russia by native groups still occurs. Other current and projected threats include oil and gas exploration and development, interaction with commercial fishing gear, and water quality issues. Climate change may also present a threat to these whales, as high northern latitudes are expected to be affected more than other areas. Ice-associated animals, such as the bowhead whale, may be sensitive to changes in Arctic weather,

sea-surface temperatures, ice extent, and associated prey availability. However, the current and future effects of climate change on this species are poorly understood.

Conservation Actions:

- The subsistence harvest by Alaskan Natives of the Western Arctic population is closely managed through the International Whaling Commission, NMFS, and the Alaska Eskimo Whaling Commission. The most recent 5- year harvest quota was issued in 2008, and this group continues to set harvests at sustainable levels consistent with conservation and recovery.
- Administration of the MMPA section 101(a)(5) program to authorize small takes of bowhead whales incidental to lawful activities, including mitigative measures to reduce adverse effects.
- Ongoing consultations under Section 7 of the ESA concerning offshore oil and gas actions in the Beaufort and Chukchi seas.

Priority Recovery Actions Needed: The Western Arctic (U.S.) population is increasing at approximately 3 percent annually and may be nearing a recovered state. No priority actions are identified.

Recovery Priority Number: **7**

The magnitude of threats for this species is considered moderate, as four of the five extant populations are greatly reduced and at precariously low levels, but extinction is not considered to be almost certain in the immediate future. The recovery potential for bowheads is considered low to moderate, as the limiting factors to at least four of the five populations are not sufficiently understood. At least some degree of conflict is associated with these populations.

Fin Whale (*Balaenoptera physalus*)

Photo credit: NOAA Southwest Fisheries Science Center

Date Listed: June 2, 1970 (35 FR 18319)

Legal Status: Endangered

Recovery Plan Status: A recovery plan was drafted in 2006 and is expected to be finalized in 2009.

Species Status: Fin whales occur in oceans of both Northern and Southern Hemispheres between 20–75° N and S latitudes. Worldwide, fin whales were severely depleted by commercial whaling activities. The pre-exploitation abundance of fin whales in the Southern Hemisphere is estimated at 400,000 and the most current population estimate (1979) for fin whales in the southern oceans is 85,200. In the North Pacific, the total pre-exploitation population size of fin whales is estimated at 42,000 to 45,000. The most recent abundance estimate (early 1970s) for fin whales in the entire North Pacific basin is between 14,620 and 18,630. The current minimum population estimate for the California/Oregon/Washington stock is 2,316 whales. In the North Atlantic, the pre-exploitation population size for fin whales is estimated at 30,000 to 50,000; the current estimate of fin whale abundance for the entire North Atlantic is 23,000 to 39,000 whales. The current minimum population estimate for the western North Atlantic stock is 1,678 whales.

The MMPA stock assessment reports for the fin whale recognize one stock in the U.S. North Atlantic Ocean (the western North Atlantic stock) and three stocks in the U.S. North Pacific (California/Oregon/Washington stock, Hawaii stock, and Alaska/Northeast Pacific stock).

Threats and Impacts: Fin whales from the western North Atlantic stock are injured and killed at least occasionally by inshore fishing gear (e.g., gillnets) off eastern Canada and the United States, and are relatively commonly injured or killed by ship strikes off the U.S. East Coast. NMFS' records on this stock from 2003 through 2007 yield an average of 2.2 human-caused deaths per year—1.0 per year resulting from fishery interactions or entanglements, and 1.2 due to collisions with vessels. Because fin whales are also among the main attractions of whale-watching enterprises in eastern Canada and the northeastern United States, they are regularly subjected to close and persistent following by vessels.

Interaction with commercial fisheries and ship strikes are also threats to the Northeast Pacific stock. One fin whale mortality in 1999 was attributed to the Gulf of Alaska pollock trawl fishery, leading to an estimate of three deaths in 1999 and an average of 0.6 deaths over the 1999–2003 period. Additional mortality from ship strikes probably goes unreported because the whales do not strand or, if they do strand, they do not always have obvious signs of trauma. Ship-strike deaths and serious injuries averaged 1.6 whales per year in U.S. west coast waters between 2002 and 2006.

Fin whales are much less subject to whale watching in the eastern North Pacific than in the western North Atlantic. Thus, disturbance of fin whales in the Pacific is more likely to come from the abundant industrial, military, and fishing vessel traffic off the Mexican, U.S., and Canadian coasts than from the deliberate approaches of whale-watching vessels.

Conservation Actions: For conservation measures concerning fishing gear interactions, see the Northern Right Whale section of this report. North Atlantic right, humpback, and fin whales are all managed under the Atlantic Large Whale Take Reduction Plan implemented through the MMPA.

There are no conservation actions for the Hawaii and Alaska/Northeast Pacific stocks of fin whales.

Conservation actions for the California/Oregon/Washington stock of fin whales are ongoing and include the following:

- Monitoring the status of the California/Oregon/Washington stock of fin whales via ship-board surveys, which are conducted every 3 years with MMPA funding.
- Placing observers onboard vessels in the California/Oregon swordfish/thresher shark drift gillnet fishery to monitor for the take of protected species, including marine mammals (MMPA funding).
- Implementing marine mammal take reduction measures identified in the Pacific Offshore Cetacean Take Reduction Plan (including the use of acoustic pingers) to reduce the bycatch of marine mammals (MMPA funding).

Priority Recovery Actions Needed: Continue ongoing conservation actions listed above. Further priority recovery actions will be specified in the recovery plan.

Recovery Priority Number: 7
This priority number reflects a moderate degree of threat, low to moderate recovery potential, and the presence of conflict with economic activities.

Humpback Whale (*Megaptera novaeangliae*)

Date Listed: June 2, 1970 (35 FR 18319)

Legal Status: Endangered

Recovery Plan Status: A recovery plan for the humpback whale was completed in November 1991.

Photo credit: David Matilla, Humpback Whale National Marine Sanctuary, NMFS Permit #807

Species Status: Humpback whales live in all major ocean basins from equatorial to sub-polar latitudes. In the entire Southern Hemisphere, humpback whale abundance prior to commercial exploitation is estimated at 100,000 whales. Recent abundance estimates south of 60°S in summer range from 5,900 to 16,800 whales. No current or historical abundance estimates are available for humpbacks in the Indian Ocean. In the entire North Pacific Ocean prior to 1905, it is estimated there were 15,000 humpback whales basin-wide. In 1966, after heavy commercial exploitation, humpback abundance was estimated at 1,000 to 1,200 whales, although it is unclear whether estimates were for the entire North Pacific or just the eastern North Pacific. The current abundance estimate for the entire North Pacific is between 18,000 and 20,000 whales. For the North Atlantic, the best available estimate is 11,570 whales.

Four stocks of humpback whales are recognized in U.S. waters: the Gulf of Maine stock in the Atlantic Ocean, and the western North Pacific, central North Pacific (including the Southeast Alaska feeding area), and the California/Oregon/Washington stocks in the Pacific Ocean. While estimating humpback whale abundance is inherently difficult, best estimates for minimum populations are: 549 for the Gulf of Maine stock, 367 for the western North Pacific stock, 3,698 for the central North Pacific stock (plus an additional 868 that aggregate at the Southeast Alaska feeding area), and 1,250 for the California/Oregon/Washington stock. The Gulf of Maine, central North Pacific, and California/Oregon/Washington stocks seem to be increasing while there is not enough information to accurate access population trends for the western North Pacific stock. In 2009 an American Samoa stock assessment will be published for the first time. Between 2003 and 2005 92 unique individuals were identified within the American Samoa EEZ.

Threats and Impacts: One threat to humpback whales is entanglement in commercial fishing gear. On occasion, humpback whales are capable of becoming entangled and swimming away with parts of fixed fishing gear, which can, in turn, result in subsequent entanglement in additional gear. From 2002 through 2006, eight deaths and six serious injuries to North Atlantic humpback whales were attributed to entanglement. NMFS has observed the incidental take of humpback whales in the California/Oregon swordfish/thresher shark drift gillnet fishery, and suspects humpback whales are also taken in drift gillnet fisheries off Baja California, but detailed information regarding takes in these fisheries is not available. In the North Pacific, humpback

whales migrate annually from Hawaii to northern British Columbia, Southeast Alaska and Prince William Sound west to Kodiak, and therefore the potential exists for them to become entangled in gear from several fisheries. Longline gear, crab pots, and other non-fishery-related lines have been implicated in the entanglement of humpback whales seen in Hawaii. Between 2002 and 2006, one humpback whale was killed and nine were seriously injured as a result of interactions with pot and/or trap gear off the U.S. West Coast. For the period 2003 through 2007, the minimum annual rate of fishing-related mortality and serious injury to the Gulf of Maine humpback whale stock averaged 2.8 per year (U.S. waters, 2.4; Canadian waters, 0.4).

Another threat to humpback whales is mortality or serious injury from ship strikes. From 2003 through 2007, eight mortalities from the Gulf of Maine stock were attributed to collisions with vessels. Between 2001 and 2005, five mortalities were attributed to collisions with vessels in southeast Alaska. NOAA has confirmed 50 vessels strikes in Hawaiian waters from 1975 to 2008. Seven of those 50 ship strikes occurred in 2006, six occurred in 2007, and twelve occurred in 2008.

Interaction with whale-watching vessels is also a threat to humpback whales. The Gulf of Maine stock of humpback whales is the focus of whale watching in New England from late spring to early fall, particularly within the Stellwagen Bank National Marine Sanctuary. The central North Pacific stock is the focus of a developed whale-watching industry on its wintering grounds in the Hawaiian Islands. The feeding aggregation in southeast Alaska is also the focus of a developing whale-watching industry that may impact whales in localized areas there.

Habitat loss and degradation may also impact humpback whales. Shipping channels, fisheries, and aquaculture may all occupy or destroy humpback whale aggregation areas. Recreational use of marine areas, including resort development and increased boat traffic (thrill craft), may displace whales that would normally use an area. In Hawaii, acoustic impacts from vessel operation, oceanographic research using active sonar, and military operations are also of increasing concern.

Conservation Actions:

Reduction of incidental take

- For conservation measures concerning fishing gear interactions in the North Atlantic, see the Northern Right Whale section of this report. North Atlantic right, humpback, and fin whales are all managed under the Atlantic Large Whale Take Reduction Plan.
- NMFS implements marine mammal take reduction measures identified in the Pacific Offshore Cetacean Take Reduction Plan (including the use of acoustic pingers) to reduce the bycatch of marine mammals (MMPA funding).
- The Hawaiian Islands Humpback Whale National Marine Sanctuary continues to play a leading role—locally, nationally, and internationally—in mitigating the impact to humpback whales from entanglement in ropes and nets. Locally, the sanctuary is conducting training of personnel, acquiring specialized equipment for islands with histories of events, and responding to calls concerning humpback whales in distress.
- The Hawaiian Islands Humpback Whale National Marine Sanctuary Advisory Council and its partners convened a Ship Strike Mitigation Meeting with resource managers,

scientists, and representatives of the maritime community to assess strike risks in Hawaii and to identify possible actions to reduce the occurrence of vessel/whale collisions.

Education and outreach

- Stellwagen Bank National Marine Sanctuary maintains a working group on whale-watching issues.
- NMFS continues to reach out to the commercial whale-watch vessels in New England ports about whale-watching guidelines.
- NMFS installs ship strike mitigation signage (boater safety signs) to remind Hawaii's ocean users to practice safe boating around whales.

Surveys and research

- NMFS monitors the status of the eastern North Pacific stock via shipboard surveys, which are conducted every 3 years, and mark-recapture studies conducted annually (MMPA funding).
- NMFS places observers onboard vessels in the California/Oregon swordfish/thresher shark drift gillnet fishery to monitor for the take of protected species, including marine mammals (MMPA funding).
- The SPLASH project (structure, levels of abundance, and status of humpbacks) is an international cooperative research effort to understand the population structure of humpback whales across the entire North Pacific. The final report is available online at http://swfsc.noaa.gov/prd-splash.aspx.
- The Hawaiian Islands Humpback Whale National Marine Sanctuary has continued to build partnerships to conduct marine mammal surveys, concentrating on humpback whales, in the waters surrounding American Samoa.
- The MoNAH (More North Atlantic Humpbacks) project was a cooperative venture to estimate the population size of North Atlantic humpback whales that visit the primary calving grounds in the West Indies. A genetic marker–based mark recapture estimate from this venture should be available by the end of 2009 and be comparable to the YoNAH (Year of the North Atlantic Humpback) project of the prior decade.

Priority Recovery Actions Needed: NMFS will continue its efforts to address human-caused mortality and serious injury of humpback whales associated with gear and vessel interactions. Additional work is needed to complete the development and implementation of a more comprehensive ship-strike strategy that encompasses large cetacean species in addition to right whales. Although substantial work has already been done concerning gear modifications to address entanglement risks associated with the groundline of pot/trap gear, additional work is needed to better understand the entanglement risk posed by the endlines (buoy lines) of fixed gear, and to better understand humpback behavior once whales become entangled. Additional studies must also be conducted to evaluate the effectiveness of the right whale measures on humpback entanglements.

Recovery actions specific to the western North Pacific stock have a low priority until further research is done. No priority recovery actions have been officially identified specific to the central North Pacific stock; however, the issue of entanglement continues to be a local priority for education and mitigation.

Recovery Priority Number: 3
The species recovery priority reflects a high magnitude of threat, a medium recovery potential (because levels of fishing gear and vessel interactions appear to be increasing), and the presence of conflict (because restrictions on commercial fishing and shipping would potentially create a significant conflict).

North Atlantic Right Whale (Eubalaena glacialis)

Photo Credit: NOAA

Date Listed: Right whales were originally listed as endangered in December of 1970 (35 FR 18319). Based on a December 2006 status review of the northern right whale, NMFS listed the North Pacific and North Atlantic right whale populations as separate endangered species on March 6, 2008 (73 FR 12024).

Legal Status: Endangered

Recovery Plan Status: A recovery plan for the North Atlantic right whale was completed in May 2005.

Species Status: The pre-exploitation distribution of northern right whales in the North Atlantic probably included coastal and continental shelf waters in temperate to subarctic latitudes. Pre-exploitation abundance is unknown but has been estimated at over 1,000 individuals. Current distribution and abundance data suggest significant reductions from historic levels. In the eastern North Atlantic, the northern right whale population probably numbers in the low tens, with little known regarding their distribution and migration pattern. The western north Atlantic population had at least 325 individuals in 2003 having grown at a mean rate of 1.8 percent from 1990–2003. In 2009 at least 39 calves were observed off the coasts of Georgia and Florida, the most ever recorded since record keeping and systematic surveys began in the early 1980s. While movements of western North Atlantic right whales are extensive, there are six major habitats or congregation areas: coastal waters of the southeastern United States; Great South Channel; Georges Bank/Gulf of Maine; Cape Cod and Massachusetts bays; the Bay of Fundy; and the Scotian Shelf.

Threats and Impacts: Ship strikes and fishing gear entanglements are the most common human-related causes of mortality in the western North Atlantic right whale population. Other potential threats are habitat degradation, industrial and ship noise, contaminants, military activities, and climate and ecosystem change. Of 16 recorded deaths or serious injuries to North Atlantic right whales attributed to human causes during 2003–2007 (in both U.S. and Canadian waters), five involved entanglement or fishery interactions and 11 were from collisions with vessels. Entanglement records from 1990 through 2006 included 45 confirmed right whale entanglements, including right whales caught in weirs, in gillnets, and in trailing line and buoys. These numbers are likely underestimates, given unreported or unseen incidences. Any human-caused mortality is problematic for this species because of its low population size.

Conservation Actions: NMFS has many new and ongoing programs to assuage the threats of incidental ship strikes and commercial fishing gear entanglement. Many of these activities (e.g., the Boston Traffic Separation Scheme and the Atlantic Large Whale Reduction Plan) are intended to protect not only North Atlantic right whales but also endangered humpback and fin

whales and to benefit non-endangered minke whales. NMFS' Marine Mammal Health and Stranding Response Program has continued to respond to stranding and entanglements with its partners and administer grants for response and recovery of marine mammals through the John H. Prescott Marine Mammal Rescue Assistance Grant Program.

Reduction of incidental take- Ship Strikes

- In December 2008, NMFS promulgated new rules for all vessels 65 feet or greater to limit speed to 10 knots or less in Seasonal Management Areas where whales are known to congregate at particular times. NOAA also expects, but does not require, mariners to avoid or limit speed to 10 knots or less in Dynamic Management Areas (http://www.nmfs.noaa.gov/pr/shipstrike/).
- The U.S. submitted two routing proposals to the International Maritime Organization in 2008. One proposal will amend the north-south leg of the Boston Traffic Separation Scheme by shifting traffic 12 degrees and narrowing the traffic lanes by about one half mile each. The second proposal is a voluntary seasonal Area To Be Avoided from April 1st to July 31st in the Great South Channel off of Massachusetts. These proposals will move ships away from the greatest densities of whales while minimizing overlap between whales and ships. Both of these proposals were endorsed by the International Maritime Organization and will be implemented in June, 2009.
- In November 2006, NOAA established recommended shipping routes in key right whale aggregation areas within Cape Cod Bay and off three ports in Georgia and Florida. These routes are intended to reduce ship transit times in whale habitat while ensuring safe and timely shipping.
- The International Maritime Organization has continued a mandatory ship reporting system that requires ships 300 tons or larger to report relevant ship information when they enter certain waters off New England and calving/nursery areas in waters off Georgia and Florida. This reporting prompts an automated return message providing information about the vulnerability of right whales to ship strikes and recent right whale sighting locations.
- NOAA and other federal and state agencies continued supporting or conducting extensive aircraft surveys for right whales. NMFS assembled reports, and "alerts" are disseminated to mariners via e-mail, fax, web pages, U.S. Coast Guard Broadcast Notices to Mariners, NOAA Weather Radio, NAVTEX, NOAA Weather Buoys, shipping agents, pilots, and port authorities. These efforts have been ongoing since the early 1980s.
- NMFS has contributed to many outreach and education projects including: continued distribution of placards, brochures, and videos to mariners on ways to reduce ship strikes; maintenance of two websites devoted to ship-strike reduction; reprinted updates to whale advisory charts; and worked to produce and distribute an interactive CD on reducing ship strikes.

Reduction of incidental take- Gear Entanglement

- NMFS developed and implemented an emergency and final rule to revise the regulations implementing the Atlantic Large Whale Take Reduction Plan by expanding the Southeast U.S. Restricted Area and prohibiting gillnet fishing during the right whale calving season within the restricted area.

- As part of the Atlantic Large Whale Take Reduction Plan NMFS implemented over 25 Dynamic Area Management zones requiring gear modifications for trap/pot and gillnet gear in areas of unexpected aggregations of right whales north of 40°.
- NMFS developed and implemented a broad-based gear modification and completed a full Environmental Impact Statement. This new strategy includes weak link and sinking groundline requirements; additional gear marking requirements; changes in boundaries; seasonal restrictions for gear modifications; and expanded exempted areas.
- NMFS developed a Vertical Line Strategy for the Atlantic Large Whale Take Reduction Team to assist in the development of conservation measures intended to reduce the risk of serious injury and mortality of whale interactions with endlines (buoy lines) associated with commercial fixed gear.
- NMFS provided earmarked funding of nearly $2 million to the Gulf of Maine Lobster Foundation for the administration and implementation of the Maine groundline exchange program for Maine lobster trap/pot fishermen.
- NMFS conducted investigations on gear removed from entangled whales.
- NMFS has contributed to many outreach and education projects including: conducting dockside outreach meetings throughout the east coast; collaborated with fishermen and fishing associations throughout the Northeast and Mid-Atlantic on conservation measures and gear research; and provided high level disentanglement training for fishermen, the U.S. Coast Guard, and State Marine Patrols.

Priority Recovery Actions Needed: Continue to enhance efforts to reduce threats from fishing gear entanglement and vessel collisions.

Recovery Priority Number: 1
This recovery priority number reflects a high degree of threat based on extremely low population numbers, high recovery potential, and potential conflict with economic activities.

North Pacific right whale (Eubalaena japonica)

Photo credit: NOAA National Marine Mammal Lab

Date Listed: Right whales were originally listed as endangered in December of 1970 (35 FR 18319). Based on a December 2006 status review of the northern right whale, NMFS listed the North Pacific and North Atlantic right whale populations as separate endangered species on March 6, 2008 (73 FR 12024).

Legal Status: Endangered

R**ecovery Plan Status:** A recovery plan for the recently listed species is not currently under development. The 1991 recovery plan for Northern Right Whales has a section devoted to the North Pacific population.

Species Status: For North Pacific right whales, the photographic recapture rate and genetic data suggest a very small population size. The eastern population of the North Pacific right whale is arguably the most endangered stock of whales in the world. Although there are currently no estimates of abundance, the extreme rarity of sightings in recent decades suggests the population numbers in the tens. Little is known about the distribution, movements, migrations, or habitat use of this population. It is thought that North Pacific right whales were once widely distributed across the Gulf of Alaska and Bering Sea. The current range of this population is probably significantly reduced from historic levels.

Threats and Impacts: Ship collisions and fishing gear entanglements are the most common anthropogenic causes of mortality in the western North Atlantic right whale population, but the extent of this problem in the North Pacific is unknown. Gillnets were implicated in the death of a right whale off the Kamchatka Peninsula (Russia) in 1989. No other incidental takes of right whales are known to have occurred in the North Pacific, but entanglement evidence has been documented in 1998 aerial photographs of one whale. There is no evidence of entanglement scars in the photographic catalog, but, due to incomplete body coverage of most of the animals, it is impossible to discount this possibility.

There has been recent interest in oil and gas exploration and development in the Bering Sea North Aleutian Basin (NAB), an area that overlaps with the North Pacific right whale critical habitat. Such activity could potentially alter the distribution of North Pacific right whales.

Conservation Actions: In 2007, the National Marine Mammal Laboratory (NMML) and Minerals Management Service (MMS) entered into an Interagency Agreement (IA) for NMML to conduct integrated surveys of right whales and other cetaceans (and their habitat) in the Bering Sea. This work was prompted by the need for better data to assess the potential impact of oil and gas development in the NAB area.

The overall goal of the IA study is to facilitate development of future oil and gas–related mitigation by assessing the distribution, occurrence, and habitat use of North Pacific right whales in the southeastern Bering Sea (NAB lease sale area and adjacent waters). The general objectives of the study are to estimate seasonal distribution, relative abundance, and movement patterns of right whales in and adjacent to the lease sale area and to characterize right whale habitat, foraging behavior, health, and prey distribution. The proposed study will have three component projects: right whale biology, passive acoustics, and right whale feeding and prey.

The specific objectives are to:

1. Assess the distribution of right whales using fixed-winged aircraft and ship-based surveys (focused in the lease sale and adjacent areas).
2. Assess short- and long-term movements of whales through satellite tagging of individuals in the lease sale area and Critical Habitat.
3. Locate whales for tagging, behavioral observations, and habitat studies using ship-based passive acoustic methodology.
4. Conduct acoustic tagging and concurrent oceanographic and zooplankton sampling to investigate right whale foraging ecology and assess related habitat characteristics.
5. Use acoustic monitoring to assess year-round presence and relative abundance of whales in the lease sale area and Critical Habitat, as well as to identify potential migration routes from the Bering Sea.
6. Photo-identify and biopsy-sample individual right whales during tagging operations for analysis of population structure, genetics, pollutants, and diet. In addition, samples of copepods will be taken during oceanographic operations to establish a baseline of existing anthropogenic compounds.

The 2007 portion of this work was more limited in scope due to the short time available for organization of the field work; this resulted from the relatively late finalization of the IA between the two agencies. The 2008 study included a ship survey, foraging ecology studies, satellite tagging, photo-identification, and biopsy sampling. The 2009 study will be a continuation of the full survey work.

Priority Recovery Actions Needed: For right whales in the North Pacific, the most urgent recovery need is better information on the basic distribution and occurrence of right whales in the eastern North Pacific, including identification of their wintering areas, which remain unknown and to identify threats to the population. Surveys need to be continued, as well as the use of autonomous underwater recording devices and satellite-monitored radio tags. Additional specific recovery actions for this population will be specified upon completion of a recovery plan.

Recovery Priority Number: 1

This recovery priority number reflects a high degree of threat based on extremely low population numbers, high recovery potential, and potential conflict with economic activities.

Sei Whale (*Balaenoptera borealis*)

Photo credit: NOAA

Date Listed: June 2, 1970 (35 FR 18319)

Legal Status: Endangered

Recovery Plan Status: A draft recovery plan is under development.

Species Status: Sei whales live in temperate regions of all oceans in the Northern and Southern Hemispheres and are not usually associated with coastal features. Worldwide, sei whales were severely depleted by commercial whaling activities. In the Southern Hemisphere, it is estimated that between 63,000 and 65,000 sei whales existed prior to commercial exploitation. Current estimates for sei whale abundance in the southern oceans range from 9,718 to 12,000 whales. In the North Pacific, the pre-exploitation population estimate for sei whales is 42,000 and the most current population estimate for sei whales in the entire North Pacific (from 1977) is 9,110. The 2008 Pacific Stock Assessment report for the California/Oregon/Washington stock indicates that the population is quite small (46 whales estimated based on surveys conducted in 2001 and 2005). One ship-strike mortality was recorded in 2003 in Washington State. In the entire North Atlantic, information is not available on the pre-exploitation population size of sei whales, and there are insufficient data to determine population size or trend for North Atlantic sei whales at this time.

The stock identity of sei whales in the North Atlantic poses a major research challenge; however, NMFS provisionally recognizes one stock in U.S. waters—the Nova Scotia stock, which is found in continental shelf waters of the northeastern U.S. and ranges northeast to waters south of Newfoundland. This stock has an estimated minimum population of 128 whales. In the North Pacific, there are two stocks of sei whales in U.S. waters—the eastern North Pacific stock and the California/Oregon/Washington stock. Little is known about the size of the eastern North Pacific stock in Alaskan waters.

Threats and Impacts: Sei whales in the western North Atlantic are occasionally impacted by ship strikes. A review of NMFS stranding and entanglement records from 2002–2006 show a minimum annual rate of human-caused mortality and serious injury at 0.6 per year. The first ship-strike record between 2002 and 2006 was an 11-meter male discovered in February 2003 outside of Norfolk Naval Base in Virginia. Another ship-strike mortality was reported in April 2006 when a fresh sei whale carcass was brought in to Baltimore on the bow of a ship. A fishery entanglement mortality was discovered on Jeffreys Ledge in southern Maine in September 2006.

Threats and impacts to the eastern North Pacific stock of sei whales are relatively unknown at this time. There is a potential for bycatch of sei whales in drift gillnet fisheries off California and Mexico. There is also a potential for sei whales in the North Pacific to be killed or seriously injured by ship strikes.

Conservation Actions: There are no specific conservation actions for the Nova Scotia stock of sei whales at this time.

Conservation actions for the sei whale in the western North Pacific include the following:

- Monitoring the status of the California/Oregon/Washington stock of sei whales via shipboard surveys, which are conducted every 3 years (MMPA funding).
- Placing observers onboard vessels in the California/Oregon swordfish/thresher shark drift gillnet fishery to monitor for the take of protected species, including marine mammals (MMPA funding).
- Implementing marine mammal take reduction measures identified in the Pacific Offshore Cetacean Take Reduction Plan (including the use of acoustic pingers) to reduce the bycatch of marine mammals (MMPA funding).

Priority Recovery Actions: Continue current conservation actions.

Recovery Priority Number: 3
This recovery priority number reflects a high degree of threat, low to moderate recovery potential, and potential conflict with economic activities.

Sperm Whale (*Physeter macrocephalus*)

Date Listed: June 2, 1970 (35 FR 18319)

Legal Status: Endangered

Recovery Plan Status: A recovery plan was drafted in 2006 (71 FR 38385) and is expected to be finalized in 2009.

Photo credit: NOAA

Species Status: Sperm whales occur throughout all ocean basins from equatorial to polar waters, including the entire North Atlantic, North Pacific, northern Indian Ocean, and the southern oceans. Reliable estimates of current and historical sperm whale abundance across each ocean basin are not available. Five stocks of sperm whales are recognized in U.S. waters: the North Atlantic stock, northern Gulf of Mexico stock, Hawaiian stock, California/Oregon/Washington stock, and North Pacific stock.

The geographic distribution of the North Atlantic stock appears to have a distinct seasonal cycle, ranging from being concentrated off Cape Hatteras (in winter), to being widespread throughout the central portion of the mid-Atlantic bight up to Georges Bank (in spring and summer), to being concentrated on the continental shelf south of New England and along the continental shelf edge into the mid-Atlantic bight (in fall). The minimum population estimate for the western North Atlantic sperm whale stock is 3,539 individuals. There are insufficient data to determine the population trend for this stock.

Sperm whales are present year-round in the Gulf of Mexico. Preliminary results of genetic, satellite tagging, photo-identification, and vocalization studies support the distinct stock status of Gulf of Mexico sperm whales. The minimum population estimate for the northern Gulf of Mexico stock of sperm whales is 1,409 individuals. There are insufficient data to determine the population trend for this stock.

In the waters around Hawaii, sounds of sperm whales have been recorded throughout the year off Oahu. In addition to the main Hawaiian Islands, sperm whales have also been sighted around several of the Northwest Hawaiian Islands. The most up–to-date minimum population estimate for this stock is 5,531. No data are available on the current population trend for this stock.

The geographic distribution of the California/Oregon/Washington stock of sperm whales varies seasonally. Sperm whales are found year-round in California waters, but peak in abundance from April through mid-June and from the end of August to mid-November. Off Washington and Oregon, whales from this stock are present in every season except winter. The current minimum population estimate for this stock is approximately 2,326 whales. Sperm whale abundance appears to have been rather variable off California and does not show any apparent trend at this time.

Sperm whales are widely distributed across the entire North Pacific Ocean and into the southern Bering Sea in summer, but the majority are thought to be south of 40°N in winter. Estimates of pre-whaling abundance in the North Pacific are considered somewhat unreliable, but may have totaled 1,260,000 sperm whales. Whaling harvests from 1800 to the 1980s took at least 436,000 sperm whales from the entire North Pacific Ocean. Sperm whales in the North Pacific stock found in Alaskan waters (Gulf of Alaska, Bering Sea, and Aleutian Islands). The number and population trend of sperm whales of the North Pacific occurring within Alaskan waters is unknown.

Threats and Impacts: During 1999–2003, human-caused mortality for the North Atlantic stock was estimated at 0.4 sperm whales per year. This is derived from the 2000 stranding of a sperm whale off Florida (which had fishing gear in its blow hole) and from ship strikes. Prior to this most recent analysis, several sperm whale entanglements and ship strikes had been documented, including five cases of observed entanglement from 1990–1997. For the California/Oregon/Washington stock, NMFS has observed the incidental take of sperm whales in the California/Oregon swordfish/thresher shark drift gillnet fishery. The average estimated incidental take for this fishery is 1.0 sperm whale per year from this stock. NMFS expects sperm whales are also taken in drift gillnet fisheries for swordfish and sharks off Baja California, but detailed information regarding takes in these fisheries is not available.

Sperm whales in the North Pacific stock are also known to interact with fisheries. Sperm whale interactions with longline fisheries in the Gulf of Alaska typically involve sperm whales feeding off the gear set to target both sablefish and halibut, and may be increasing in frequency. The total estimated mortality and serious injury incurred by this stock as a result of incidental interactions with fisheries from 2000–2004 is 0.5 whales per year.

Another potential human-caused source of mortality in sperm whales is from accumulation of stable pollutants, such as polychlorobiphenyls (PCBs), chlorinated pesticides (e.g., DDT, DDE, and dieldrin), polycyclic aromatic hydrocarbons (PAHs), or heavy metals. These stable pollutants may affect the health or behavior of North Atlantic sperm whales.

Other possible threats to sperm whales include global sea temperature change and altered prey distribution. Also, for the Gulf of Mexico stock of sperm whales, disturbance by anthropogenic noise may become an important habitat issue, notably in areas of oil and gas activities or where shipping activity is high.

Conservation Actions:

- Monitoring the status of the California/Oregon/Washington stock of sperm whales via shipboard surveys, which are conducted every 3 years (MMPA funding).
- Placing observers onboard vessels in the California/Oregon swordfish/thresher shark drift gillnet fishery to monitor for the take of protected species, including marine mammals (MMPA funding).
- Implementing marine mammal take reduction measures identified in the Pacific Offshore Cetacean Take Reduction Plan (including the use of acoustic pingers) to reduce the bycatch of marine mammals (MMPA funding).

- Placing of observers on all seismic vessels operating in the Gulf of Mexico to monitor for sperm whales, implement mitigation measures, and collect data.

Priority Recovery Actions Needed: Continue ongoing conservation actions listed above.

Recovery Priority Number: 7
This recovery priority number reflects a moderate magnitude of threat, low to moderate recovery potential, and the presence of conflict.

Killer Whale (Orcinus orca) – Southern Resident DPS

Photo credit: Sean Ledwin

Date Listed: November 18, 2005 (70 FR 69903)

Legal Status: Endangered

Recovery Plan Status: A final recovery plan for the Southern Resident killer whales was completed in January 2008.

Species Status: In the 1980s and early 1990s, the Southern Resident population increased following reductions due to live captures for public display in the 1960s and 1970s. From 1996–2001, the population declined by almost 20 percent, prompting a petition to list them under the ESA. The population increased for several years, reaching 90 whales in 2006, but has declined to 85 whales as of the 2008 census.

Threats and Impacts: Threats identified for Southern Resident killer whales include limited prey availability, pollution/contaminants, vessel effects, and sound. Concerns regarding the demographics of the population include the small number of reproductive-age males, presence of reproductive-age females that are not having calves, and potential for inbreeding. In addition, the small population size and social structure make Southern Resident killer whales susceptible to catastrophic oils spills or disease outbreaks, which have the potential to impact the entire population. Live captures have been discontinued and are no longer a threat to the population.

Conservation Actions: During 2006–2008, research programs supported include projects on population monitoring, winter distribution, prey associations and diet, vessel interactions, contaminant levels, health assessments, taxonomy and genetics, improving research techniques and technology, research planning, and coordination. In addition to research projects, continuing implementation of conservation actions include:

- Coordination with salmon recovery programs (see Pacific Salmon Recovery).
- Participation to incorporate killer whale recovery into Puget Sound Partnership Action Agenda for cleaning up, restoring, and protecting Puget Sound by 2020.
- Advance Notice of Proposed Rulemaking regarding protective regulations for killer whales in the Northwest Region published March 22, 2007 (72 FR 13464).
- Increased on-water stewardship and vessel monitoring, including reports on vessel activities in the vicinity of whales.
- Increased enforcement presence on the water in coordination with Washington State law prohibiting approach within 100 yards of Southern Resident killer whales (HB 2514).
- Oil Spill Response Plan developed and submitted for inclusion as an appendix to the Northwest Area Contingency Plan.
- Mitigation of in-water construction and other activities through section 7 consultations under the ESA.

- Implemented education and outreach programs, including continued promotion of the "Be Whale Wise" campaign, partnering with the Seattle Aquarium and The Whale Museum, and support of "Killer Whale Tales" and "Saving Springer" classroom programs.
- Increased capability to respond to killer whale strandings.

Priority Recovery Actions Needed: There is considerable uncertainty regarding which threats may be responsible for the decline in the population or which is the most important factor to address for recovery. The recovery plan lays out an adaptive management approach and a recovery strategy that addresses each of the potential threats based on the best available science. The recovery program links management actions to an active research program to fill data gaps and incorporates monitoring to assess effectiveness. Feedback from research and monitoring will provide the information necessary to refine ongoing recovery actions and develop and prioritize new actions. Needed recovery actions include:

- Prey availability*:* Support salmon restoration efforts in the region including habitat, harvest and hatchery management considerations, and continued use of existing NMFS authorities to ensure an adequate prey base.
- Pollution/contamination*:* Clean up existing contaminated sites, minimize continuing inputs of contaminants harmful to killer whales, and monitor emerging contaminants.
- Vessel effects*:* Continue with evaluation and improvement of guidelines for vessel activity near Southern Resident killer whales and evaluate the need for regulations or protected areas.
- Acoustic effects*:* Continue agency coordination and use of existing mechanisms to minimize potential impacts on the whales from anthropogenic sound.
- Oil spills*:* Prevent oil spills and improve response preparation to minimize effects on Southern Resident killer whales and their habitat in the event of a spill.
- Education and outreach*:* Enhance public awareness, educate the public on how they can help conserve killer whales, and improve reporting of southern resident killer whale sightings and strandings.
- Respond to sick, stranded, and injured killer whales*:* Improve responses to live and dead killer whales to implement rescues, conduct health assessments, and determine causes of death to learn more about threats and guide overall conservation efforts.
- Transboundary and interagency coordination*:* Coordinate monitoring, research, enforcement, and complementary recovery planning with Canadian agencies and U.S. federal and state partners.
- Research and monitoring*:* Conduct research to facilitate and enhance conservation efforts. Continue the annual census to monitor trends in the population, identify individual animals, and track demographic parameters.

Recovery Priority Number: 3

This recovery priority number is based on a high magnitude of threat due to low population numbers and continuing threats to recovery, a moderate recovery potential based on uncertainty regarding most important threats, and presence of conflict, because regulatory actions taken could involve restrictions on commercial fishing, contaminant discharge, and vessels.

Appendix A. NMFS Recovery Priority Number Guidelines